

Running head: BUSINESS ANALYTICS

Business Analytics Model for Fire Department Planning & Decision Support

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Certification Statement

I hereby certify that this paper constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

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Abstract

As a professional public safety organization, the Henrico County Division of Fire has continued to pursue organizational excellence and improve the safety and strength of the community it serves. As a key part of its strategy, the Division has made a commitment to pursue data-driven decision making and promote the enhancement of business analytics in the fire service. Despite the presence of this doctrine, the Division did not have a model in place to integrate business analytics into the ongoing operations of the department. This research examined that problem through the evaluation of feedback from members of the department at various ranks, as well as representatives from other accredited fire departments. With this new perspective, combined with research from other industries which have successfully integrated business analytics into the fabric of their operations, this work identifies areas for improvement and proposes a model for data-driven decision making for the fire service.

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Business Analytics for Fire Department Planning & Decision Support

As part of its most recent strategic planning process, the Henrico County Division of Fire has established a goal of developing improved process and data management systems that will help guide organizational decision-making. Not only mentioned at the highest levels, this desire to improve the coordinated use of business intelligence for decision support is a common thread for organizational improvement, extending to multiple facets of the Division's operations (Henrico County Division of Fire, 2013). With such a major emphasis on this theme, and so much potentially at stake, given both the danger and importance of the Division's community responsibilities, an examination of this area is well-justified to ensure efforts are in keeping with industry best-practices for data analysis, both internal and external to the fire service.

The problem is that the Henrico County Division of Fire does not have a defined process for appropriately developing, analyzing, and integrating quantitative data to support organizational decision making. The purpose of this research is to establish a systematic process for business analytics for the Division, which will optimize data-driven decision making. This applied research effort focused on answering the following questions: (a) What types of data analytics are most commonly utilized in the fire service and to what impact? (b) What are the most relevant needs for data and decision support currently faced by department leadership at the chief officer and company officer levels? (c) What is the perceived level of effectiveness at utilizing data for decision support across the ranks of the Division? (d) Understanding the existing strengths and weaknesses in this area, how can the department best design a procedure to improve its use of data for effective decision making?

As an action research project, this effort also served to develop an adapted business analytics system model for the Division, which can be utilized as a roadmap for the comprehensive integration of data for decision support in the future.

Background and Significance

The Henrico County Division of Fire is the second largest career fire department in the Commonwealth of Virginia. Situated just north of the state capital, Richmond, the county encompasses just over 244 square miles and has a population of 314,932 residents. With a diverse community makeup, the Division's 20 fire response zones range from rural farmlands and forest areas to suburban, urban, and metropolitan-density developments. As the primary all-hazards emergency response agency, the Division responded to 41,269 emergency incidents during FY13 (Henrico County Division of Fire, 2014).

As one of the first organizations to receive "Accredited Agency" status by the Commission on Fire Accreditation International (CFAI), the Division has been deeply involved in the formal pursuit of organizational excellence for a number of years through the use of the accreditation process (Henrico County Division of Fire, 2013). The CFAI accreditation process involves a review of the organization's comprehensive self-assessment manual and strategic planning efforts, as well as an examination into the evaluation of risk in the community and the response deployment performance, or standard of cover. With a heavy emphasis on data collection and analysis, this model for organizational improvement uses both qualitative and quantitative performance measurements (CFAI, 2009).

Outside of the accreditation effort, historically the most prevalent collection and analysis of data by the Division has centered on the mandatory, regulatory reporting requirements related to submission to NFIRS via the Virginia Department of Fire Programs and patient care

information submitted to the Virginia Office of EMS. Two different third-party software packages have been used to collect, submit, and complete the primary analysis of the data collected from these distinct processes. Response demands and response time data has been pulled from the computer-aided dispatch system, via the County's Darwin Public Safety Data Warehouse and analyzed through the use of SQL queries, which replaced the previous use of Crystal Reports. Complete analysis capabilities have been lacking due to the inability to easily join these three processes using a common data storage schema and set of data definitions, leading the Division to begin to investigate the creation of a Fire Data Warehouse to unify this effort (Shukoor, 2014).

The Division has used this distributed data to compile periodic reports for County leadership that include basic statistics on service demands, fire loss, and the incidence of injury & death related to fires (Henrico County Division of Fire, 2014). However, with the shift of focus towards a desire to promote data-driven decision making, the Division's information technology team has faced increasing demands for business intelligence to support planning activities. Given the current limitations of the costly third-party reporting systems, arrangement of the data, and concerns about the quality of the information recorded at the time of entry, this effort can be unnecessarily resource-consuming and sometimes still falls short of the desired result (Shukoor, 2014).

Notably, this problem is not isolated with one specific department, rather it is a common issue throughout the fire service. To address this issue on the broader scale, the U.S. Fire Administration's (USFA) National Fire Data Center helps to coordinate data collection and analysis across the industry. As quality data and sound analytics are used more effectively throughout the fire service, the advancement of the USFA's goals can be better achieved. From

helping to improve all-hazards prevention/mitigation, preparedness, response, and recovery, the integration of data is a cornerstone of the effective, efficient use of resources. Additionally, the further development of sound business analytics for the fire service help to achieve the USFA's goal of improving the fire service's professional status, as it will help bring about increased credibility to the industry's efforts (U.S. Fire Administration, 2010).

With a strong linkage to the goals and objectives of the Executive Development course, which serves to elevate the profession and the use of evidence-based practice to advance leadership in the fire service (National Fire Academy, 2012), this new research serves to increase the focus of both an organization and an industry on the promotion of solid data analytics and effective decision-making.

Literature Review

The collection and analysis of fire service data is not a new adventure. One of the key landmarks along this journey was the 1973 report of the National Commission on Fire Prevention and Control, *America Burning*. This report formally announced the findings of the group's two-year investigation of the nature of the fire problem of the day and the tremendous financial and human losses associated.

Though the Commission was able to provide some statistical information to highlight the problem, in addition to the lack of standardized metrics available at the time, they underscored the lack of capacity in the fire service to distill the raw data available into useful business intelligence for planning and decision-support. The Commission wrote of this further, describing a "gap in data and information that effectively separated us from sure knowledge of various aspects of the fire problem." They went on to note that one of their ultimate goals was to "help place solutions to the fire problem on a firmer foundation of scientific data."

As a result of the Commission's recommendations to President Nixon and the Congress, Public Law 93-498, the National Fire Prevention and Control Act, was passed (U.S. Fire Administration, 2010). This resulted in the creation of the National Fire Prevention and Control Administration, now known as the United States Fire Administration (USFA), and the National Fire Data Center (NFDC). To tackle the data collection and analysis effort, the NFDC developed the National Fire Incident Reporting System (NFIRS) over the years that immediately followed (National Fire Protection Association, 2008).

Today, NFIRS collects data from participating departments on some 23 million incidents each year and prepares findings to help support the better understanding of the fire problem and the impact of fire prevention and response activities (United States Fire Administration, 2014). This desire of the fire service to improve through data analysis, which may well owe its genesis to the call for industry reform initiated by America Burning, lives on with many other examples.

Nowhere is that desire greater than the mission to reduce the number of deaths and injuries to firefighters. According to the current USFA strategic plan, an average of 100 firefighters are killed each year in the line of duty with 100,000 receiving various degrees of injury. In pursuit of a model process to help address this concern, the USFA is working to integrate data into their Line of Duty Deaths and Injuries Strategy (2010). This is consistent with the findings of the Firefighter Life Safety Summit, also known as Tampa I, which also identified the need for a "national research agenda and data collection system" to help inform their progress on achieving their life safety initiatives (Federal Emergency Management Agency, 2014).

In his article, *Five Wicked Issues We Can No Longer Ignore*, Chief Mark Light, the Executive Director of the International Association of Fire Chiefs, identified data as one of the

key problems facing the fire service. He went on to identify the “failure to collect, develop, and disseminate” as the various phases of the issue, each requiring attention for improvement. Notably, the other “wicked issues” Light included were cost-efficiency, deployment and staffing, culture, and political acumen; he went on to describe how these would likely be easier to tackle if they were better informed by high-quality data analysis (2013).

In her work related to the fire service, Flynn defines performance measurement as the examination of the relationship between achieved and desired outcomes (2009), however Watkins illustrates that a systematic review must first be done to clearly define the desired results, rather than blindly moving forward with less than meaningful measurements, simply for measurement’s sake (2007). Also mentioned by Flynn to this regard, Behn notes that, “Neither the act of measuring performance, nor the resulting data accomplishes anything itself; only when someone uses the measures,” speaking directly to the necessity of the business intelligence created through measurement being utilized for the support of organizational decision making (2003).

If data is to drive the decision making process to this end for the fire service, the research needs of the fire service must be identified and prioritized. To attempt to answer this question, the National Fire Service Data Summit brought together fire service leaders from across the country to discuss the issue. One of the focus groups centered their efforts on this research question for the fire service – what exactly needs to be collected and what performance measurements will they help define? As summarized in the final report, these items included numerous elements, such as the development of a better understanding of the projected service demands, how to best evaluate and quantify community risk, how measure the return on

investment across functions, and the relationship between prevention activities and outcomes (Averill, Moore-Merrell, Notarianni, Santos, & Wissoker, 2011).

The concept of outcomes is of particular interest in discussing fire service performance measurement and decision-support, because it often yields to output measurement due to the complexities associated with outcome measurement. As described by Kime, an example of the difference is illustrated by the comparison between how many units were dispatched to a fire and the timeliness of their arrival, versus the actual positive community impact they made after beginning their suppression efforts (1999). Wodicka also challenges the fire service to consider the importance of the distinction between output-based performance measurement and the true outcomes, with emphasis on developing better abilities to target the actual performance through an analysis of the results (2013).

At nearly the same time as the fire service was undergoing a transformation with the publication of *America Burning*, the prehospital emergency medical services (EMS) industry was emerging as a profession. Several months in advance of the similar legislation to develop a uniform fire service system, Public Law 93-154, the Emergency Medical Service Systems Act of 1973 was passed. As noted by Harvey's 1974 review in the *Journal of the American Medical Association*, this law would ensure "extensive researches" which would utilize "professional and technical services as well as administrative methodologies." Time would prove Harvey correct, with the influence of the modern medical establishment continuing to help further the development of the use of data and analysis methods in EMS.

Largely due to the influence of the American Heart Association (AHA), comprehensive resuscitation has received considerable attention and development. Since first publishing recommendations from the initial Utstein Symposium in 1991, the success in this area was

largely in part due to the establishment of a standardized methodology for the collection, analysis, and reporting of cardiac arrest data and the ultimate patient outcomes (Mears, Ornato, & Dawson, 2002). As a result of this continued effort, and the unification provided by a common model and set of data definitions, the researchers were able to recently recommend a fifth-link in the chain of survival from cardiac arrest, which reflects the need for systematic post-resuscitative care (Langhelle, et al., 2005).

Like recommendations related to fire service data improvements, given the success of the Utstein researchers and others, there has been a call for EMS data to be, “defined and analyzed based on sound business principles” (Mears, Ornato, & Dawson, 2002). In fact, the first two recommendations of the EMS Agenda for the Future called for a uniform data dictionary and the development of a sound analysis methodology (National Highway Traffic Safety Administration, 1996).

Other partners in public safety have also utilized business analytics principles to great success. Many leading law enforcement agencies, specifically the Federal Bureau of Investigation (FBI), are commonly known for their systematic use of data and business intelligence. In the current FBI Strategic Plan for Information Technology, they note the requirement of their information system to aid in, “objective decision making that promotes investments to achieve mission outcomes.” The report goes on to note the importance of not only ensuring data is integrated from multiple sources, but to ensure that both the data and supporting technology infrastructure are of sufficient quality for influencing optimum service effectiveness (2010).

The support for data-driven decision making also has a large body of support outside of public safety and an academic basis. With the ultimate goal of demonstrating the nature of the

relationship between the use of data-informed decisions and actual performance improvements, 179 publicly traded corporations were evaluated by a team of researchers at MIT and the University of Pennsylvania. Through this work, a positive causal relationship was established between the use of data-driven model and increased performance. These performance improvements were significant, boosting output measurements 5 to 6 percent across the organizations, as compared to their counterparts without this business intelligence and decision-making model in place (Brynjolfsson, Hitt, & Kim, 2011).

Loshin defines business intelligence as, “The processes, technologies, and tools needed to turn data into information, information into knowledge, and knowledge into plans that drive profitable business action. Business intelligence encompasses data warehousing, business analytic tools, and content/knowledge management.” As he describes, an effective business intelligence system can influence both strategic and tactical action, as the ongoing analysis of operations can be tailored to examine historical trends and emerging developments to tackle functional, cross-functional, and enterprise problems (2013).

The use of business analytics to develop insight and help facilitate organizational planning and decision-making reflects an opportunity to change the culture and improve outcomes. As Cokins describes, this can result in a movement of management from the more reactive, “command-and-control” style, to one that is anticipatory, proactive, and much more effective. With this information, leadership can ensure that human and physical resources are prepared for challenges before they occur and unnecessary risk can be reduced or avoided completely (2012). This is particularly relevant to the needs of the fire service, as a movement towards proper planning to ensure the best utilization of relatively scarce resources is of great importance.

To help facilitate this decision making process, the business intelligence system must have access to useful data from which information can be derived. In helping to define the attributes of information helpful in decision-making, Sauter describes the need for its timeliness, understandability, freedom from bias, relevance, reliability, and cost efficiency (2010). This relationship is vital, preventing the phenomenon of “garbage-in, garbage-out,” but it does not tell the full story. In order for this input and output to connect for decision-support, effective analysis and consideration is required. Moreover, the utilization of a comprehensive model for business analytics can help an organization balance need for answers with the effective delivery of information (Laursen & Throlund, 2010).

Madsen describes how such a model can be used for decision-support in the healthcare industry. In addition to stressing the importance of quality data, she describes the opportunity to not only influence this quality at the time of creation, but during its time in the organization’s data warehouse. This “second-chance,” provides the managers of the business analytics system an opportunity to help sort out any garbage that did arrive and to inform the focused improvement of the organization’s data creation processes (2012). For the fire service, this means that there is a realistic prospect of addressing concerns about data quality in an informed manner, rather than with a broad brush.

Despite the wealth of information that supports the use of a business analytics model, there are some decisions for which it might not be ideal. These include decisions that must be made without the sufficient provision of time for analysis or those that are seemingly too complex. Often this complexity is driven by the predicament of seemingly-equally negative outcomes on either side of the issue (Buytendijk, 2010). Additionally, when the details

surrounding a decision do not dynamically change, the need for the use of a formal decision-support system is less apparent (Yates, 2003).

Overall, the literature review performed helped to inform this researcher's effort by providing a stronger foundation for the examination of both the current state and potential for the use of an enhanced model for decision support in the fire service.

Procedures

Overview

This applied research project began with the thoughtful selection of a key organizational problem relevant to the successful achievement of stated goals and objectives identified in the Division's strategic plan, the Henrico Fire Continuous Improvement Strategy (2013). With consideration for the appropriate methods outlined in this researcher's first Executive Fire Officer Program course, the appropriate problem and purpose statements were identified (National Fire Academy, 2012).

With this guidance in mind, a preliminary literature review was then performed at the National Fire Academy (NFA) Learning Research Center. This helped to further establish the need of this research, not only to impact the specific challenges faced by one department, but in a manner that would hopefully positively influence the broader fire service, consistent with the published strategic goals of the United States Fire Administration (2010) and the Executive Fire Officer Program (2014).

In addition to the ongoing work to conduct a literature review to examine business intelligence and decision support in the fire service, this researcher also studied and included an array of relevant non-fire service reference publications. With this backdrop established for a

more complete context, original research was performed to specifically address the questions posed in this ARP. Those methods included the conduct of questionnaires of Division personnel and a survey of other CFAI-accredited fire departments – specifically their accreditation managers.

Given an evaluation of the information gained in this process, as an action-research effort, this researcher compiled a draft guidance document for members of the fire service to utilize as a guide to the use of business data to successfully provide decision support.

Division Members Questionnaires

The questionnaires conducted to gather feedback from members of the Division included an instrument distributed to firefighters (Appendix A), company officers (Appendix B), and command officers (Appendix C). As described by Palmquist, this cohort sampling method helps to evaluate specific groups within a population and provide data for comparative evaluation, both immediately and potentially in further examinations in the future (2000). The group of firefighters included all sworn personnel at the rank of firefighter, regardless of their level in the Division's career development process. The company officer group included all personnel at the rank of lieutenant, which also includes several lieutenants currently assigned outside the operations section. The survey to command officers was distributed to all personnel at the rank of captain, battalion chief, and district chief.

Since this focus of this research was to help recommend changes for the executive leadership, the Fire Chief and three Assistant Chiefs were excluded from the survey. The intent of this omission was to help reflect the distinct perspective of the middle managers, front-line supervisory staff, and field personnel. Additionally, given the relatively small sample size for

this cohort of senior executives, it was less consistent with successful numerical comparison with the other groups.

In total, 501 questionnaires were distributed to Division members, with 368 to the firefighters, 87 to the company officers, and 46 to the command staff. Although these numbers do not reflect the totals for the Division's allowable staffing at each rank, they represented the current complement of employees at that rank at the time of the evaluation (Henrico County Division of Fire, 2014). Distribution of the questionnaires was completed through the use of the department's email system and all employees were addressed at their current business mailbox. To facilitate participation, respondents were provided with a brief set of instructions and a hyperlink to the hosted survey site. For example, the following instructions were emailed to the Division's company officers:

As a part of my ongoing training, I am conducting a brief survey on the collection and use of data to help inform decision-making for our department. If you would please take a moment to respond, I would greatly appreciate it.

<https://www.surveymonkey.com/s/CompanyOfficers>

The survey will remain open (for one week). If you have any questions, please let me know.

For each group, the survey questions were the same, save addressing the respondents by the correct cohort title. Each survey included 25 questions, with the last 3 focusing on collecting basic information about the age, length of service, and education of the respondent. The remaining questions were all multiple choice, required an answer, and were limited to one answer selection per question. Both four-option and five-option answers were available; each was arranged consistent with the Likert scale. According to McLeod, this scale developed in 1932 by Rensis Likert, provides a simple, effective mechanism for evaluating the attitudes of the respondents (2008).

The primary intent of the questionnaire set for the internal personnel was to answer the questions related to the depth and scope of the need for data across the Division members, as well as to determine the relative effectiveness of the department at meeting those needs currently. With the emphasis on quality data gained from the literature review, an examination of the perceptions of quality and frequency of quality-related feedback was included. Additionally, given the Division's history with the accreditation process, a question was offered to help establish the perceived relationship between that effort and the Division's pursuit of data-driven decision making (Appendices A, B, & C).

Accredited Agency Questionnaires

In addition to the questionnaires distributed within the Division, a broader context was required to help understand the experience of other fire service agencies. Considering the potential impact of accreditation on the agency's pursuit of data, this researcher - also the Division's accreditation manager, reached out to other accreditation managers across the 192 agencies currently accredited by the Commission on Fire Accreditation International. Although email contact information was not readily available for each agency, this was developed for 179 agencies by calling the telephone number provided on the agency roster for each department (Center for Public Safety Excellence, 2014).

The following instructions were emailed to each of the CFAI accredited agencies surveyed:

As a part of my training at the National Fire Academy, I am completing an applied research project examining the use of data and business intelligence by the fire service. If you could take a few minutes to respond to the brief survey below, I would greatly appreciate it. The survey will remain open (for one week).

<https://www.surveymonkey.com/s/AccreditedAgencies>

If you have any questions, please let me know.

Similar to the questionnaire distributed to the Division members, the accredited agency instrument (Appendix D) captured information related to the need for data and relationship between the accreditation process and the organization's successful use of data. Additionally, this questionnaire focused on the elements of quality and included a new question about the organization's overall confidence in their data analysis program.

Each questionnaire included 13 questions. The first 11 were multiple choice, required an answer, and were limited to one answer selection per question. Four-, five-, and ten-option answers were available, each arranged consistent with the Likert scale. The final two questions required a free text answer: the first addressed the department's current data-analysis team staffing and the second collected feedback about the biggest challenge the organization faces in the area of data analysis.

The primary intent of the questionnaire was to help establish an industry basis for comparison with the answers provided by the Division members. As a notable limitation, these findings were only collected from one member of each agency, not a representative body. This body of findings was intended to help provide a collective perspective of departments that join the Division in a small group of departments that have achieved accredited agency status, however this may also be a potential limitation to understanding the entire industry experience.

Results

Division Members Questionnaires

The complete set of responses for the completed Division surveys are included in Appendices E, F, & G. Of the 501 questionnaires distributed, 146 were completed and returned. At 29%, this response rate is comparable to the average rate of expected returns for electronic

surveys, 33%, demonstrated through experimental research in this area (Nulty, 2008). Individual totals for each completed survey included 83 responses by firefighters, 40 responses by company officers, and 23 responses by command officers, with individual response rates of 22, 48, and 50 percent, respectively.

Overall measures of success. One of the key research questions was to determine the extent to which the Division was successful in using data for informed decision-making. On a five-point scale, representing the continuum between no success and significant success, the firefighters, company officers, and command officers assigned scores of 3.18, 3.33, and 3.57, respectively.

Although the previous overall scores fell close to the middle, when asked about organizational commitment and the positive impact of accreditation, the results were very strong in both, especially related to the commitment of leadership to the positive use of data for organizational decision making.

	Firefighters	Company Officers	Command Officers
Positive Impact of Accreditation	56.8%	60.0%	82.6%
Positive Organizational Commitment	88.0%	90.0%	91.3%

Figure 1: Overall Success - Percent of respondents with agreement or strong agreement

A more detailed look into the specific level of success in the area of data collection and analysis is provided by the results provided relative to the fire, EMS, and response time data programs. Figure 2 demonstrates the percentage of respondents with the highest level agreement to each question.

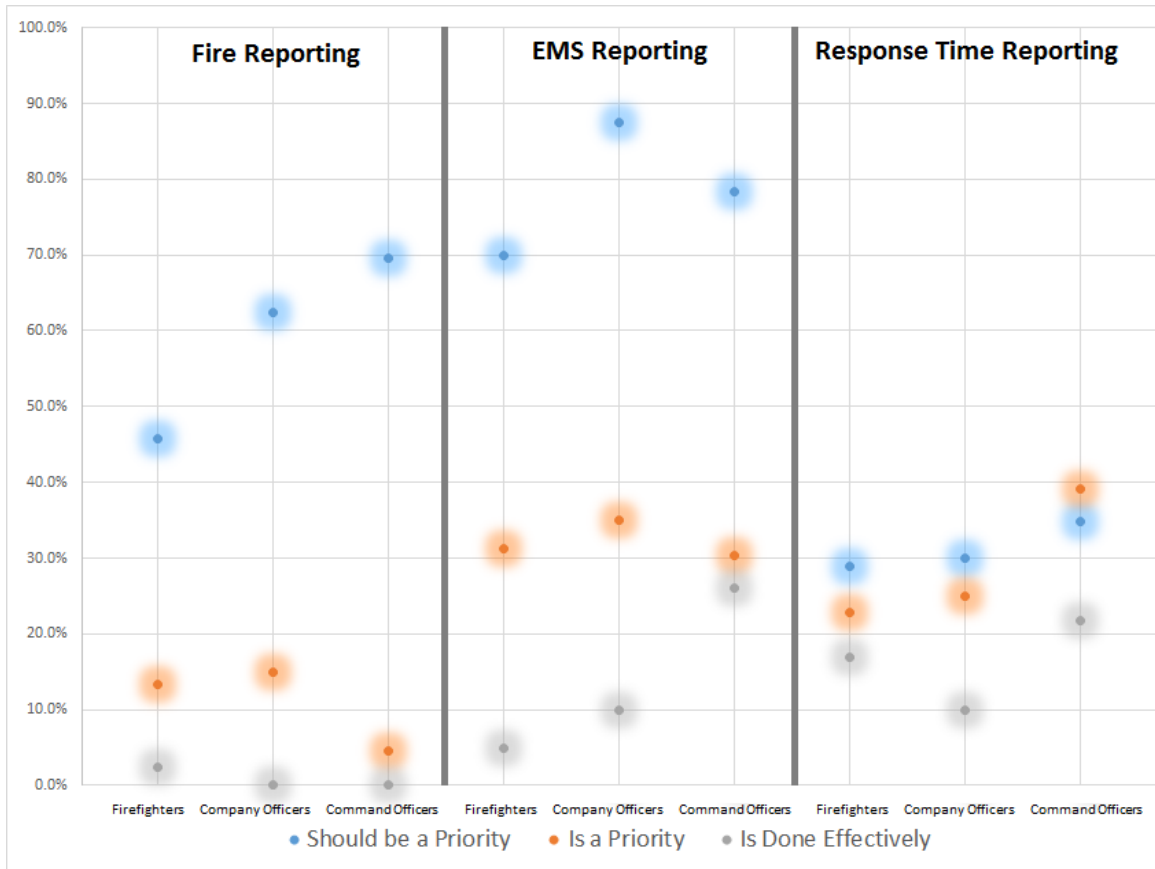


Figure 2: Overall Perceptions - Relative priority & effectiveness across reporting modes

While reporting for fire and EMS reporting both got much higher marks in terms of relative priority, they scored lower when respondents were asked how important they feel these areas are to the organization and how well they are actually done. Though these gaps were noticeably different in both areas, due to the number of neutral answers, an examination of the percentage of respondents with disagreement or strong disagreement to the same question helps to reveal more detail.

Across the groups of firefighters, company officers, and command officers, EMS reporting only received disagreement or strong disagreement values 17.1, 7.5, and 8.6 percent,

respectively. Strikingly, across the same groups, fire reporting received scores of 22, 41.1, and 34.7 percent, making it the clear standout for needing improvement.

This is further reinforced by the responses Division members provided to questions related to the level and perceived adequacy of training provided in these areas. On a five-point scale, the amount of training received score for fire reporting was only 2.42, 2.28, and 2.57, respectively, compared to scores for EMS training, which were 3.21, 3.38, and 3.57.

When asked about the adequacy of the training provided, fire reporting again scored lower, with only 20.5 percent of firefighters reporting they had received adequate or more than adequate training. Alarmingly, this score for company officers was only 15 percent. The adequacy of EMS reporting training scored much better, receiving adequate or more than adequate scores across 56.6, 70.0, and 73.9 percent of the reporting groups.

In addition to the gaps identified related to the level of training, there were also opportunities identified for improving the level of feedback to members.

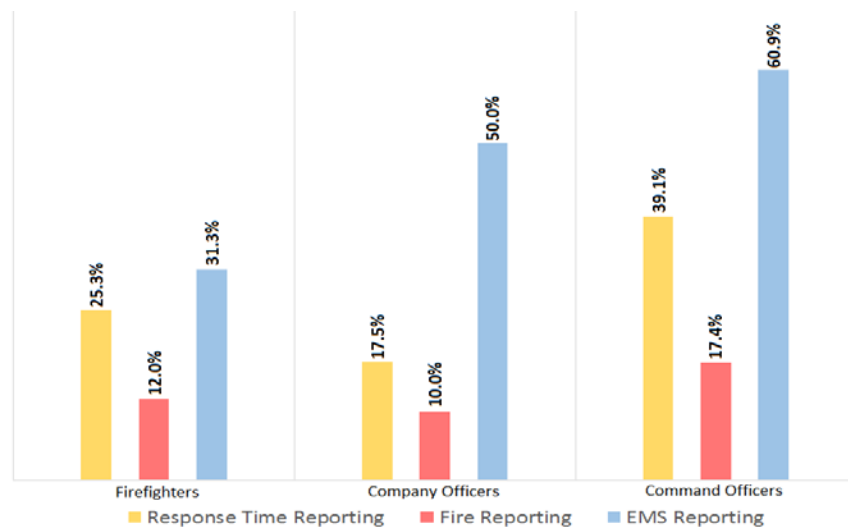


Figure 3: Level of Performance Feedback – Percentage of respondents reporting adequate or better

Decision support needs. The effort of researching the Division’s needs also included a determination of the most relevant needs for data and decision support currently at each level in the organization. Given the three functional organizational units of the Division, Operations, Administration, and Community Risk Reduction, personnel were asked to evaluate the frequency of their use of data for decision support across these activities.

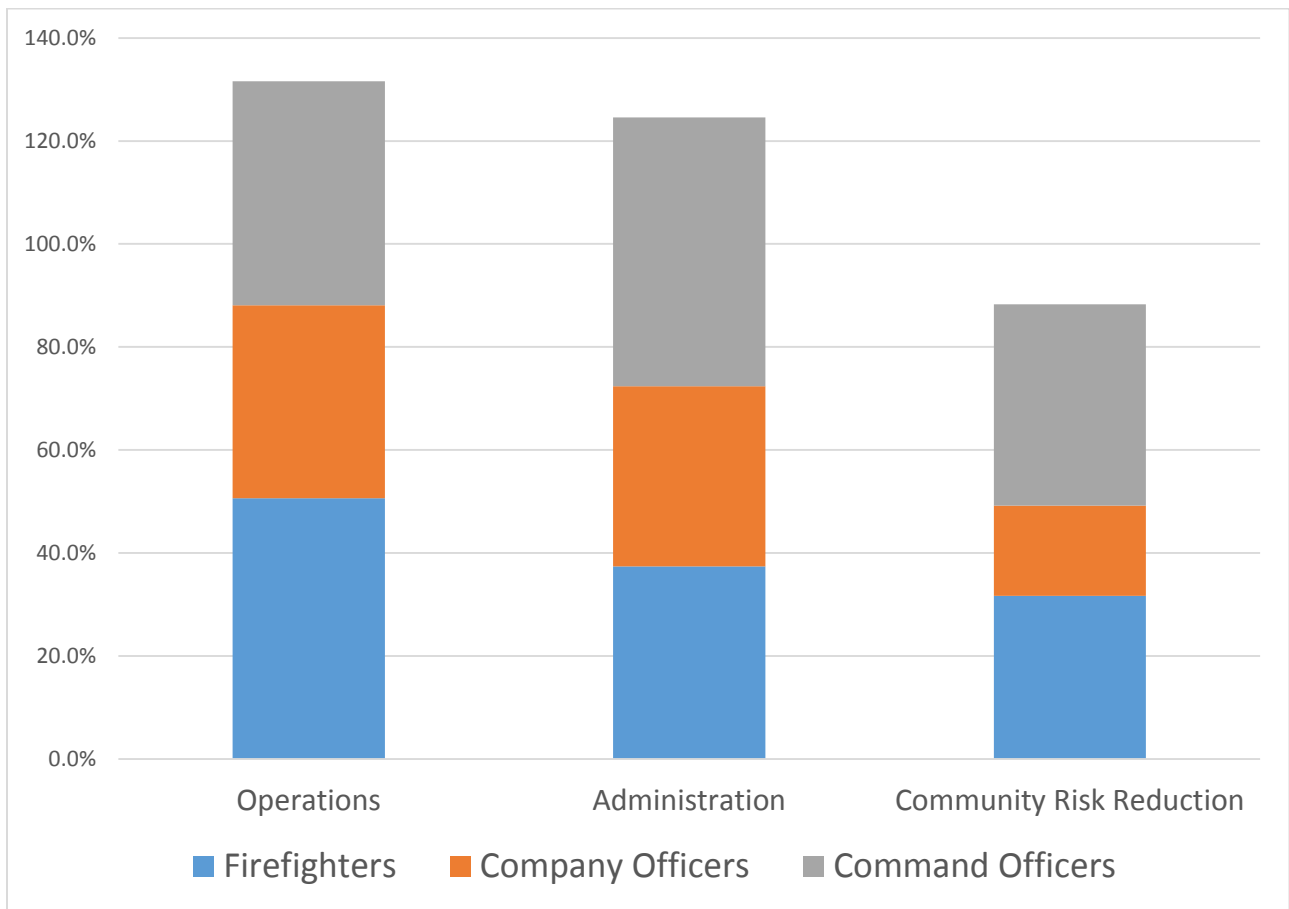


Figure 4: Use of Data – Percentage of respondents reporting weekly or daily use by focus area

As demonstrated in a stacked column chart, Figure 4, the overall use of data to support decision making on a weekly or daily basis was highest in the operational area. Most inconsistent with the progression of the results is the low frequency of data use reported by company officers related in community risk reduction activities. This could suggest a lack of

involvement in this process area or that their efforts are present but simply are not as actively informed by data.

Accredited Agency Questionnaires

The comprehensive set of responses for the accredited agency surveys is included in Appendix H. Included are the complete, unedited comments provided to both free-text questions. Of the 179 questionnaires distributed, 60 were completed and returned by the one-week deadline. This resulted in a response rate of 34%, in this case just above the expected value of returns predicted by Nulty (2008).

Overall measures of success. Compared to the results of the Division questionnaires in Figure 1, the accredited agency score for overall success was slightly higher, scoring 3.95 out of a possible 5 points. When asked about the positive impact of the CFAI accreditation process and the positive organizational commitment of their departments, 91.6 percent reported agreement or strong agreement in both categories. All three values were scored most consistently with the findings of the Division's Command Officers.

Also consistent with the Division surveys, the accredited agencies reported the lowest success with their fire data reporting, when compared with their EMS and response time reporting. Though only 28.3 percent, the number of agencies reporting strong agreement with the effectiveness of their fire reporting program was however, much greater than any of the results found in the Division results.

Decision support needs. With values lower than the overall Division results, the accredited agencies reported that the use of data for decision making was higher in the administrative area, with 38.3 percent reporting either its weekly or daily use in this area. To this

same question, the agencies reported values of 26.7 percent for operations and 15.3 percent for community risk reduction.

Challenges in using data. Understanding the strengths and weaknesses of the Division, it is also important to consider the experiences of other similar, in this case accredited, agencies that may face their own challenges at incorporating data for decision support into their own models. Though too numerous to mention individually, there are a number of common themes that can be developed from analyzing the full results – included in Appendix H.

One of the most commonly mentioned problems was a lack of human and technical resources to understand the available data and generate useful business intelligence. Only 40 percent of the agencies reported adequate staffing in this area and many commented on how these responsibilities are often left to individuals already tasked or who may not have adequate training for analysis tasks.

The technical challenges included difficulty integrating data across reporting platforms, a lack of locational attributes, issues with third-party software, and simply the phenomenon of “garbage-in, garbage-out.” Additionally, one unidentified respondent spoke directly to the cultural change required in their organization related to the appropriate execution of decision-support activities: “Getting leadership to change their paradigm of “make a decision then analyze to find support” vs “ask a question, analyze possible pros and cons then use experience to interpret and weight the unbiased research.”

Discussion

As a result of this effort, the Henrico County Division of Fire should be better prepared to address the challenges of effectively integrating business analytics into the appropriate decision-

making processes. It is the sincere hope of this researcher that this work, and others like it, will help to strengthen the broader fire service and help the industry march steadily forward. In this journey, technology can only serve as a facilitator; it is the responsibility of professional fire officers, firefighters, and support personnel to provide the leadership necessary to ensure the great potential of its uses are realized.

The use of a business analytics model is well established across many other professions, from healthcare to the financial service industry, however each had to face resistance to change and the challenge of overcoming barriers created by organizational culture (Madsen, 2012). Although this transition may be slow at first, evidence demonstrates the ability of a business analytics system to provide increased performance, especially when the leadership effectively promotes the integration of data-driven decision making across the organization (Popovic, Hackney, Coelho, & Jaklic, 2012).

The results of this research indicate that the Division is succeeding in developing a culture that appreciates the value of data-driven decision making. Further, Division members, especially officers, demonstrate a strong understanding of the relationship of the CFAI accreditation process at promoting continuous measurement, evaluation, and quality improvement. This “Journey to Excellence,” as described by CFAI (2009), resonates in the Division’s Continuous Improvement Strategy (2013).

Although the Division’s effort appears consistent with the ongoing effort of the USFA to elevate the use of business intelligence, much more progress can be made. As Cokins described, this opportunity is especially great in the area of predictive modeling (2012) which could help the fire service get ahead of problems, limiting harm and maximizing the effectiveness of response when required.

Examining the feedback provided by the Division members related to the current data collection effort provides some excellent advantages for the organization. First, across all ranks, members demonstrate a knowledge of the importance of both the fire and EMS data collection programs. Additionally, when asked, they provided feedback that there was significant room for improvement in creating quality through the use of documentation reviews and feedback. While EMS reporting demonstrated a moderate degree of success in this area, the quality review process for fire reporting data is lacking severely. With this insight, the Division has an opportunity to address this concern, ultimately improving the quality of the data that feeds its decision support efforts, as well as the databases of the USFA.

The feedback provided also indicates the need to improve the initial and ongoing training of members at completing these reports. Additional training will hopefully address the problems described of having data of sufficient character to be included for consideration and in sufficient detail to inform a decision (Saxena & Srinivasan, 2013). This additional focus on quality at the level of the data creator, in this case the firefighters and company officers, will also help to strengthen their direct connection to the overall business analysis process.

The evaluation of response time performance is also a significant consideration for the agency, elevated through the use of the accreditation model, which provides a formal process for the evaluation of an organization's Standards of Cover (Commission on Fire Accreditation International, 2009). Further evaluation of this information will surely help identify areas for improvement, and help inform the planning for new station and apparatus placement. Through their responses, representatives from other agencies demonstrated a consistent view that the accreditation process helps to facilitate and unify the effort for understanding community risk and providing an appropriate response system.

In considering the responses to the evaluation of data use throughout the Division, it is not surprising that the key function of operations received the most attention. Opportunities are certainly apparent for the continued use in this area, however even greater progress may be made with the full build-out and utilization of data to support decision-making related to administrative and community risk reduction activities.

Although not fully examined by this research, many of the survey results from the accredited agencies explored the opportunity to integrate the geospatial attributes of their data into the business intelligence process. The Standard of Cover Process, described by CFAI, focuses sharply on the opportunity for this to impact deployment and response times (2009). Additionally, Amdahl describes several case studies of GIS-based evaluations that can be applied to community risk reduction across the all-hazards spectrum (Amdahl, 2001).

Recommendations

As specified in the Division's current strategic plan, the department should continue to actively pursue a comprehensive strategic planning effort focused on the improvement of technology and the information systems (2013). This effort, especially as it is conducted in partnership with the Henrico County Information Technology Department, will provide an opportunity for the ongoing development of the data collection and business intelligence capabilities of the Division. Additionally, increased dialogue and a stronger partnership will help facilitate a broader understanding of both the business and technical challenges and opportunities, and provide the platform for system optimization.

Also, as specified in the current strategic plan, the Division should begin a process to update the existing EMS quality assurance review process and to implement a similar effort for

fire report documentation (Henrico County Division of Fire, 2013). Both efforts should maximize the incorporation of the Division's information technology team to facilitate data integration with the subject-matter experts in each business area, such as the Operational Medical Director and members of the Fire Marshal's Office. This cross-functional approach has the best opportunity for initial and long-term success, promoting both a relationship between partners and a relationship between the data collection and analysis processes.

Related to response time tracking, the Division should continue to utilize the CFAI accreditation model, which promotes active measurement of performance – both overall, and as a measurement of each component of the response. As specified in the Continuous Improvement Strategy, the Division should work to publish improved monthly data reports that highlight the level of compliance and identify performance trends for improvement (Henrico County Division of Fire, 2013). Since the development of this data is already underway, it appears to be fertile ground for quick deployment. Additionally, this familiar concept can help share the greater potential of intelligence to inform other areas of the business.

Community risk reduction and administrative activities should also be evaluated for opportunities to integrate outcome and performance data. In addition to finding new efficiencies, this effort will help to validate the Division's efforts in these domains. Obviously this will take time and resources, so prioritization of efforts and staffing considerations for the information technology team should be considered as a part of the overall plan.

Finally, the use of the decision-making model (Appendix I) may serve as a useful guide to help inform the activity of the Division as it continues to improve its business analytics capabilities. Ultimately, regardless of the approach taken, the intent of this model is to provide a framework for the promotion of positive discussions related to organizational decision-making,

the appropriate integration of business analytics, and how to ensure that the information gained from the effort is of sound character to inform the actions of the organization. Through this work, both the Division and the Nation's fire service, will continue to improve their ability to deliver professional emergency services.

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APPENDIX A

Fire Data Analysis Questionnaire – Henrico Firefighters

Fire Data Analysis Survey - Firefighters

***1. In your opinion, what degree of success has the department realized through the use of data analysis and informed decision-making?**

None Little Moderate Great Significant

***2. Please respond to the following statement: "The participation in the CFAI Accreditation process has had a positive impact on how the department collects, analyzes, and uses data to inform decision-making."**

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

***3. Please respond to the following statement: "The current department leadership has demonstrated a commitment to data-driven decision making."**

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

***4. In your opinion, to what degree should response time analysis be a priority for the department?**

- None
- Low
- Moderate
- High

Fire Data Analysis Survey - Firefighters

5. Please respond to the following statement: "Response times are a priority for the department."

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

6. Please respond to the following statement: "The department effectively measures and tracks response time data for performance improvement."

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

***7. In your opinion, to what degree should quality NFIRS fire report documentation be a priority for the department?**

- None
- Low
- Moderate
- High

8. Please respond to the following statement: "Quality NFIRS fire report documentation is a priority for the department."

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Fire Data Analysis Survey - Firefighters

9. Please respond to the following statement: "The department effectively evaluates NFIRS fire report documentation for performance improvement."

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

***10. In your opinion, to what degree should quality patient care documentation be a priority for the department?**

- None
- Low
- Moderate
- High

11. Please respond to the following statement: "Quality patient care documentation is a priority for the department."

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

12. Please respond to the following statement: "The department effectively evaluates patient care documentation for performance improvement."

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

13. How much training have you received related to the completion of NFIRS fire reports?

None	Little	Moderate	Great	Significant
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Fire Data Analysis Survey - Firefighters

***14. How adequate has the training your have received related to the completion of NFIRS fire reports?**

- N/A (No Training Received)
- Inadequate
- Somewhat Adequate
- Adequate
- More than Adequate

15. How much training have you received related to the completion of EMS reports?

None	Little	Moderate	Great	Significant
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

***16. How adequate has the training your have received related to the completion of EMS reports?**

- N/A (No Training Received)
- Inadequate
- Somewhat Adequate
- Adequate
- More than Adequate

***17. How adequate would you rate the quality of the feedback you receive related to your response time performance?**

- N/A (No Feedback Received)
- Inadequate
- Somewhat Adequate
- Adequate
- More than Adequate

***18. How adequate would you rate the quality of the feedback you receive related to your fire report documentation?**

- N/A (No Feedback Received)
- Inadequate
- Somewhat Adequate
- Adequate
- More than Adequate

Fire Data Analysis Survey - Firefighters

***19. How adequate would you rate the quality of the feedback you receive related to your EMS report documentation?**

- N/A (No Feedback Received)
- Inadequate
- Somewhat Adequate
- Adequate
- More than Adequate

***20. As a firefighter, how often do you rely on data to inform your operational decision-making?**

- Never
- Yearly
- Monthly
- Weekly
- Daily

***21. As a firefighter, how often do you rely on data to inform your administrative decision-making?**

- Never
- Yearly
- Monthly
- Weekly
- Daily

22. As a firefighter, how often do you rely on data to inform your decision-making related to community risk reduction?

- Never
- Yearly
- Monthly
- Weekly
- Daily

Fire Data Analysis Survey - Firefighters

***23. What is your age?**

- 18 to 24
- 25 to 34
- 35 to 44
- 45 to 54
- 55 to 64
- 65 or older

***24. What is the highest level of education you have completed?**

***25. How many years of service do you have with the department?**

- 0-5
- 6-10
- 11-15
- 16-20
- 21-25
- 26-30
- 31-35
- 36+

APPENDIX B

Fire Data Analysis Questionnaire – Henrico Company Officers (Lieutenants)

Fire Data Analysis Survey - Command Officers

***1. In your opinion, what degree of success has the department realized through the use of data analysis and informed decision-making?**

None

Little

Moderate

Great

Significant

***2. Please respond to the following statement: "The participation in the CFAI Accreditation process has had a positive impact on how the department collects, analyzes, and uses data to inform decision-making."**

Strongly Agree

Agree

Neutral

Disagree

Strongly Disagree

***3. Please respond to the following statement: "The current department leadership has demonstrated a commitment to data-driven decision making."**

Strongly Agree

Agree

Neutral

Disagree

Strongly Disagree

***4. In your opinion, to what degree should response time analysis be a priority for the department?**

None

Low

Moderate

High

Fire Data Analysis Survey - Command Officers

5. Please respond to the following statement: "Response times are a priority for the department."

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

6. Please respond to the following statement: "The department effectively measures and tracks response time data for performance improvement."

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

***7. In your opinion, to what degree should quality NFIRS fire report documentation be a priority for the department?**

- None
- Low
- Moderate
- High

8. Please respond to the following statement: "Quality NFIRS fire report documentation is a priority for the department."

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Fire Data Analysis Survey - Command Officers

9. Please respond to the following statement: "The department effectively evaluates NFIRS fire report documentation for performance improvement."

- Strongly Agree
 Agree
 Neutral
 Disagree
 Strongly Disagree

***10. In your opinion, to what degree should quality patient care documentation be a priority for the department?**

- None
 Low
 Moderate
 High

11. Please respond to the following statement: "Quality patient care documentation is a priority for the department."

- Strongly Agree
 Agree
 Neutral
 Disagree
 Strongly Disagree

12. Please respond to the following statement: "The department effectively evaluates patient care documentation for performance improvement."

- Strongly Agree
 Agree
 Neutral
 Disagree
 Strongly Disagree

13. How much training have you received related to the completion of NFIRS fire reports?

None	Little	Moderate	Great	Significant
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Fire Data Analysis Survey - Command Officers

***14. How adequate has the training your have received related to the completion of NFIRS fire reports?**

- N/A (No Training Received)
- Inadequate
- Somewhat Adequate
- Adequate
- More than Adequate

15. How much training have you received related to the completion of EMS reports?

None	Little	Moderate	Great	Significant
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

***16. How adequate has the training your have received related to the completion of EMS reports?**

- N/A (No Training Received)
- Inadequate
- Somewhat Adequate
- Adequate
- More than Adequate

***17. How adequate would you rate the quality of the feedback you receive related to your response time performance?**

- N/A (No Feedback Received)
- Inadequate
- Somewhat Adequate
- Adequate
- More than Adequate

***18. How adequate would you rate the quality of the feedback you receive related to your fire report documentation?**

- N/A (No Feedback Received)
- Inadequate
- Somewhat Adequate
- Adequate
- More than Adequate

Fire Data Analysis Survey - Command Officers

***19. How adequate would you rate the quality of the feedback you receive related to your EMS report documentation?**

- N/A (No Feedback Received)
- Inadequate
- Somewhat Adequate
- Adequate
- More than Adequate

***20. As a command officer, how often do you rely on data to inform your operational decision-making?**

- Never
- Yearly
- Monthly
- Weekly
- Daily

***21. As a command officer, how often do you rely on data to inform your administrative decision-making?**

- Never
- Yearly
- Monthly
- Weekly
- Daily

22. As a command officer, how often do you rely on data to inform your decision-making related to community risk reduction?

- Never
- Yearly
- Monthly
- Weekly
- Daily

Fire Data Analysis Survey - Command Officers

***23. What is your age?**

- 18 to 24
- 25 to 34
- 35 to 44
- 45 to 54
- 55 to 64
- 65 or older

***24. What is the highest level of education you have completed?**

***25. How many years of service do you have with the department?**

- 0-5
- 6-10
- 11-15
- 16-20
- 21-25
- 26-30
- 31-35
- 36+

APPENDIX C

Fire Data Analysis Questionnaire – Henrico Command Officers (Capt., Batt./Dist. Chiefs)

Fire Data Analysis Survey - Command Officers

*** 1. In your opinion, what degree of success has the department realized through the use of data analysis and informed decision-making?**

None	Little	Moderate	Great	Significant
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

*** 2. Please respond to the following statement: "The participation in the CFAI Accreditation process has had a positive impact on how the department collects, analyzes, and uses data to inform decision-making."**

- Strongly Agree
 Agree
 Neutral
 Disagree
 Strongly Disagree

*** 3. Please respond to the following statement: "The current department leadership has demonstrated a commitment to data-driven decision making."**

- Strongly Agree
 Agree
 Neutral
 Disagree
 Strongly Disagree

*** 4. In your opinion, to what degree should response time analysis be a priority for the department?**

- None
 Low
 Moderate
 High

Fire Data Analysis Survey - Command Officers

5. Please respond to the following statement: "Response times are a priority for the department."

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

6. Please respond to the following statement: "The department effectively measures and tracks response time data for performance improvement."

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

***7. In your opinion, to what degree should quality NFIRS fire report documentation be a priority for the department?**

- None
- Low
- Moderate
- High

8. Please respond to the following statement: "Quality NFIRS fire report documentation is a priority for the department."

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Fire Data Analysis Survey - Command Officers

9. Please respond to the following statement: "The department effectively evaluates NFIRS fire report documentation for performance improvement."

- Strongly Agree
 Agree
 Neutral
 Disagree
 Strongly Disagree

***10. In your opinion, to what degree should quality patient care documentation be a priority for the department?**

- None
 Low
 Moderate
 High

11. Please respond to the following statement: "Quality patient care documentation is a priority for the department."

- Strongly Agree
 Agree
 Neutral
 Disagree
 Strongly Disagree

12. Please respond to the following statement: "The department effectively evaluates patient care documentation for performance improvement."

- Strongly Agree
 Agree
 Neutral
 Disagree
 Strongly Disagree

13. How much training have you received related to the completion of NFIRS fire reports?

None	Little	Moderate	Great	Significant
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Fire Data Analysis Survey - Command Officers

***14. How adequate has the training your have received related to the completion of NFIRS fire reports?**

- N/A (No Training Received)
- Inadequate
- Somewhat Adequate
- Adequate
- More than Adequate

15. How much training have you received related to the completion of EMS reports?

None	Little	Moderate	Great	Significant
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

***16. How adequate has the training your have received related to the completion of EMS reports?**

- N/A (No Training Received)
- Inadequate
- Somewhat Adequate
- Adequate
- More than Adequate

***17. How adequate would you rate the quality of the feedback you receive related to your response time performance?**

- N/A (No Feedback Received)
- Inadequate
- Somewhat Adequate
- Adequate
- More than Adequate

***18. How adequate would you rate the quality of the feedback you receive related to your fire report documentation?**

- N/A (No Feedback Received)
- Inadequate
- Somewhat Adequate
- Adequate
- More than Adequate

Fire Data Analysis Survey - Command Officers

***19. How adequate would you rate the quality of the feedback you receive related to your EMS report documentation?**

- N/A (No Feedback Received)
- Inadequate
- Somewhat Adequate
- Adequate
- More than Adequate

***20. As a command officer, how often do you rely on data to inform your operational decision-making?**

- Never
- Yearly
- Monthly
- Weekly
- Daily

***21. As a command officer, how often do you rely on data to inform your administrative decision-making?**

- Never
- Yearly
- Monthly
- Weekly
- Daily

22. As a command officer, how often do you rely on data to inform your decision-making related to community risk reduction?

- Never
- Yearly
- Monthly
- Weekly
- Daily

Fire Data Analysis Survey - Command Officers

***23. What is your age?**

- 18 to 24
- 25 to 34
- 35 to 44
- 45 to 54
- 55 to 64
- 65 or older

***24. What is the highest level of education you have completed?**

***25. How many years of service do you have with the department?**

- 0-5
- 6-10
- 11-15
- 16-20
- 21-25
- 26-30
- 31-35
- 36+

APPENDIX D

Fire Data Analysis Questionnaire – CFAI Accredited Agencies

Fire Data Analysis Survey - Accredited Agencies

***1. In your opinion, what degree of success has your department realized through the use of data analysis and informed decision-making?**

None	Little	Moderate	Great	Significant
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

***2. Please respond to the following statement: "My department's participation in the CFAI Accreditation process has had a positive impact on how the organization collects, analyzes, and uses data to inform decision-making."**

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

***3. Please respond to the following statement: "My current department's leadership has demonstrated a commitment to data-driven decision making."**

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

***4. Please rate (1-10) your overall confidence in the data collection and analysis capabilities of your department.**

1	2	3	4	5	6	7	8	9	10
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

5. Please respond to the following statement: "My department effectively measures and tracks response time data for performance improvement."

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Fire Data Analysis Survey - Accredited Agencies

6. Please respond to the following statement: "My department effectively evaluates NFIRS fire report documentation for performance improvement."

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

7. Please respond to the following statement: "My department effectively evaluates patient care documentation for performance improvement."

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

***8. From your perspective as an accreditation manager, how often do you feel that your department members rely on data to inform their operational decision-making?**

- Never
- Yearly
- Monthly
- Weekly
- Daily

***9. From your perspective as an accreditation manager, how often do you feel that your department members rely on data to inform their administrative decision-making?**

- Never
- Yearly
- Monthly
- Weekly
- Daily

Fire Data Analysis Survey - Accredited Agencies

10. From your perspective as an accreditation manager, how often do you feel that your department members rely on data to inform their decision-making related to community risk reduction?

- Never
- Yearly
- Monthly
- Weekly
- Daily

***11. How adequate is the current staffing of your data analysis team?**

- Inadequate
- Somewhat Adequate
- Adequate
- More than Adequate

***12. Briefly describe the make-up of your department's data analysis team. (i.e. no dedicated staff, full-time data analyst / part-time GIS analyst, etc.)**

***13. What do you feel are your biggest challenges related to data collection and analysis?**

APPENDIX E

Questionnaire Results – Henrico Firefighters

Fire Data Analysis Survey Results - Firefighters

1. In your opinion, what degree of success has the department realized through the use of data...						
Answer Options	None	Little	Moderate	Great	Significant	Average
	1	12	43	25	2	3.18

2. Please respond to the following statement: "The participation in the CFAI Accreditation process..."		
Answer Options	Percent	Count
Strongly Agree	6.0%	5
Agree	51.8%	43
Neutral	33.7%	28
Disagree	8.4%	7
Strongly Disagree	0.0%	0

3. Please respond to the following statement: "The current department leadership has demonstrated..."		
Answer Options	Percent	Count
Strongly Agree	25.3%	21
Agree	62.7%	52
Neutral	9.6%	8
Disagree	2.4%	2
Strongly Disagree	0.0%	0

4. In your opinion, to what degree should response time analysis be a priority for the department?		
Answer Options	Percent	Count
None	1.2%	1
Low	6.0%	5
Moderate	63.9%	53
High	28.9%	24

5. Please respond to the following statement: "Response times are a priority for the department."		
Answer Options	Percent	Count
Strongly Agree	22.9%	19
Agree	60.2%	50
Neutral	9.6%	8
Disagree	3.6%	3
Strongly Disagree	3.6%	3

6. Please respond to the following statement: "The department effectively measures and tracks..."		
Answer Options	Percent	Count
Strongly Agree	16.9%	14
Agree	50.6%	42
Neutral	20.5%	17
Disagree	9.6%	8
Strongly Disagree	2.4%	2

7. In your opinion, to what degree should quality NFIRS fire report documentation be a priority for...		
Answer Options	Percent	Count
None	0.0%	0
Low	9.6%	8
Moderate	44.6%	37
High	45.8%	38

8. Please respond to the following statement: "Quality NFIRS fire report documentation is a priority..."

Answer Options	Percent	Count
Strongly Agree	13.3%	11
Agree	45.8%	38
Neutral	24.1%	20
Disagree	13.3%	11
Strongly Disagree	3.6%	3

9. Please respond to the following statement: "The department effectively evaluates NFIRS fire..."

Answer Options	Percent	Count
Strongly Agree	2.4%	2
Agree	18.3%	15
Neutral	57.3%	47
Disagree	15.9%	13
Strongly Disagree	6.1%	5

10. In your opinion, to what degree should quality patient care documentation be a priority for...

Answer Options	Percent	Count
None	0.0%	0
Low	0.0%	0
Moderate	30.1%	25
High	69.9%	58

11. Please respond to the following statement: "Quality patient care documentation is a priority for..."

Answer Options	Percent	Count
Strongly Agree	31.3%	26
Agree	53.0%	44
Neutral	10.8%	9
Disagree	2.4%	2
Strongly Disagree	2.4%	2

12. Please respond to the following statement: "The department effectively evaluates patient care..."

Answer Options	Percent	Count
Strongly Agree	4.9%	4
Agree	52.4%	43
Neutral	25.6%	21
Disagree	12.2%	10
Strongly Disagree	4.9%	4

13. How much training have you received related to the completion of NFIRS fire reports?

Answer Options	None	Little	Moderate	Great	Significant	Average
	7	42	27	6	1	2.42

14. How adequate has the training your have received related to the completion of NFIRS fire...

Answer Options	Percent	Count
N/A (No Training)	7.2%	6
Inadequate	26.5%	22
Somewhat Adequate	45.8%	38
Adequate	19.3%	16
More than Adequate	1.2%	1

15. How much training have you received related to the completion of EMS reports?

Answer Options	None	Little	Moderate	Great	Significant	Average
	1	17	38	16	10	3.21

16. How adequate has the training your have received related to the completion of EMS reports?

Answer Options	Percent	Count
N/A (No Training)	1.2%	1
Inadequate	10.8%	9
Somewhat Adequate	31.3%	26
Adequate	48.2%	40
More than Adequate	8.4%	7

17. How adequate would you rate the quality of the feedback you receive related to your response...

Answer Options	Percent	Count
N/A (No Feedback)	31.3%	26
Inadequate	14.5%	12
Somewhat Adequate	28.9%	24
Adequate	24.1%	20
More than Adequate	1.2%	1

18. How adequate would you rate the quality of the feedback you receive related to your fire report...

Answer Options	Percent	Count
N/A (No Feedback)	45.8%	38
Inadequate	26.5%	22
Somewhat Adequate	15.7%	13
Adequate	12.0%	10
More than Adequate	0.0%	0

19. How adequate would you rate the quality of the feedback you receive related to your EMS report...

Answer Options	Percent	Count
N/A (No Feedback)	33.7%	28
Inadequate	16.9%	14
Somewhat Adequate	18.1%	15
Adequate	27.7%	23
More than Adequate	3.6%	3

20. As a company officer, how often do you rely on data to inform your operational decision-making?

Answer Options	Percent	Count
Never	26.5%	22
Yearly	6.0%	5
Monthly	16.9%	14
Weekly	20.5%	17
Daily	30.1%	25

21. As a company officer, how often do you rely on data to inform your administrative decision...

Answer Options	Percent	Count
Never	33.7%	28
Yearly	10.8%	9
Monthly	18.1%	15
Weekly	19.3%	16
Daily	18.1%	15

22. As a company officer, how often do you rely on data to inform your decision-making related to...

Answer Options	Percent	Count
Never	28.0%	23
Yearly	18.3%	15
Monthly	22.0%	18
Weekly	14.6%	12
Daily	17.1%	14

23. What is your age?

Answer Options	Percent	Count
18 to 24	1.2%	1
25 to 34	31.3%	26
35 to 44	44.6%	37
45 to 54	22.9%	19
55 to 64	0.0%	0
65 or older	0.0%	0

24. What is the highest level of education you have completed?

Answer Options	Percent	Count
Graduated from high	9.6%	8
1 year of college	15.7%	13
2 years of college	16.9%	14
3 years of college	20.5%	17
Graduated from college	31.3%	26
Some graduate school	2.4%	2
Completed graduate	3.6%	3

25. How many years of service do you have with the department?

Answer Options	Percent	Count
0-5	19.3%	16
6-10	38.6%	32
11-15	27.7%	23
16-20	7.2%	6
21-25	7.2%	6
26-30	0.0%	0
31-35	0.0%	0
36+	0.0%	0

APPENDIX F

Questionnaire Results – Henrico Company Officers

Fire Data Analysis Survey Results - Company Officers

1. In your opinion, what degree of success has the department realized through the use of data...

Answer Options	None	Little	Moderate	Great	Significant	Average
	0	2	24	13	1	3.33

2. Please respond to the following statement: "The participation in the CFAI Accreditation process..."

Answer Options	Percent	Count
Strongly Agree	17.5%	7
Agree	42.5%	17
Neutral	35.0%	14
Disagree	5.0%	2
Strongly Disagree	0.0%	0

3. Please respond to the following statement: "The current department leadership has demonstrated..."

Answer Options	Percent	Count
Strongly Agree	32.5%	13
Agree	57.5%	23
Neutral	7.5%	3
Disagree	2.5%	1
Strongly Disagree	0.0%	0

4. In your opinion, to what degree should response time analysis be a priority for the department?

Answer Options	Percent	Count
None	0.0%	0
Low	5.0%	2
Moderate	65.0%	26
High	30.0%	12

5. Please respond to the following statement: "Response times are a priority for the department."

Answer Options	Percent	Count
Strongly Agree	25.0%	10
Agree	60.0%	24
Neutral	7.5%	3
Disagree	2.5%	1
Strongly Disagree	5.0%	2

6. Please respond to the following statement: "The department effectively measures and tracks..."

Answer Options	Percent	Count
Strongly Agree	10.0%	4
Agree	50.0%	20
Neutral	25.0%	10
Disagree	10.0%	4
Strongly Disagree	5.0%	2

7. In your opinion, to what degree should quality NFIRS fire report documentation be a priority for...

Answer Options	Percent	Count
None	0.0%	0
Low	2.5%	1
Moderate	35.0%	14
High	62.5%	25

8. Please respond to the following statement: "Quality NFIRS fire report documentation is a priority..."

Answer Options	Percent	Count
Strongly Agree	15.0%	6
Agree	37.5%	15
Neutral	27.5%	11
Disagree	17.5%	7
Strongly Disagree	2.5%	1

9. Please respond to the following statement: "The department effectively evaluates NFIRS fire..."

Answer Options	Percent	Count
Strongly Agree	0.0%	0
Agree	12.8%	5
Neutral	46.2%	18
Disagree	38.5%	15
Strongly Disagree	2.6%	1

10. In your opinion, to what degree should quality patient care documentation be a priority for...

Answer Options	Percent	Count
None	0.0%	0
Low	0.0%	0
Moderate	12.5%	5
High	87.5%	35

11. Please respond to the following statement: "Quality patient care documentation is a priority for..."

Answer Options	Percent	Count
Strongly Agree	35.0%	14
Agree	55.0%	22
Neutral	2.5%	1
Disagree	5.0%	2
Strongly Disagree	2.5%	1

12. Please respond to the following statement: "The department effectively evaluates patient care..."

Answer Options	Percent	Count
Strongly Agree	10.0%	4
Agree	60.0%	24
Neutral	22.5%	9
Disagree	5.0%	2
Strongly Disagree	2.5%	1

13. How much training have you received related to the completion of NFIRS fire reports?

Answer Options	None	Little	Moderate	Great	Significant	Average
	1	29	8	2	0	2.28

14. How adequate has the training your have received related to the completion of NFIRS fire..."

Answer Options	Percent	Count
N/A (No Training)	7.5%	3
Inadequate	37.5%	15
Somewhat Adequate	40.0%	16
Adequate	15.0%	6
More than Adequate	0.0%	0

15. How much training have you received related to the completion of EMS reports?

Answer Options	None	Little	Moderate	Great	Significant	Average
	0	6	16	10	5	3.38

16. How adequate has the training your have received related to the completion of EMS reports?

Answer Options	Percent	Count
N/A (No Training)	2.5%	1
Inadequate	7.5%	3
Somewhat Adequate	20.0%	8
Adequate	57.5%	23
More than Adequate	12.5%	5

17. How adequate would you rate the quality of the feedback you receive related to your response...

Answer Options	Percent	Count
N/A (No Feedback)	17.5%	7
Inadequate	35.0%	14
Somewhat Adequate	30.0%	12
Adequate	17.5%	7
More than Adequate	0.0%	0

18. How adequate would you rate the quality of the feedback you receive related to your fire report...

Answer Options	Percent	Count
N/A (No Feedback)	45.0%	18
Inadequate	32.5%	13
Somewhat Adequate	12.5%	5
Adequate	10.0%	4
More than Adequate	0.0%	0

19. How adequate would you rate the quality of the feedback you receive related to your EMS report...

Answer Options	Percent	Count
N/A (No Feedback)	7.5%	3
Inadequate	17.5%	7
Somewhat Adequate	25.0%	10
Adequate	40.0%	16
More than Adequate	10.0%	4

20. As a company officer, how often do you rely on data to inform your operational decision-making?

Answer Options	Percent	Count
Never	30.0%	12
Yearly	12.5%	5
Monthly	20.0%	8
Weekly	12.5%	5
Daily	25.0%	10

21. As a company officer, how often do you rely on data to inform your administrative decision...

Answer Options	Percent	Count
Never	17.5%	7
Yearly	25.0%	10
Monthly	22.5%	9
Weekly	15.0%	6
Daily	20.0%	8

22. As a company officer, how often do you rely on data to inform your decision-making related to...

Answer Options	Percent	Count
Never	32.5%	13
Yearly	30.0%	12
Monthly	20.0%	8
Weekly	10.0%	4
Daily	7.5%	3

23. What is your age?

Answer Options	Percent	Count
18 to 24	0.0%	0
25 to 34	17.5%	7
35 to 44	37.5%	15
45 to 54	42.5%	17
55 to 64	2.5%	1
65 or older	0.0%	0

24. What is the highest level of education you have completed?

Answer Options	Percent	Count
Graduated from high	17.5%	7
1 year of college	15.0%	6
2 years of college	10.0%	4
3 years of college	12.5%	5
Graduated from college	37.5%	15
Some graduate school	7.5%	3

25. How many years of service do you have with the department?

Answer Options	Percent	Count
0-5	0.0%	0
6-10	10.0%	4
11-15	30.0%	12
16-20	30.0%	12
21-25	12.5%	5
26-30	17.5%	7
31-35	0.0%	0
36+	0.0%	0

APPENDIX G

Questionnaire Results – Henrico Command Officers

Fire Data Analysis Survey Results - Command Officers

1. In your opinion, what degree of success has the department realized through the use of data...						
Answer Options	None	Little	Moderate	Great	Significant	Average
	0	1	11	8	3	3.57

2. Please respond to the following statement: "The participation in the CFAI Accreditation process..."		
Answer Options	Percent	Count
Strongly Agree	43.5%	10
Agree	39.1%	9
Neutral	8.7%	2
Disagree	8.7%	2
Strongly Disagree	0.0%	0

3. Please respond to the following statement: "The current department leadership has demonstrated..."		
Answer Options	Percent	Count
Strongly Agree	52.2%	12
Agree	39.1%	9
Neutral	8.7%	2
Disagree	0.0%	0
Strongly Disagree	0.0%	0

4. In your opinion, to what degree should response time analysis be a priority for the department?		
Answer Options	Percent	Count
None	0.0%	0
Low	4.3%	1
Moderate	60.9%	14
High	34.8%	8

5. Please respond to the following statement: "Response times are a priority for the department."		
Answer Options	Percent	Count
Strongly Agree	39.1%	9
Agree	56.5%	13
Neutral	0.0%	0
Disagree	4.3%	1
Strongly Disagree	0.0%	0

6. Please respond to the following statement: "The department effectively measures and tracks..."		
Answer Options	Percent	Count
Strongly Agree	21.7%	5
Agree	52.2%	12
Neutral	8.7%	2
Disagree	17.4%	4
Strongly Disagree	0.0%	0

7. In your opinion, to what degree should quality NFIRS fire report documentation be a priority for...		
Answer Options	Percent	Count
None	0.0%	0
Low	8.7%	2
Moderate	21.7%	5
High	69.6%	16

8. Please respond to the following statement: "Quality NFIRS fire report documentation is a priority..."

Answer Options	Percent	Count
Strongly Agree	4.5%	1
Agree	63.6%	14
Neutral	13.6%	3
Disagree	13.6%	3
Strongly Disagree	4.5%	1

9. Please respond to the following statement: "The department effectively evaluates NFIRS fire..."

Answer Options	Percent	Count
Strongly Agree	0.0%	0
Agree	21.7%	5
Neutral	43.5%	10
Disagree	30.4%	7
Strongly Disagree	4.3%	1

10. In your opinion, to what degree should quality patient care documentation be a priority for...

Answer Options	Percent	Count
None	0.0%	0
Low	0.0%	0
Moderate	21.7%	5
High	78.3%	18

11. Please respond to the following statement: "Quality patient care documentation is a priority for..."

Answer Options	Percent	Count
Strongly Agree	30.4%	7
Agree	60.9%	14
Neutral	8.7%	2
Disagree	0.0%	0
Strongly Disagree	0.0%	0

12. Please respond to the following statement: "The department effectively evaluates patient care..."

Answer Options	Percent	Count
Strongly Agree	26.1%	6
Agree	52.2%	12
Neutral	13.0%	3
Disagree	4.3%	1
Strongly Disagree	4.3%	1

13. How much training have you received related to the completion of NFIRS fire reports?

Answer Options	None	Little	Moderate	Great	Significant	Average
	0	13	8	1	1	2.57

14. How adequate has the training your have received related to the completion of NFIRS fire..."

Answer Options	Percent	Count
N/A (No Training)	0.0%	0
Inadequate	39.1%	9
Somewhat Adequate	30.4%	7
Adequate	26.1%	6
More than Adequate	4.3%	1

15. How much training have you received related to the completion of EMS reports?

Answer Options	None	Little	Moderate	Great	Significant	Average
	0	2	10	7	4	3.57

16. How adequate has the training you have received related to the completion of EMS reports?

Answer Options	Percent	Count
N/A (No Training)	0.0%	0
Inadequate	0.0%	0
Somewhat Adequate	26.1%	6
Adequate	47.8%	11
More than Adequate	26.1%	6

17. How adequate would you rate the quality of the feedback you receive related to your response...

Answer Options	Percent	Count
N/A (No Feedback)	13.0%	3
Inadequate	4.3%	1
Somewhat Adequate	43.5%	10
Adequate	34.8%	8
More than Adequate	4.3%	1

18. How adequate would you rate the quality of the feedback you receive related to your fire report...

Answer Options	Percent	Count
N/A (No Feedback)	8.7%	2
Inadequate	47.8%	11
Somewhat Adequate	26.1%	6
Adequate	17.4%	4
More than Adequate	0.0%	0

19. How adequate would you rate the quality of the feedback you receive related to your EMS report...

Answer Options	Percent	Count
N/A (No Feedback)	8.7%	2
Inadequate	8.7%	2
Somewhat Adequate	21.7%	5
Adequate	43.5%	10
More than Adequate	17.4%	4

20. As a company officer, how often do you rely on data to inform your operational decision-making?

Answer Options	Percent	Count
Never	17.4%	4
Yearly	4.3%	1
Monthly	34.8%	8
Weekly	17.4%	4
Daily	26.1%	6

21. As a company officer, how often do you rely on data to inform your administrative decision...

Answer Options	Percent	Count
Never	8.7%	2
Yearly	8.7%	2
Monthly	30.4%	7
Weekly	26.1%	6
Daily	26.1%	6

22. As a company officer, how often do you rely on data to inform your decision-making related to...

Answer Options	Percent	Count
Never	8.7%	2
Yearly	21.7%	5
Monthly	30.4%	7
Weekly	26.1%	6
Daily	13.0%	3

23. What is your age?

Answer Options	Percent	Count
18 to 24	0.0%	0
25 to 34	4.3%	1
35 to 44	26.1%	6
45 to 54	52.2%	12
55 to 64	17.4%	4
65 or older	0.0%	0

24. What is the highest level of education you have completed?

Answer Options	Percent	Count
Graduated from high	8.7%	2
1 year of college	4.3%	1
2 years of college	21.7%	5
3 years of college	8.7%	2
Graduated from college	34.8%	8
Some graduate school	8.7%	2
Completed graduate	13.0%	3

25. How many years of service do you have with the department?

Answer Options	Percent	Count
0-5	0.0%	0
6-10	4.3%	1
11-15	4.3%	1
16-20	21.7%	5
21-25	30.4%	7
26-30	34.8%	8
31-35	0.0%	0
36+	4.3%	1

APPENDIX H

Questionnaire Results – CFAI Accredited Agencies

Fire Data Analysis Survey - Accredited Agencies

1. In your opinion, what degree of success has your department realized through the use of data...

Answer Options	None	Little	Moderate	Great	Significant	Average
	0	1	16	28	15	3.95

2. Please respond to the following statement: "My department's participation in the CFAI..."

Answer Options	Response Percent	Response Count
Strongly Agree	58.3%	35
Agree	33.3%	20
Neutral	8.3%	5
Disagree	0.0%	0
Strongly Disagree	0.0%	0

3. Please respond to the following statement: "My current department's leadership has demonstrated a..."

Answer Options	Response Percent	Response Count
Strongly Agree	53.3%	32
Agree	38.3%	23
Neutral	6.7%	4
Disagree	1.7%	1
Strongly Disagree	0.0%	0

4. Please rate (1-10) your overall confidence in the data collection and analysis capabilities...

Answer Options	1	2	3	4	5	
	0	0	2	2	1	
	6	7	8	9	10	Average
	6	7	20	16	6	7.80

5. Please respond to the following statement: "My department effectively measures and tracks..."

Answer Options	Response Percent	Response Count
Strongly Agree	58.3%	35
Agree	38.3%	23
Neutral	3.3%	2
Disagree	0.0%	0
Strongly Disagree	0.0%	0

6. Please respond to the following statement: "My..."

Answer Options	Response Percent	Response Count
Strongly Agree	28.3%	17
Agree	50.0%	30
Neutral	16.7%	10
Disagree	5.0%	3
Strongly Disagree	0.0%	0

7. Please respond to the following statement: "My department effectively evaluates patient care..."

Answer Options	Response Percent	Response Count
Strongly Agree	36.7%	22
Agree	43.3%	26
Neutral	13.3%	8
Disagree	5.0%	3
Strongly Disagree	1.7%	1

8. From your perspective as an accreditation manager, how often do you feel that your department...

Answer Options	Response Percent	Response Count
Never	6.7%	4
Yearly	21.7%	13
Monthly	45.0%	27
Weekly	11.7%	7
Daily	15.0%	9

9. From your perspective as an accreditation manager, how often do you feel that your department...

Answer Options	Response Percent	Response Count
Never	5.0%	3
Yearly	15.0%	9
Monthly	41.7%	25
Weekly	25.0%	15
Daily	13.3%	8

10. From your perspective as an accreditation manager, how often do you feel that your department...

Answer Options	Response Percent	Response Count
Never	8.5%	5
Yearly	50.8%	30
Monthly	25.4%	15
Weekly	6.8%	4
Daily	8.5%	5

11. How adequate is the current staffing of your data analysis team?

Answer Options	Response Percent	Response Count
Inadequate	28.3%	17
Somewhat Adequate	31.7%	19
Adequate	35.0%	21
More than Adequate	5.0%	3

12. Briefly describe the make-up of your department's data analysis team...

Deputy Fire Chief (accreditation manager) makes up the entire team.
No dedicated staff. City GIS resource.
30% shared GIS Analyst, 10% Admin Analyst. Nobody dedicated.
Part-Time within the fire department and utilize other departments within the city for data.
1 - BC - Manager - Management Analyst
No dedicated staff
no dedicated staff. "other" assigned duties.
Several personnel work on data analysis but there is not one single dedicated data analysis person.
We also work with County and City IT and GIS personnel.
full time analyst, full time GIS analyst, IT department, Accreditation Team

Varies by shift. At least each shift has one person concerned with data analysis (5-7)
one full time supervisor, 2 full time data analysts
Shared GIS employee with other City departments, 2-fire employees work with GIS in data collection
3 people are dedicated to data analysis
Full time dedicate analyst. Access to any GIS information and resources needed.
one-me
1 Full time Fire Management Analyst. Makes reports to Staff bi-weekly at staff meetings and data is discussed at these meetings. A team of 6 people will be assembled this fall to start the reaccreditation process due in 2 years.
No Dedicated Staff Full-Time GIS (Employee of IT Department -not fire department employee)
3 full time data analysis dedicated only to EMS; 3 full time staff members for all other department needs.
1-2 fire part time FD personnel and loaned out personnel from City IT as they can provide.
no dedicated staff
Deputy Chief has data analysis as a job responsibility; Captain has GIS analysis as a job responsibility
No dedicated personnel. Data analysis is performed by Chief Officers who function as bureau commanders
Personnel on duty with front line apparatus assignments as well as other daily officer tasks.
Public safety departments share a city employees GIS analyst. One full time BC who has oversight for research and analysis, accreditation, and public information. One civilian public safety analyst supervisor and one analyst.
One full time data analyst. Team of 10 part time for 2015 reaccreditation.
Chief, shift commanders and administrative assistant
1 fulltime and 1 part time
We have an accreditation manager and a Research Analyst.
In-house staff (AC, BCs, Training Director, others), to varying degrees, and additional resources in other City departments (planning/GIS, engineering).
1 full time data/GIS analyst.
1 Planning and Tech Person GIS Specialist
No dedicated staff, it is handled as an administrative function for Battalion Chiefs and higher.
1- BC ACC Mgr, 1- Capt., 2-FF, 1-IT civilian
Deputy Chief reviews response time monthly.
This is managed by the department members as ancillary duties.
No dedicated staff. Chief pulls the data via 5Alive
We have a Planning and Research Division comprised of an Accreditation Manager (dedicated Battalion Chief Position) a Planning and Research Officer (dedicated Captain position) and an assistant P&R Officer (Lt. temporarily assigned from shift). We are on attempting to develop a permanent civilian data analyst position that will not rotate out, as our other positions do.
3 Division Chiefs
No dedicated staff. Assistant Chief assumes AM duties including data analysis with the help of a Captain and Engineer as part of Succession Planning.
No truly dedicated to data analysis. Part of many jobs for one person.
Dedicated staff, operational staff with that responsibility (to ensure accuracy) and GIS
shared amongst staff
one full-time data analyst and several others who help as needed.
one analyst
We are all full-time employees wearing many hats, but I have 4 people (including myself) doing data analysis. Good cross section of the district: 1 command staff, 1 company officer, 1 private, 1 civilian.
We have a 3-member team. All analysis is done on shift (24/48) 1 person is responsible for NFIRS data, 1 person is responsible for GIS, and 1 person analyzes the data and prepares the reports for the monthly board meetings.
We have a battalion chief who is dedicated in analyzing our total response times in fractile form. These times are updated in our SOC document monthly.
MYself
No dedicated personnel. Staff members perform this duty in addition to their "typical" job descriptions.
Non dedicated staff
There is no one person assigned the duties of data analysis. There is an Assistant Fire Chief over the Prevention Division who acts as the Accreditation Manager and facilitates the expertise of other members of the department, as well as other departments within the city upon whom we rely on data or mapping.
Management Analyst, Sr. (contract) Management Analyst, Sr Data Analyst, Sr Data Analyst GIS Technician 5 TOTAL, all civilia

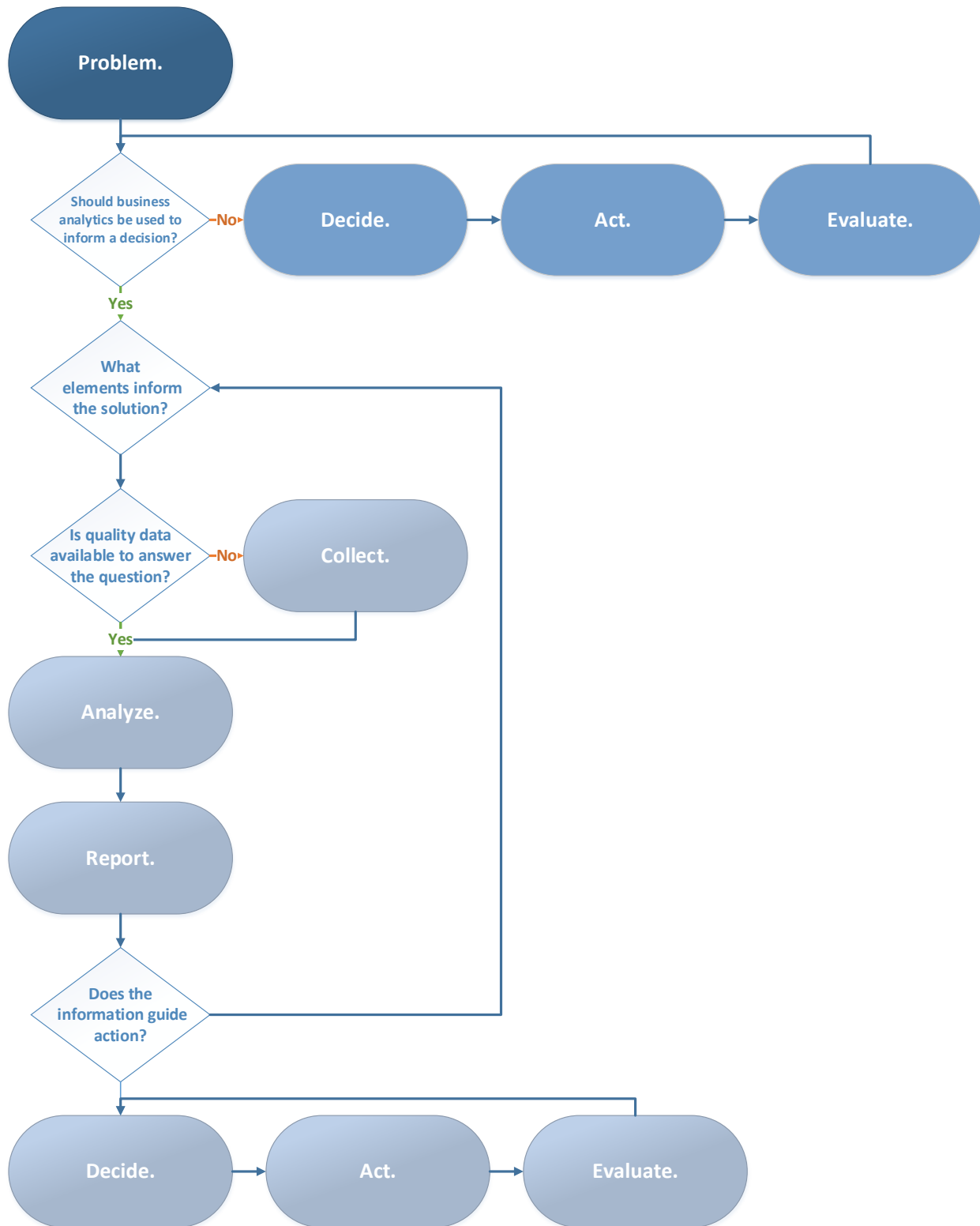
civilian
No dedicated staff
One shift level Battalion Chief who tallies all the numbers.
No dedicated staff, extra duty fire inspector / 911 operator
Full time System Administrator and a full time systems analyst. Additionally, I am capable of analyzing data and do so frequently using pivot tables and Crystal reports.
No dedicated staff
no dedicated staff. other duties as assigned
Planning Section Chief, Logistics Chief and Operations Chief.
No dedicated staff, but a battalion chief that focuses on the data analysis on a monthly basis

13. What do you feel are your biggest challenges related to data collection and analysis?
Obtaining a higher percentage of reports populated with lat/long for meaningful GIS analysis.
People and programs to run data. Also consistency of data input.
Lack of dedicated resources, and quality data.
Getting folks to use the data that has been collected. The data is under utilized.
You cant always utilize data to drive decision making, it's very important to view situations/problems 360 degrees and continue soliciting the actual responders for their input and intuition.[]
Money still drives many, if not all decisions.[]
Decisions developed and executed with the use of data need to be veted and have an educational process.
Good Software
data collection software is not designed to support CFAI reports; dispatch is not owned/managed by the department (3rd party service)
No full time dedicated data analysis staff.
ensuring data is properly cleaned and the variables remain the same in each query that is pulled multiple times.
Uniformity
Analyzing large amounts of data. On an annual basis there are more than 100,000 records to analyze. Solid methodology and QA processes exist
no dedicated full time staff to this position
Finding the time to get it done. All 3 people have other responsibilities and data collection and analysis is a time consuming process.
Data input and analysis. We are unable to consistently record our times either due to MDC non-connectivity or end user error, i.e. company officer did not properly document enroute or arrival. Specifically didn't push the enroute, onscene button. With working with my data analyst we are working on solutions to improve this issue.
Understanding and working with our new software
Working with multiple systems: CAD Newworld, Fire RMS Zoll to make sure the data is clean and free of as many errors as possible.
Quality and accuracy of the data collected.
combining data from mulitlpe sources into one system where it can all be accessed.
Ensuring good data is going in and the technology backbone information systems to get the information out.
department wide "buy in". not everyone is committed. over time there is many personnel getting involved, but we could use more and a dedicated AM and data analyst.
Accurate input with quality report review;
Accurate data input is difficult to achieve from the field.
Getting the data to be input in a consistent manner as well as working through a new software interface that will allow us to effectively extract necessary data.
Getting leadership to change their paradigm of "make a decision then analyze to find support" vs "ask a question, analyze possible pros and cons then use experience to interpret and weigh the unbiased research". Our leadership has recognized the need to support research and analysis but has not used or realized the full capacity of that organizational goal.
Continuity of assigned staff and distribution of data in a way that makes sense to operational staff.
Not having the call volume to collect the data necessary to evaluate performance
innaccurate data
Working from three different databases that do not easily integrate the information in each of them.
Use of analytics software is not 'Joe Firefighter' friendly.

<p>1. Ensuring data reliability, particularly between the dispatch system and the analysis software 2. Incomplete data - not enough information entered. 3. Inconsistent data - Some do it, some don't 4. Changing the culture to appreciate the value of quality data. 5. Lack of motivation to increase data quality 7. Access to post-incident data to measure outcomes and effectiveness of service</p>
<p>Upgrading our GIS software package - on schedule for FY 2014/15 purchase. Availability & Cost of Census or similar data. End User Ease of Use. End User Consistency in Reporting</p>
<p>Limiting the number of programs used for collection, and compatability of those programs.</p>
<p>Resisting the tendency to go to the numbers ignoring other factors that influence the attainment of performance goals.</p>
<p>Making sure the input is accurate and data is compared apples to apples.</p>
<p>Consistency and accuracy</p>
<p>Analysis is the challenge. Collecting data is beneficial but very little applied research is available to empirically analyze it against. Data is viewed mostly from the context of the CFAI (only) model. The model is based on what research? What ERF is effective? We don't know this answer because its not been established in the industry. Until departments/dod's with an ERF of 5 stop getting accredited and a national (credible) benchmark is established, analysis means measuring against what? Ourselves? So if you are bad, you do it bad 90% of the time. Until then we must continue to try and redefine agency by agency what is effective. Is that effective?</p>
<p>Not having a dedicated data analyst to develop a consistent performance measurement system and efficient RMS, CAD, and GIS capabilities.</p>
<p>Time</p>
<p>Effectively using new technology and determining appropriate outliers in regards to response times.</p>
<p>How valid the information really is.</p>
<p>Understanding of data accuracy at the field operations level</p>
<p>we acquire our data from a county 911 system; it often is inaccurate, inconsistent, and too timely to acquire having meaningful/correct data input. It's the old "garbage in, garbage out".</p>
<p>Time and staff to intepret</p>
<p>Data is only as good as it is entered. The GIGO principle is definitely in play here. My biggest challenge is ensuring that data is coded correctly, especially NFIRS. I have at least quarterly training on how to enter data properly. I have separate data set runs for analysis for CRR hazard zones. These require accurate coding (unattended cooking as opposed to alarm activation). This has been difficult, but I can show that our efforts have reduced these types of alarms in this facility. This is an area of our service delivery model that is greatly underappreciated and underutilized.</p>
<p>We have an outside dispatch center that dispatches for several other fire as well as police agencies. They time stamp the runs, but we are unsure how accurate they are with their time stamps. We have sat in the dispatch center to get an idea how accurate they are, but there is still the human element to contend with.</p>
<p>Our biggest challenge is in call processing times through our dispatch center. They still struggle to meet NFPA standards 90% of the time.</p>
<p>lack of training to Officer on its use. They do not recieve as part of Officer certification programs, including IFSTA accredited programs.</p>
<p>Time and personnel.</p>
<p>Ensuring those who enter data do so consistently and accurately. Limitations due to current RMS and not having a dedicated staff. Dedicated staff in this area would be extremely beneficial for any agency.</p>
<p>The biggest challenge is having a reliable database from which to pull data. Firehouse software is a nightmare and forget about tech support. We used VineLight for our most recent data but had some may issues with initial reliability. We think they are finally up to speed with fixes.</p>
<p>Datya entry with a reliable quality assurance process</p>
<p>Poor data input</p>
<p>Finding a computer program that could tabulate and crunch the numbers, instead of having one person in the department who does it</p>
<p>Recent (2 months old) new Air Force Data program forced to use, desnt provide/allow us the data we need to collect in a format we can use or be able to manipulate effective</p>
<p>Receiving valid and accurate data from the field</p>
<p>Correct information</p>
<p>data interpretation and applicaiton to operational decisions</p>
<p>Our current RMS is not user friendly when it comes to getting data back out.</p>
<p>we have a small volume of calls, less than 1500 annually of which many are not related to EMS, Tech Rescue, Haz-Mat, and Fires; which then leads to an outliar or two that totally throws off the entire data set.</p>

APPENDIX I

Fire Department Data-Driven Decision Making Model



The workflow associated with the successful use of this model begins with the clear determination of a problem or question. Rather than providing solutions in search of a problem, the goal of this process is to focus results on key strategic and tactical issues that face leadership.

A careful evaluation should then be performed to determine the role of business analytics in informing the response to the issue. Factors such as time, resources, and significance should help drive prioritization. The professional business analyst can help provide guidance in this instance, but over time the organization will likely develop more comfort and experience at making this important decision.

Obviously, some decisions are not appropriate for the model. They should be made by traditional means, illustrated here as “Decide, Act, and Evaluate.” A key is the importance to remember to loop back to the consideration of a business analysis evaluation, especially if outcomes are not favorable.

If there is a desire to use data, the first step is to go back to the problem statement or question and determine the elements of information that will most successfully guide the decision. For example, a question related to the placement of a new station may be informed by both historical performance, as well as projections on development, demographics, and road network analysis.

The next step is to evaluate the character and quantity of data available. Each data set will have some elements that make it more or less favorable; the key is to make an informed decision and to know the limitations before you proceed. If data isn't readily available, consideration for its creation should be made. If this is not possible, an overall change of strategy might be required, or at least a different approach tailored to the situation.

After the data is appropriately analyzed, the final report should be evaluated to determine the significance of the information gained. At times, the information may clearly define the best course of action, while other times it may be inconclusive or too suspect to be considered.

Once solid information is in hand, the decision-making process can continue. As with before, keeping the loop of action and continuous evaluation alive is key to adapting to the changing conditions.