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National Fire Data Survey:

Findings on the State of the Existing American Fire Data Ecosystem

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Acknowledgements

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Contents

National Fire Data Survey:
Findings on the State of the Existing
American Fire Data Ecosystem 4/17   i   NFPA Research, Quincy, MA

Executive Summary

This national fire data survey was designed to learn what types of data fire departments collect; what software they use to capture, store and analyze data; and how they use that data for local decision-making. The survey was not intended as a complete census of all fire departments in the United States and are part of a wider effort to assess the needs of the fire service.

There appears to be a growing paradigm shift away from simply creating static fire records to the emergence of a dynamic fire data environment where digital records are being created through a host of systems. While some fire service agencies seem to primarily use data for reporting compliance and record-keeping processes, an increasing number of fire service agencies appear to be using data to manage their organization and their emergency operations.

Two key themes emerged when we asked the fire service to sum up fire data in one word (see right) and continued throughout the survey findings. Underlying these themes is the intricate, seemingly disparate reality: that current systems store substantial quantities of fire data but the benefits of these systems are often limited by data quality, accuracy, and access.

Theme 1:
The Fire Service recognizes the value of data.

Theme 2:
The Fire Service isn't satisfied with the status quo.

Increasingly, fire departments are analyzing data for local decision-making. Fire departments collect and maintain data on a wide variety of fire activities ranging from response information, patient care, fire inspection, training, public education, and many other types of records that go beyond the type of information collected by the National Fire Incident Reporting System (NFIRS). Collection has grown far beyond incident data and a comprehensive approach to connect all fire activity data is needed to ensure that fire departments work with data that truly accounts for the full picture of their activities.

Many fire departments maintain all their records in an enterprise Records Management System (RMS). The respondents shared mixed feelings about the various RMS systems that they used. Ultimately, the various software vendors appear to play a significant role in both the capabilities of each fire department as well as potential improvements. Some agencies noted difficulty getting access to the stored data due to technical reasons such as the lack of system integrations or political reasons such as systems operated and maintained by different agencies. The legacy data model, NFIRS 5.0, emerged at various times as a source of frustration. However, it was not clear whether the frustrations were attributable to vendor-specific user interfaces or to the underlying data model and logic required by NFIRS 5.0, or a combination of both factors.

Finally, there does not appear to be one overarching fire data problem, nor does there appear to be one overarching one-size-fits-all fire data solution. Depending on the size of the agency, their current capabilities and need, fire departments seem to have different fire data problems. Challenges that one department may be struggling with are likely issues recently solved by another department or other data domains outside of the fire service. Identifying, leveraging, and sharing the best practices across the fire service and beyond can likely have significant benefits for the wider fire service.

Survey Purpose & Overview

In August 2016, NFPA was awarded funding through the Assistance to Firefighters Grant/Fire Prevention & Safety program to develop a new national fire data system. The system seeks to provide for quality local and national data that can improve the U.S. fire service's emergency response and community risk reduction activities. In order to better understand the current data capabilities, needs and aspirations within the U.S. fire service, NFPA developed and administered a national fire data survey.

The survey and this document is part of a wider effort to assess the needs of the fire service. NFPA has also established an executive advisory board with delegates from the major fire service stakeholder groups as well as a technical working group of subject matter experts from a broad cross-section of the fire service. NFPA is also convening a series of workshops with fire data users to further understand the diversity of capabilities and needs of the fire service in terms of how agencies capture, store and utilize data about their various activities. Taken together these various linked efforts are designed to create a deep understanding of the existing fire data ecosystem, what the priority needs are, and how NFPA can best assist the fire service in leveraging best-in-breed data practices, technologies, and standards.

Methodology

The national fire data survey was designed to learn about what types of data fire departments collect, what software they use to capture, store and analyze data, and how they use that data for local decision-making. NFPA drafted the survey and solicited feedback from the key stakeholder groups on both the questions and the overall approach. The survey was designed to capture priority needs from across the fire service landscape. The survey was conducted electronically using the SNAP Survey platform. The survey used skip logic to allow a participant to bypass any questions irrelevant to their experience. The survey was sent out through many electronic mediums including various fire service organizations and social media platforms. The survey was not intended as a complete census of all fire departments in the United States and was not sent directly to every fire department as is practice with other NFPA surveys. This was done so as not to inundate departments with surveys that might dilute the response rate to these major surveys.

The survey was open for 30 days closing on Friday 20 January 2017. Given that this initiative is ongoing the survey will remain open to capture additional responses. This analysis only includes those responses that were received by January 20, 2017.

Who Responded

The survey respondents represented 29 states and 4 countries[1]. Respondents were asked what category "best described" their role within their organization. While this approach gives a good overview of the distribution of the respondents it is very likely that some respondents may wear "many hats" within their organizations and may have fit multiple categories as they are not mutually exclusive in practice. Expectedly, most respondents represented those that are most

Primary Job Role	Number	Percent
Chief Officer / Administrator	319	72%
Firefighter / Company Officer	66	15%
Analyst / IT Professional	33	7%
Fire Marshal / Inspector / Investigator	12	3%
Labor or Employee Representative	3	1%
Consultant / Retired Fire Service	3	1%
Administrative Support	3	1%
Stakeholder Group Representative	2	0%
Training Officer	2	0%
Accreditation Manager	2	0%
Not Provided	1	0%

likely to typically use data. The majority were chief officers or other executive administrators, though no distinction was made between the various levels of chief officers or administrators.

The top-heavy distribution of the respondents is somewhat expected as the people towards the bottom of the chain of command in many organizations (firefighters through company officers—drivers, engineers, "chauffeurs", Technicians, Corporals, Sergeants, Master Firefighters, Lieutenants, Captains and other rank designations) who may be more apt to collect and enter data are perhaps less likely to be interested or allowed to complete national surveys on behalf of their organizations.

The types of agencies that each of the respondents represented also mirror the wider distribution of the fire service. The majority (65%) served municipal or county agencies whereby the city or county government traditionally funds and oversees the operation of the fire department. A smaller number (14%) represented fire protection or emergency services districts which are often independent of or serve

Governance Structure	Number	Percent
Municipal / County Agency	292	65%
Independent Emergency Service District	62	14%
Non-Profit Organization	46	10%
State Agency	32	7%
Other	5	1%
Federal Agency	4	1%
Not Provided	4	1%
For-Profit Company	1	0%

[1] This survey is in support of a federal grant funded activity and thus the express focus of the survey was to understand about the U.S. fire service uses data; however, responses from other countries were allowed and welcomed as they help provide a greater depth of understanding about how the themes identified in the U.S. may link to or differ from experiences in other countries. There were 4 International respondents: Canada (2), Australia (1) and Brazil (1).

National Fire Data Survey:
Findings on the State of the Existing
American Fire Data Ecosystem 4/17   3   NFPA Research, Quincy, MA

multiple municipalities or unincorporated areas and are often governed by a board. Other agencies identified themselves as non-profit organizations which may share characteristics with municipal agencies or districts but the organization functions as its own legal entity.

Fire Data at a Crossroads

Survey respondents were asked "what is the one word they would use to describe data in the fire service?" From the word cloud below, we can see the many themes that flow through the survey results.

The results show that the fire service is at an important crossroads in the way it understands and uses data. Two important themes emerged:

1. **Data, as it is currently being collected, is problematic and is not used to its full potential.**

2. **Data has significant untapped value and potential for the fire service to improve service delivery, resource planning, and increasing community safety.**

The following pages will try to unpack these themes to understand how fire departments currently use data and how they hope to in the future. The survey results were primarily organized into three content areas to be consistent with the cyclical flow of data through the fire service, from collection to analysis to dissemination.
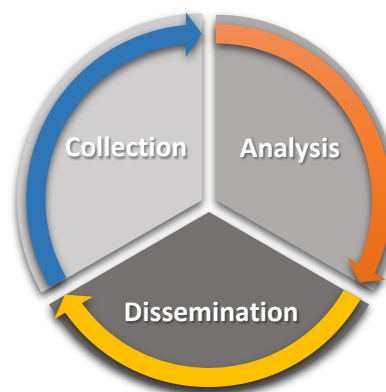
Collection: The Beginning of the Fire Data Journey

The origin of fire incident data tends to begin with an emergency 911 call to a Public Safety Answering Point (PSAP) where a tele-communicator typing what they are told into the Computer Aided Dispatch (CAD) system. The CAD system not only recommends available units to dispatch but also adds a considerable amount of data that can be important to each fire departments. Increasingly there are other sources for fire activity data, such as building records, fire hydrant records, or citizen-initiated requests for service. However, the creation of fire data remains primarily a manual data entry task.

Computer Aided Dispatch (CAD) Systems

Of the 429 respondents to the question about what Computer Aided Dispatch (CAD) system is used to dispatch their units, over 40% (n=176) did not know. A number of the respondents anecdotally noted that the PSAP and dispatching responsibilities fall under agencies outside of their purview or control. It was not always clear how well integrated CAD systems were with Records Management Systems (RMS). It was also not clear whether information recorded in the CAD system is consistently available to the respective fire agency. Standardization of data contained within these systems is unknown, especially given the diversity of CAD system vendors represented in this survey (see below).

CAD Vendor[2]	Number		CAD Vendor	Number
I don't know	176		Alpine Red NMX – Red Alert	2
Tiburon / TriTech - Zuercher / Visionair	43		Keystone Public Safety	2
Tyler / New World Systems	36		Sundance Systems	2
Intergraph	30		Symposium	2
SunGard / OSSI – One Solution	19		Versaterm	2
Motorola	18		Cardinal Tracking	2
Spillman	17		ADSi	1
IMC	14		Alerts Public Safety Solutions	1
Inform	8		Application Data Systems Inc.	1
Northrup Grumman – Command-Point / Altaris	7		Archonix XCAD	1
Integrated Computer Systems (ICS)	6		ASTRA CAD – Emergency Plus	1
Do not have a CAD system	5		CADWeb	1
Southern Software CAD	4		CORE Technology	1
PSSI	4		Crime Star	1
INFOR - EnRoute Emergency Systems	3		EDISPATCHES	1
Crimes	3		Calibre - InterAct CAD	1
CIS	2		Pamet	1
e-Force	2		PowerCAD	1
ID Networks	2		Pro-Phoenix	1
Internally created system	2		Rescuenet	1
ITI (Information Tech Inc.)	2			

Record Management Systems (RMS)

Of all the survey respondents, which included non-first responder agencies, the majority (n=415) maintained a records management system (RMS) for collecting data locally.[3] Like CAD systems there is considerable diversity among the RMS vendors that fire departments use.

Of the fire departments with a RMS, nearly 20% (n=81) maintained more than one major system within their own agency. Given that many records management systems provide comprehensive suites of data collection tools there is likely a considerable amount of overlap and underutilization among the capabilities of the various systems.

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[2] Some vendors have consolidated with other vendors so wherever feasible new and old names as well as parent companies were amalgamated for ease of counting, recognizing that some respondents have legacy systems that predate the new companies—such as Tiburon and TriTech as well as Tyler and New World Systems.

[3] It is important to note that this survey is not a representative sample of the entire fire service and should not be considered a comprehensive market study. Moreover, one software vendor let us know that they actively encouraged their customers to participate in the survey while it is not clear if other vendors did as well.

Moreover, as will be discussed in greater depth below, unless each system is appropriately integrated to share data between the different platforms the process of conducting comprehensive analyses is likely to be even more challenging.

RMS Vendor[4]	Number
Firehouse Software	157
Emergency Reporting	54
ImageTrend*	52
Zoll	34
State Provided Systems*	23
Alpine Red Alert	15
ESO	13
Fire Programs	13
New World Systems	12
USFA DEBI	11
TriTech/IMC	10
Respondent Was Not Sure	7
USAF – ACES – FD – IMS	3
HTE Sunguard	3
Fire Tools	2
High Plains Fire Manager	2
PSSI	2
ADSi	1

RMS Vendor	Number
Crossfire	1
Emergency Pro	1
ESP	1
ETI Visual Fire	1
FCT	1
File Maker Pro	1
Fire Central	1
Fire Station Software	1
Fire Tools	1
Fully Involved, LLC.	1
ICS (Integrated Computer Systems)	1
Infor	1
Intergraph/Hexagon	1
NFIRS Online	1
OMS - built in house	1
Pro-Phoenix	1
SunPro (now Zoll)	1

How Departments View their RMS

To understand a fire department's opinions about their existing data systems we asked, "What is the best thing about your current RMS?" Each of these questions were open-ended and then manually coded to identify common themes.

What is the best thing about your current RMS?			
Theme	**Number**	**Theme**	**Number**
Data Utilization / Visualization	76	Free / Low Cost	8
User Experience / Ease of Use	52	Other	6
Umbrella / All-in-One System	43	Customer Support	6

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[4] Some states have contracted with large vendors (like ImageTrend – State Bridge, EmergencyReporting or others) to provide a free comprehensive fire and/or EMS reporting system for any fire department in their state so some vendors might have greater representation than is indicated.)

Cloud Based / Web Interface	18	Access to Legacy Data	5
Nothing / Strongly Dissatisfied	17	Drop Down Menus / Check Boxes	4
Continuity / Familiarity	13	Improvement Over Previous	4
Unknown / Unclear	13	System Stability	3
Satisfies Reporting Requirements	13	Being Replaced	1
System Integrations	11	Local Expert Knowledge on System	1
Consistency	10	Mobile Access	1
QA / Custom Rules / Customizability	9	New System – Too Early to Tell	1
Auto-Population	8	Staffing Module	1

Conversely, we also asked "what is the worst thing about your current RMS?" These responses were similarly manually coded to identify themes.

What is the <u>worst</u> thing about your current RMS?			
Theme	**Number**	**Theme**	**Number**
Difficulty Accessing Data	77	Limited CRR Functionality	4
Not User Friendly	34	Not Cloud Based	4
Limited Customizability	23	USFA System Challenges	4
Not Integrated with Other Systems	21	Local Implementation Challenges	3
Data Errors / GIGO / Inconsistency	18	RMS selection made by another entity / FD had Limited Input	3
NFIRS Coding Structure	17	Doesn't Collect Operational Data	2
None Identified	17	Fire Investigation Module	2
Limited Training / Learning Curve	16	Password Resets	2
Out-of-Date / Non-Compliant with Modern Requirements	15	Personnel Assignments	2
Other	13	Reliability / Software Stability	2
Unfixed Bugs / Software Latency	10	Too Focused on EMS data	1
Cumbersome / Complicated	9	Vendor Going Out of Business	1
Lack of Customer Service	9	Lack of QA Tools / Validations	1
Time Consuming	8	Not ideal for ARFF	1
Cost (Upfront and Ongoing)	6	Redundancy	1

Mutual Aid / Inconsistency Between Agencies / Limited Comparisons	5		Scheduling Module	1
Everything!	5		Too Customizable	1

Perhaps most interesting is that the top two responses for both the *best thing* and *worst thing* were basically mirror images of one another. Fire service personnel were most interested or excited by the possibility of using the data within their systems; however, they also expressed frustration getting access to and using that data. Similarly, fire service personnel had mixed emotions about the user experience with their software.

Other themes that emerged were well within the domain and responsibility of the local fire service. Fire departments identified the quality and consistency of the data, otherwise known as *Garbage In, Garbage Out* or GIGO, as a significant concern. Fire departments also identified challenges training personnel and the learning curve for their specific software solution as a significant challenge. Other challenges were outside of the immediate control of the local fire department and squarely in the domain and responsibility of the software vendors, namely concerns about the customer service and perceived responsiveness of the vendor.

Earlier research has emphasized a strong desire within the industry for simplifying user interfaces and auto-populating data for improving both the user experience and quality of data entry (NIST 2011, Pg. 26). These survey findings support that conclusion. However, given that the software vendors control the configuration and design of their own proprietary systems it is not clear whether wholesale improvements in the user interfaces can be made industry-wide without widespread consensus or standards.

National Fire Incident Reporting System

The existing fire data landscape continues to be dominated by National Fire Incident Reporting System (NFIRS) despite growth well beyond the bounds of the NFIRS coding structure. Of the respondents that represented U.S. fire service agencies, 95% (n=408) noted that they submitted incident data to NFIRS. Perhaps more interesting are the reasons noted for why an agency did not report (n=19): they ranged from a flippant "ask the chief" to more circumspect "because the chief before never showed or explained [the] system to members", "no training plus a pain to use, or "we do not currently have an NFIRS reporting number". Several respondents likely do report data to NFIRS as they submit data to their state or through a state-maintained system, but may not realize where their data goes.

The current NFIRS coding structure was a theme that also underlies several of the "worst things" feedback the respondents provided. Specifically, the themes NFIRS Coding Structure, Cumbersome, USFA System Challenges, Time Consuming and Limited Customizability likely link back to the underlying data model and coding configuration. These concerns need to be explored further, however, it is also not clear how much flexibility the software vendors

currently have with the design of their software interface while remaining compliant with the existing fire data standard, NFIRS version 5.0. Whether the lack of innovation and ingenuity in the user interfaces for fire data records management systems is due to the software vendors or the underlying NFIRS coding model are subject to considerable debate and cannot be sufficiently resolved through this survey.

Setting aside the debate about the current NFIRS coding structure, one topic that warrants further consideration is the amount of time it takes for data to be available for state or nationwide analyses. A common refrain is how long it takes to get access to national level data, which can be upwards of two years. While it is not always clear where the responsibility for this delay lies, the respondents did highlight a reason for a portion of the delay—the time it takes local fire departments to submit NFIRS data.

How Often Does Your Agency Submit NFIRS Data?	Respondents
Monthly	227
Quarterly	67
Immediately	40
I don't know	25
Annually	23
This is handled by the RMS software vendor	10
Other	9
Semi-annually	7

This current approach can be best summed up as "share when convenient". Local agencies can decide when to share their data externally at a frequency or at a time when is most convenient for the agency or consistent with their internal policies. As long as there are agencies who opt to upload data annually, the delays cascade throughout the system as many states and the federal government similarly opt to withhold sharing data until a reasonably comprehensive dataset is collected. Until a "share by default" approach is developed and widely adopted, where at least a basic record of the incident is shared immediately or after a rolling embargo, it is unlikely that there is going to be a significant change in the timely availability of national fire data.

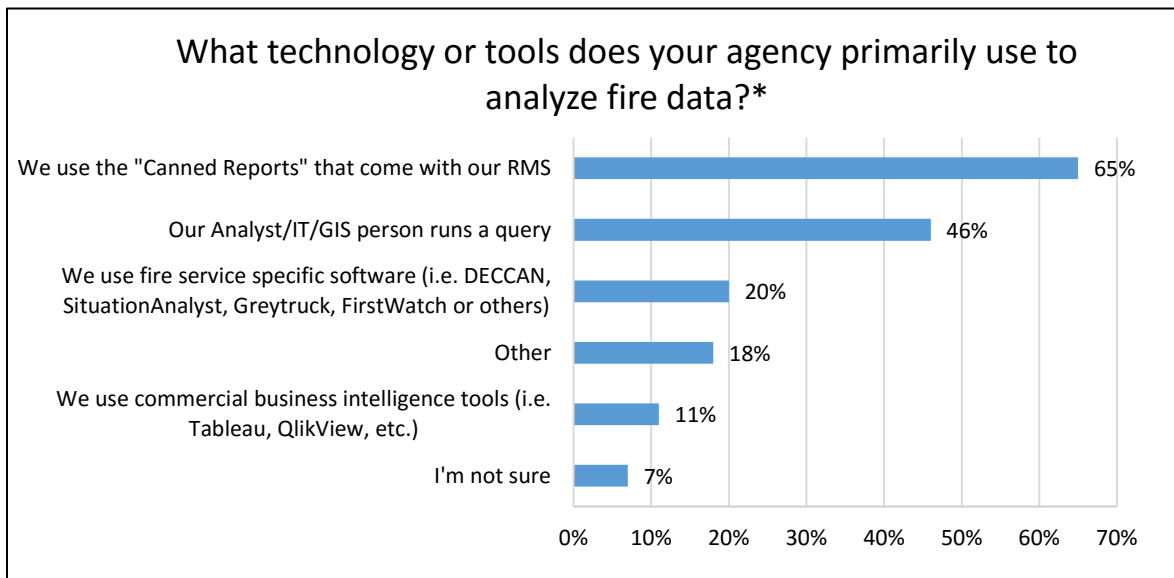## Analysis: Numbers into Knowledge

The collection of data within fire departments historically was intended to satisfy reporting requirements and occasionally for bragging rights for the busiest crews. Many fire departments have kept records for generations, but there appears to be a paradigm shift emerging as many fire departments are

Does your departments analyze data?

N/A 24

No 127

Yes 295
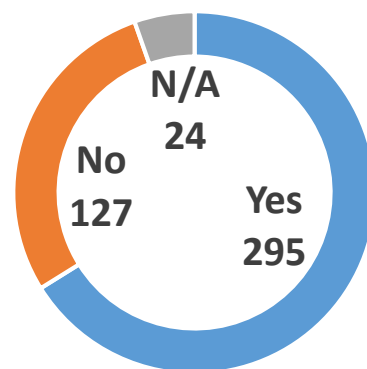
starting to become data savvy, using comprehensive data along with robust tools to analyze and leverage their data locally.

The diverse answers received as part of this survey are consistent with expectations on how fire departments work with and treat data. While it demonstrates that there is room for improvement, many departments are realizing the benefits of data in improving their operations and department administration. The majority of respondents noted that they utilize tools specifically designed to query and analyze data to help them draw conclusions from the data. A small but significant number of agencies relied upon personnel with an analytical background to draw actionable information from their data. Given that these responses are not mutually exclusive, it suggests that fire departments are beginning to make significant investments in the analysis and utilization of their data. The hiring of analysts or IT professionals to work within fire departments is an interesting insight that is beyond the scope of this analysis but should be fleshed out in greater detail elsewhere.

What technology or tools does your agency primarily use to analyze fire data?*

We use the "Canned Reports" that come with our RMS	65%
Our Analyst/IT/GIS person runs a query	46%
We use fire service specific software (i.e. DECCAN, SituationAnalyst, Greytruck, FirstWatch or others)	20%
Other	18%
We use commercial business intelligence tools (i.e. Tableau, QlikView, etc.)	11%
I'm not sure	7%

Only those who answered "Yes" on the question "Does your agency review or analyze incident or operational performance data?" were asked this question. (n=295)
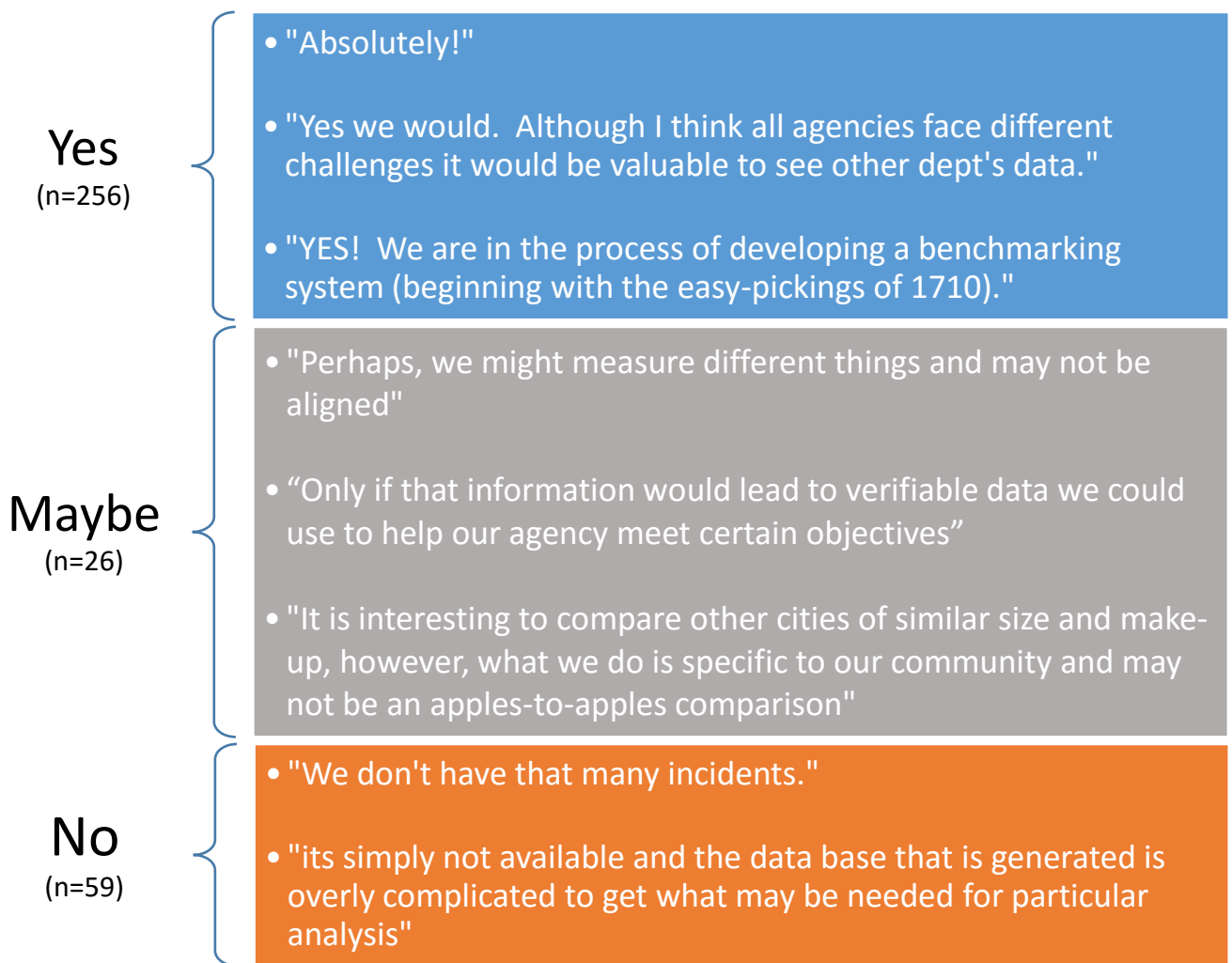
The number of agencies using fire service-specific or commercial business intelligence tools is an interesting insight. The growth of specific tools that are designed to help fire service analysts and leaders to identify problems and improve performance, appears to highlight a growing appetite for the type of analytics that have become commonplace in the business world. The majority of respondents relied upon pre-defined or customizable reports built into their software; these are sometimes known as "canned reports" because they include a series of common queries where the query logic has already been written so the user need only click a limited number of parameters and run a simple report. Taken together, the majority of agencies use built-in or supplemental analytical tools designed to help them dig into their data

to make decisions. For the majority of responding fire departments, fire data are not simply collected and stored for the purposes of reporting data to another entity. Rather, the data is collected and analyzed to help make local decisions. The survey results emphasize a maturation in how fire service agencies use data and suggest that this trend is expanding.

Benchmarking

One of the drivers for fire service data usage is the growing prevalence of benchmarking. The concept of benchmarking in the fire service takes many forms; each of which measure local performance against an existing standard or against similar agencies. One of the most common form of benchmarking is the Insurance Services Office (ISO) Public Protection Classification (PPC) scheme. The ISO evaluation process measures fire departments against industry standards and best practices. In order to improve their ISO rating, many agencies have begun or improved their own internal data analysis practices to prepare for an ISO site visit. Those agencies that pursue accreditation through Commission for Fire Accreditation International (CFAI) also engage in comprehensive benchmarking against industry standards as part of that process. Thus, the practice of benchmarking, in various forms, has become engrained in the fire service, albeit often against existing standards. What is less common is active benchmarking between and among different fire service agencies. As might be expected when the conversation changes to focus on comparisons among departments benchmarking takes on a different hue.

The respondents were overall broadly supportive of the concept of benchmarking performance among fire service agencies. In fact, four times as many respondents indicated they would be interested in benchmarking, compared with those who said no. A fair amount were non-committal, seeming to indicate a need for more information and education about what benchmarking could do, how a department could be graded, and how to ensure fair, consistent, and valid comparisons. Below is a collection of statements from respondents indicating the reasons behind their specific choice?
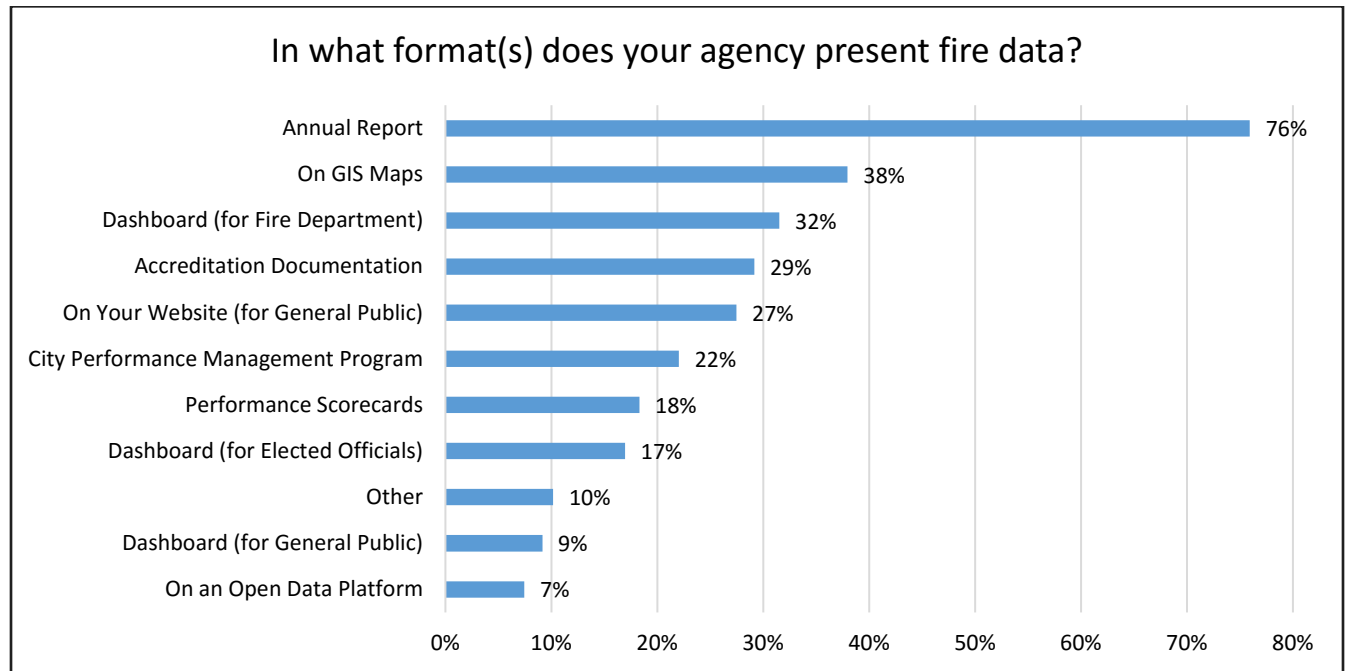
Yes
(n=256)

- "Absolutely!"

- "Yes we would. Although I think all agencies face different challenges it would be valuable to see other dept's data."

- "YES! We are in the process of developing a benchmarking system (beginning with the easy-pickings of 1710)."

Maybe
(n=26)

- "Perhaps, we might measure different things and may not be aligned"

- "Only if that information would lead to verifiable data we could use to help our agency meet certain objectives"

- "It is interesting to compare other cities of similar size and make-up, however, what we do is specific to our community and may not be an apples-to-apples comparison"

No
(n=59)

- "We don't have that many incidents."

- "its simply not available and the data base that is generated is overly complicated to get what may be needed for particular analysis"

The open question about benchmarking is "who are you comparing me to?" Several respondents tempered their enthusiasm by emphasizing that the comparisons must truly be between like departments: "Yes, as long as the agency has not only the similar population density, but also the geographic restrictions, business and industrial base as our City."

Many of the fire departments emphasized how unique their department and community is: "Yes. Although this could be challenging as we have a rather unique district and operations that don't fit neatly into standardized categories - for example, NFPA 1710 and 1720 standards." And the departments noted differences in how various agencies conduct analyses or capture data: "Yes. Problem is that everyone measures things differently." Any effort to begin benchmarking among departments must take these caveats into consideration for the fire service to buy into the process.

Dissemination: Sharing Data with Internal and External Stakeholders

The analysis of data is only part of the equation, where that data goes and how it is used is equally important. We asked a series of questions to shed light on what fire departments do with the data they collect. Fire departments utilize various mediums to share or visualize their data. Expectedly, the vast majority of fire departments produce an annual report that includes some form of fire data.

In what format(s) does your agency present fire data?

Format	Percentage
Annual Report	76%
On GIS Maps	38%
Dashboard (for Fire Department)	32%
Accreditation Documentation	29%
On Your Website (for General Public)	27%
City Performance Management Program	22%
Performance Scorecards	18%
Dashboard (for Elected Officials)	17%
Other	10%
Dashboard (for General Public)	9%
On an Open Data Platform	7%

Only those who answered "Yes" on the question "Does your agency review or analyze incident or operational performance data?" were asked this question.
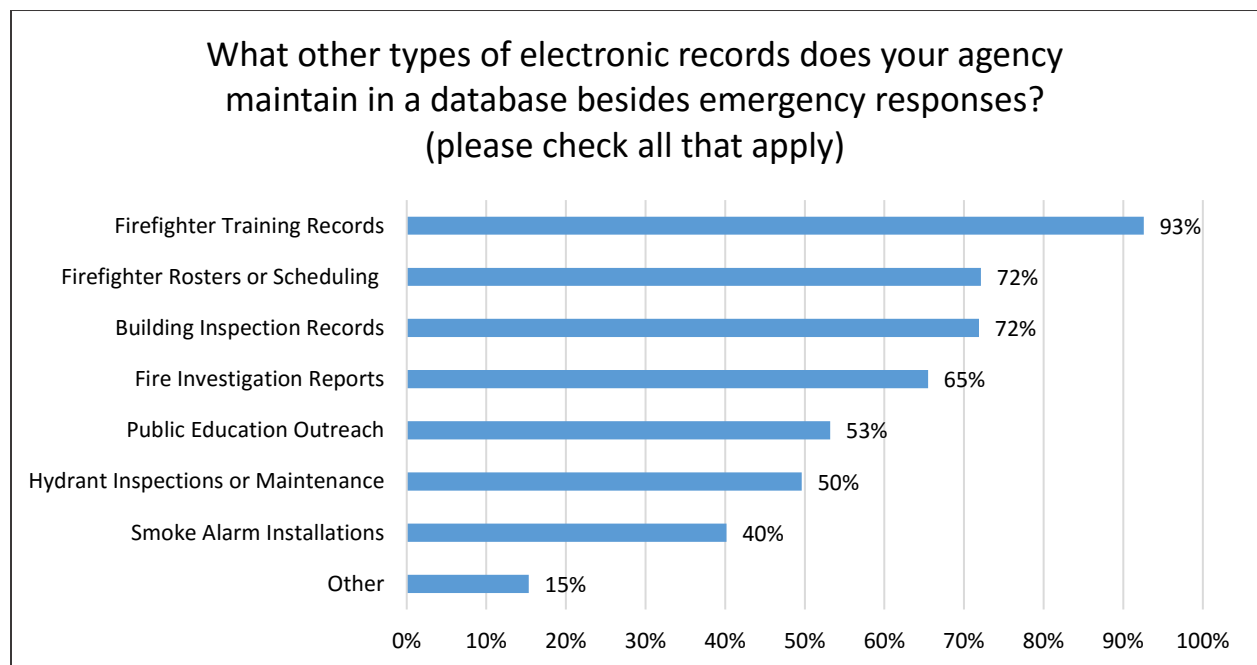
There are a number of other platforms fire departments use to share data. Nearly 40% of respondents use Geographic Information System (GIS) tools to visualize data on maps in either print or digital form. With the rise of organizations such as the National Alliance for Public Safety GIS (NAPSG) and corporate trainers demonstrating both the value of GIS analyses as well as how to begin using GIS maps this number is likely to increase. The findings highlight the growing role of performance management concepts including data visualization dashboards, performance scorecards, and formal performance management programs similar to CompStat or CityStat popularized by law enforcement and public administrators.

As was highlighted in a later question about future capabilities, many fire departments have begun using visualization dashboards for internal and external stakeholders to quickly identify what is going well, what needs to be further attention, and what needs to be fixed. Having access to an easily configurable dashboard program can give the fire service leaders, administrators, and elected representatives timely and easily-digestible access to key data

insights. This trend is only likely to increase as the calls for operational efficiency and government transparency get more pronounced.

Expanding the Fire Service Data Ecosystem

One overarching theme that has emerged is that most fire departments collect and maintain detailed digital records for many departmental activities beyond simply documenting incident responses. And this data appears to be often housed within the same RMS they use for incident reporting, though it is not clear if non-incident data from these systems gets regularly shared externally. This is a significant finding in that the existing national data system, National Fire *Incident* Reporting System, was originally conceived and designed to primarily document *incident* responses. For example, most of the fire departments noted that they maintain electronic training records, scheduling rosters, and building inspection records. An important factor that should be further explored elsewhere is how much of this digital record keeping can be attributed to fire department efforts to maintain or improve their community's ISO public protection classification (PPC). Moreover, it isn't not clear whether these digital records are being maintained in a consistent format with standardized data fields and data types that could be used compile national data or to compare data from one community to another.

What other types of electronic records does your agency maintain in a database besides emergency responses? (please check all that apply)

Category	Percentage
Firefighter Training Records	93%
Firefighter Rosters or Scheduling	72%
Building Inspection Records	72%
Fire Investigation Reports	65%
Public Education Outreach	53%
Hydrant Inspections or Maintenance	50%
Smoke Alarm Installations	40%
Other	15%

System Integrations

Given the prevalence of fire departments maintaining multiple discrete types of digital records, the obvious question remains about how well these data systems are integrated. Said another way, do these various types of data exist in siloed computer systems that do not share data among them or are they seamlessly integrated so that data can move from one system to
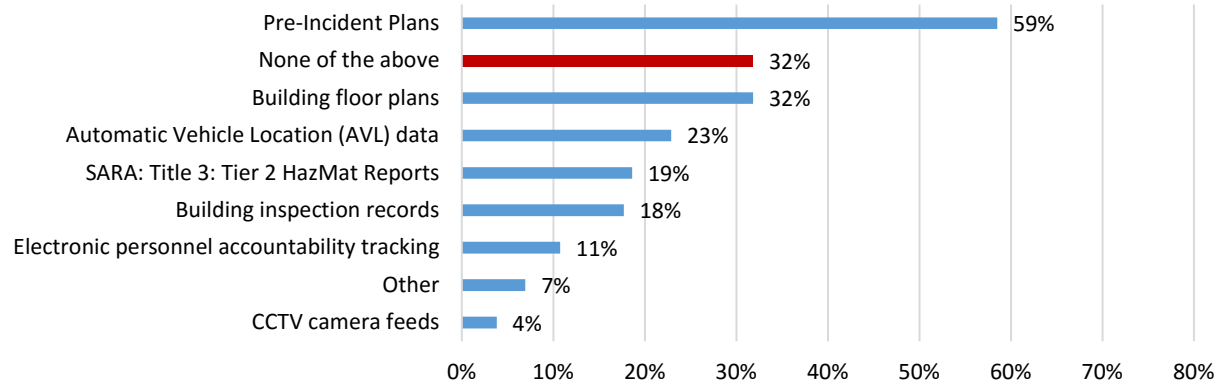
another with relative ease? Perhaps one of the easiest and most common ways that data can be integrated is when all the different types of data are collected within the same system, which is often referred to as an "all-in-one solution" or an "enterprise platform". Many if not most of the records management systems that the fire departments stated they use are designed to collect multiple types of records, but this does not mean that fire departments fully utilize all available functionality. Again, it is worth evaluating elsewhere if there is a relationship between the types of records that most all-in-one RMS solutions capture and the documentation requirements as part of the ISO PPC evaluation process.

As noted above, of all the data system integrations in the fire service, arguably the most important is the integration between the CAD system and the RMS. Whether the CAD system can transfer data correctly, quickly, and completely to the RMS can have a significant impact on the end user entering the data and the quality of the data they input. Some respondents noted that the PSAP/CAD system that dispatched their units also serviced many different fire departments across a region and often that the CAD system was operated by local law enforcement or another agency. It is not clear how integrated these systems are when the CAD system is operated and maintained by a third party, particularly one that may have other priorities. Other communities noted that they use the same vendor suite for both their CAD system and their RMS functions. Taken together, CAD systems appear to play a significant role in the quality of fire data but it is not always within the direct control of the fire service to address problems.

Using Data on the Fireground

The question about what data fire departments have access to needs to be broken down into two important distinctions, that data that can be accessed and used to make decisions in administrative settings and that data that can be accessed and used to make decisions in emergent, operational, settings. The latter situation where exigency, ambient conditions, and competing priorities all can conspire to limit the usability of even the best and most comprehensive data needs to be considered independently. The respondents were asked what type of data incident commanders have access to on emergency scenes. Over half noted that they have access to pre-incident plans, though it was not always clear whether respondents whether were referring to up-to-date digital records or more traditional paper copies in binders. Perhaps even more worryingly, a third of respondents noted that they did not have access to any of the common types of data that might be useful to emergency personnel when attempting to safely and effectively mitigate an incident.

Which of the following information can your incident commanders access on the fireground (check all that apply)

Category	Percentage
Pre-Incident Plans	59%
None of the above	32%
Building floor plans	32%
Automatic Vehicle Location (AVL) data	23%
SARA: Title 3: Tier 2 HazMat Reports	19%
Building inspection records	18%
Electronic personnel accountability tracking	11%
Other	7%
CCTV camera feeds	4%

Expanding Capabilities

To understand more about the desires of fire service in terms of what data tools or capabilities they need we asked: "If you were looking for software/tools to help you use your data more effectively what functions and capabilities would you like to see?" These open-ended responses were manually coded to identify common themes. While the majority opted to skip the question, the overarching theme among those who did respond was access to better analytics.

Data Tools Desired	Responses
No Response	164
Better Analytics	80
Improved User Experience	35
Better Integrations	22
Configurable Dashboards	18
GIS Mapping	18
None	16
Mobile Data Access	11
More Configurability	11
Centralization of Data	10
Data on Other Activities	8
Lower Cost	8
Unknown	8
Links to External Data	6
Benchmarking	5
Other	5
Automated Timestamping	3
Easier Comparisons	3

Everything	3
Improved Coding Structure	3
More Operational Data	3
Standardized Benchmarks	3
Fire Investigation Module	2
Training Records	1

For instance, the type of analytics they were interested in included: "Automatic reports, charts, and graphs for user defined needs", "Canned reports to compare agencies, customized reports for in-house use. Pre-built, customizable, dashboards, score cards with mapping", as well as "Fire-specific software/tools that have the functionality of Tableau and intuitive user interface." Interestingly, some respondents noted that they have tried to express the need for better analytics: "I have pages of suggestions that have been provided to our current software vendors. The problem with nearly all of the current RMS systems is they are developed to be data collection systems." This respondent highlights the paradigm shift in the fire data ecosystem where data was once collected almost exclusively for reporting purposes now fire data is now being reviewed and used dynamically in near real-time.

As more agencies begin to actively utilize their data there is an increasing demand for links to other types of data or other databases. The fire service appears to have lost patience with siloed data systems. The respondents noted: "Access to data that includes "feeds' from CAD, RMS, EMS and other data sources so that you can look at all data and not have to merge it after the fact. Current tools are very useful, but then don't always tell the whole story", "Merging all data together so that one computer can access all data at an emergency scene instead of using multiple computers and data bases", or more simply a "one stop shop that is user friendly" with "compatibility with other RMS programs". There were some disagreements between the respondents as to the best approach to link this data with some suggesting what is needed is "API access" while others emphasizing enterprise solutions that are "complete packages" and "all inclusive".

Final Conclusions

The fire data field is rapidly changing. There appears to be a paradigm shift underway that is moving away from simply creating fire records, formal documentation of an incident in paper or digital format primarily for record-keeping purposes, to the emergence of a dynamic fire data environment. This environment where digital records are being created through a host of systems and means will now be used to effectively manage fire emergencies, organizational processes and mitigate potential risks. This shift appears to exist on a continuum. Some fire service agencies seem to primarily use data for record-keeping processes and to comply with reporting requirements. However, an increasing number of fire service agencies appear to be using data to manage their organization and their emergency operations. Regardless of where

an individual agency is on that continuum, there are several common themes that can assist all fire agencies.

Two key themes emerged when we asked the fire service to sum up fire data in one word. The first theme was that the fire service appreciates the value and the potential of fire data. The second theme was that the fire service is not satisfied with the status quo in the way fire data is collected, analyzed, and reported. These two themes reappeared throughout these survey findings. The current systems for collecting fire data, namely the computer aided dispatching systems and the records management systems, are complex systems that store substantial quantities of fire data; however, the benefit of those systems is often limited by the quality and accuracy of the data that is entered by emergency personnel. Moreover, some agencies noted difficulty getting access to the information contained within those systems due to technical reasons such as the lack of system integrations or political reasons such as systems operated and maintained by different agencies.

Increasingly, fire departments are analyzing and utilizing data for local decision-making. The transition from fire incident records to fire activity data more broadly highlights the diversity of data types and sources that fire departments now manage. Fire departments collect and maintain data on a wide variety of different fire activities from emergency responses, medical patient care, fire inspection, training, public education, and many other types of records that are often not shared with the National Fire Incident Reporting System.

Many fire departments maintain all their incident and activity records in all-in-one enterprise-wide records management systems. The respondents shared mixed feelings about the various RMS systems that they used, the strongest feelings positively and negatively tended to be mirror images of one another. For instance, firefighters emphasized the ways they could analyze and visualize data was the best part of their system and conversely others expressed frustration getting access to the data for analysis. Similarly, some noted how user-friendly their system was meanwhile others noted frustration with a perceived lack of user-friendliness. Ultimately, the various software vendors appear to play a significant role in both the capabilities of each fire department as well as potential improvements.

The underlying legacy data coding model, namely NFIRS 5.0, emerged at various times as a source of frustration. However, it was not necessarily clear whether the frustrations that were begin expressed were because of the user interface that the vendors controlled or whether the user interface was constrained by the underlying data model and logic required by NFIRS 5.0. Either way, the current model appears to focus primarily upon incidents and does not appear to be designed to systematically collect data on all the other activity types that fire departments collect data on.

There does not appear to be one overarching fire data problem. Nor does there appear to be one overarching one-size-fits-all fire data solution. Depending on the size of the agency, their current capabilities and their current needs, fire service agencies seem to have different fire

data problems. Challenges that one department may be struggling are likely ones that was recently solved by another. And even the most persistent data challenges have likely be solved in other data domains outside of the fire service. Identifying, leveraging and sharing the best practices across the fire service and beyond can likely have significant benefits for the wider fire service.

The fire service has made tremendous strides in its use of data in the previous generation but there is much work to be done. The next generation of the fire service promises to truly revolutionize fire service data. The foundation being built today will chart the course of this data revolution.