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Georgia Public Fire Investigators' Behavioral Approach to Fire Scene Investigation

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Walden University
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Abstract

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MS, Grand Canyon University, 2010

BS, Herzing University, 2007

Dissertation Submitted in Partial Fulfillment

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Public Policy and Administration

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Abstract

Wrongful prosecutions for the crime of arson are occurring. An identified cause of this problem is the investigation processes used by public fire investigators. The purpose of this general qualitative study was to identify the targeted behaviors that influence public fire investigators when conducting fire scene investigation. Street-level bureaucracy theory indicates public fire investigators are street-level bureaucrats (SLBs). The intent of this study was to identify behavioral interventions that can be implemented to aid public fire investigators in their approach to fire scene investigation. Semistructured interviews were conducted with a purposeful sample of 10 public fire investigators in a metropolitan area in the state of Georgia to collect data. Inductive reasoning was used to code theoretical domains framework constructs, resulting in emergent themes that produced behaviors identified in the COM-B model. Predominant themes of the COM-B model were cross referenced with the behavior change wheel for suggested behavioral interventions, thus answering the research question. By targeting these identified behaviors, policy writers and implementers can identify and develop new policy interventions, resulting in a social change mechanism for fire scene investigation to help eliminate wrongful prosecution.

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Acknowledgments

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Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction to the Study

Introduction

When a fire occurs, the hope and expectation of many people is that the fire department will respond and extinguish the fire. However, some people want a property destroyed by fire, whether for vandalism, excitement, revenge, crime concealment, profit, or extremism (National Fire Protection Association [NFPA], 2017, p. 261). This intentional human act of starting a fire, with malice, is a crime.

State statutes have different names for the crime of intentional burning; the more familiar term is *arson*. Arson is defined as maliciously and intentionally, or recklessly, starting a fire or causing an explosion (NFPA, 2017, p. 14). The Official Code of Georgia Annotated (O.C.G.A, 2004) Section16-7-60 defines arson in the first degree as when a person by means of fire or explosive knowingly damages property without consent.

When determining whether intentional burning is a crime, a fire investigator must ask: Who is responsible for this? Fire investigators work as both private and public employees. The role of fire investigating is the same for both: to assign responsibility as to how a fire started. The assignment of responsibility is referred to as fire *origin and cause* (O&C) determination. However, the results for public and private fire investigators can be different.

The backgrounds of private fire investigators are diverse. They include both former and current firefighters, arson investigators, police officers, private investigators, and engineers. Private fire investigators are primarily contracted, or employed, to determine O&C for insurance companies. The investigator's final determination aids an

insurance carrier in determining if there should be an insurance claim payout or potential subrogation due to product liability. This aids in the reduction of economic loss for insurance companies.

Public fire investigators, however, work as a government agent. Public fire investigators include active firefighters, arson investigators, fire marshals, and members of law enforcement. For public fire investigators, the assignment of responsibility in an O&C investigation can lead to the following: (a) assist in product liability identification, (b) justify development for new life-safety code adoption, and (c) aid in the apprehension and adjudication of an alleged criminal assailant.

In this chapter, I address the background, problem, and purpose of this study. Also included are the research question, theoretical framework, nature of the study and operational definitions. Lastly, I discuss the assumptions, limitations, scope, delimitations, and significance of the study.

Background

Policy addresses public concerns through legitimate representation (Buchholz, 1992). However, the NFPA can be considered a national consensus standard and not a policy. The adoption of NFPA assists with conforming to the standards and use of code enforcement. The authority having jurisdiction (AHJ), such as a federal, state, local municipality, fire chief, fire marshal, or building official, may adopt NFPA; therefore, a national consensus standard will meet the definition criteria for a policy when the AHJ adopts its use to address specific problems of public concern, such as the crime of arson.

In this study, I focused on the state of Georgia. Georgia adopts minimum fire safety codes (O.C.G.A., 2015a), and via statute, the AHJ has enforceable powers such as the power of arrest (O.C.G.A., 1949). I conducted this study to further an initial study that first uncovered the need for a set of standards and qualifications for fire investigators (Boudreau et al., 1977). Gorbett et al. (2015) revealed a significant gap in the literature concerning how fire investigators perform their jobs. However, among the literature reviewed, I was unable to identify the perspectives of fire investigators and their decision making when conducting fire scene investigations.

A fire investigator's job performance is key to how the NFPA policy is implemented. Therefore, conducting a study to understand behavioral influences on decision making and how public fire investigators approach and conduct fire scene investigations can provide valuable information for future policy designers.

Problem Statement

There is a problem in the field of forensic fire investigation (Beety & Olivia, 2019; Gorbett et al., 2015; Hanger & Runkle, 2017; Lentini, 2019, Tobin et al., 2017; Toscano, 2011). Despite the advances in technology and education, wrongful prosecutions for the crime of arson occur (Grisham, 2018; Hanger & Runkle, 2017; Lentini, 2012a; Pitts & Waterfield, 2014; Possley, 2017; Segura, 2017; Tobin et al., 2017). This problem has negatively impacted firefighting, law enforcement, the courts, the field of forensic science, and society because prosecutions are rooted in faulty scientific research, or junk science (Beyler, 2009; Gorbett, et al, 2015; Grisham, 2018; Lentini, 2019; Segura, 2017). An identified cause of this problem is the investigation

processes used by public fire investigators (Davies & Delgarno, 2009; Hewitt, 2014; Hewitt & McKenna, 2014; Lentini, 2012b, 2019; Reis, 2016; Resinger, 2010a; Toscano, 2011). In this general qualitative study, I investigated the targeted behavioral influences of how public fire investigators conduct fire scene investigations in hope of helping address the stated problem.

Purpose of the Study

The purpose of this general qualitative study was to identify the targeted behavioral indicators that influence public fire investigators when approaching and conducting fire scene investigations. Focusing on targeted behaviors that need to change for proper implementation will add to the current body of knowledge and lead to an understanding of how street-level bureaucrats (SLBs), i.e., public fire investigators, approach and conduct fire scene investigations. By targeting these identified behaviors, policy writers and implementers can identify and develop new policy interventions, developing a social change mechanism for fire scene investigation with the hope to eliminate wrongful prosecution.

Research Question

RQ: What behavioral interventions can be implemented to aid SLBs—public fire investigators—in their approach to fire scene investigations?

Theoretical Foundation

The theoretical foundation of this study was street-level bureaucracy theory (SLBT). This theory is based on Michael Lipsky's (1980) seminal work, *Street-Level Bureaucracy: Dilemmas of the Individual in Public Service*, which is cited more than

17,000 times in Google Scholar. Lipsky suggested that typical SLBs are teachers, law enforcement personnel, social workers, judges, court officers, and other public-service workers who provide governmental services to citizens. SLBs are identified as frontline public-service workers who directly interact with citizens and have decision-making discretion. Lipsky identified SLBs as the true implementors of policy, and behaviors influence how SLBs implement policy to suit their working conditions (Hill & Hupe, 2002; Linder & Peters, 1987; Lipsky, 1980; Lodge et al., 2015; Loyens & Maesschalck, 2010).

Nature of the Study

Due to the lack of literature and scholarly research found for public fire investigators as SLBs and their implementation of *NFPA 1033: Standards for Professional Qualification for Fire Investigator* (2014) and *NFPA 921: Guide for Fire and Explosion Investigations* (2017), a general qualitative study provides understanding of public fire investigators' approaches to fire scene investigation (Kahlke, 2014; Merriam & Tisdell, 2016; Percy et al., 2015). The intent of using this method was to gain knowledge of the behaviors that influence public fire investigators' approaches to fire scene investigation using the COM-B model (Table 1) and the theoretical domains framework (TDF; Table 2; Atkins et al., 2017; Cane et al., 2012; Davis et al, 2015; Francis et al., 2012; Huijg et al., 2014; Michie et al., 2005; Michie et al., 2011; Richardson et al., 2019).

Table 1

COM-B Model

Behavior generators	Generator subgroupings	Definition
Capability	Psychological	Knowledge or psychological skills, strength or stamina to engage in the necessary mental processes
	Physical	Physical skill, strength or stamina
Opportunity	Physical	Opportunity afforded by the environment involving time, resources, locations, cues, physical 'affordance'
	Social	Opportunity afforded by interpersonal influences, social cues and cultural norms that influence the way that we think about things, e.g. the words
Motivation	Reflective	Reflective processes involving plans (self-conscious intentions) and evaluations (beliefs about what is good and bad)
	Automatic	Automatic processes involving emotional reactions, desires (wants and needs), impulses, inhibitions, drive states and reflex responses

Table 2

Theoretical Domains Framework and Constructs

Domain and definition	Constructs
1 – Knowledge (An awareness of the existence of something)	Knowledge (including knowledge of condition / scientific rationale) Procedural knowledge Knowledge of task environment
2 – Skills (an ability or proficiency acquired through practice)	Skills Skills development Competence Ability Interpersonal skills Practice Skill assessment
3 – Social/professional role & identity (A coherent set of behaviors and displayed personal qualities of an individual in a social or work setting)	Professional identity Professional role Social identity Identity Professional boundaries Professional confidence Group identity Leadership Organizational commitment
4 – Beliefs about capabilities (Acceptance of the truth, reality, or validity about an ability, talent, or facility that a person can put to constructive use)	Self-confidence Perceived competence Self-efficacy Perceived behavioral control Beliefs Self-esteem Empowerment Professional confidence
5 – Optimism (The confidence that things will happen for the best or that the desired goals will be attained)	Optimism Pessimism Unrealistic optimism Identity
6 – Beliefs about consequences (Acceptance of the truth, reality, or validity about outcomes of a behavior in a given situation)	Beliefs Outcome expectancies Characteristics of outcome expectancies Anticipated regret Consequences
7 – Reinforcement (Increasing the probability of a response by arranging a dependent relationship, or contingency, between the response and a given stimuli)	Rewards (proximal/distal, valued/not valued, probable/improbable) Incentives Punishment Consequents Reinforcement Contingencies Sanctions
8 – Intentions (A conscious decision to perform a behavior or a resolve to act in a certain way)	Stability of intentions Stages of change model Transtheoretical model and stages of change
9 – Goals (Mental representations of outcomes or end states that an individual wants to achieve)	Goals (distal/proximal) Goal priority Goal/target setting Goals (autonomous/controlled)

Domain and definition	Constructs
	Action planning Implementation retention
10 – Memory, attention and decision processes (The ability to retain information, focus selectively on aspects of the environment and choose between two or more alternatives)	Memory Attention Attention control Decision-making Cognitive overload/tiredness
11 – Environmental context and resources (Any circumstance of a person's situation or environment that discourages or encourages the development of skills and abilities, independence, social competence, and adaptive behavior)	Environmental stressors Resources/material resources Organizational culture/climate Salient events/critical incidents Person x environment interaction Barriers and facilitators
12 – Social influences (Those interpersonal processes that can cause individuals to change their thoughts, feelings, or behaviors)	Social pressure Social norms Group conformity Social comparisons Group norms Social support Power Intergroup conflict Alienation Group identity Modeling
13 – Emotion (A complex reaction to pattern, involving experiential, behavioral, and physiological elements, by which the individual attempts to deal with a personally significant matter or event)	Fear Anxiety Affect Stress Depression Positive/negative affect Burn-out
14 – Behavioral regulation (Anything aimed at managing or changing objectively observed or measured actions)	Self-monitoring Breaking habit Action planning

Note. Adapted from "Validation of the theoretical domains framework for use in behavior change and implementation research." by J. Cane, D. O'Connor, and S. Michie, 2012, *Implementation Science, 7*(37), pp. 13–17.

Operational Definitions

The theoretical framework and the fire service profession use certain phrases, terminology, and jargon. The following terms and definitions are used throughout the study:

Area of origin: A structure, part of a structure, or a general geographic location within a fire scene in which the point of origin of a fire or explosion is reasonably believed to be located (NFPA, 2017).

Accelerant: A fuel or oxidizer, often an ignitable liquid, intentionally used to initiate a fire or increase the rate of growth or spread of fire (NFPA, 2017).

Arson: The crime of maliciously and intentionally, or recklessly, starting a fire or causing an explosion (NFPA, 2017).

Cause: The circumstances, conditions, or agencies that brought about or resulted in the fire or explosion incident, damage to property resulting from the fire or explosion incident, or bodily injury or loss of life resulting from the fire or explosion incident (NFPA, 2017).

Computer fire modeling: Used to design and analyze fire protection systems, evaluate the effects of fire on people and property, estimate fire risk, and assess post-fire reconstruction (Gorbett, 2008).

Daubert standard: Used by a trial judge to assess whether an expert witness's scientific testimony is based on scientifically valid reasoning that can properly be applied to the facts at issue (Cornell Law School, 2018).

Evidence (documentation, collections, and preservation): To make an accurate recording of the investigation using media that will allow investigators to recall and communicate their observations at a later date (NFPA, 2017, p. 176).

Explosion dynamics: The sudden conversion of potential energy (chemical or mechanical) into kinetic energy with the production and release of gas(es) under pressure (NFPA, 2017, p. 232).

Failure analysis and analytical tools: A logical, systematic examination of an item, component, assembly, or structure and its place and function within a system conducted to identify and analyze the probability, causes, and consequences of potential and real failures (NFPA, 2017).

Fire analysis: The process of determining the origin, cause, development, responsibility, and, when required, a failure analysis of a fire or explosion (NFPA, 2017).

Fire cause: The circumstances, conditions, or agencies that bring together a fuel, ignition source, and oxidizer resulting in a fire or a combustion explosion (NFPA, 2017).

Fire chemistry: The study of chemical processes that occur in fires, including changes of state, decomposition, and combustion (NFPA, 2017, p. 23).

Fire dynamics: The detailed study of how chemistry, fire science, and the engineering disciplines of fluid mechanics and heat transfer interact to influence fire behavior (NFPA, 2017).

Fire investigation: The process of determining the origin, cause, and development of a fire or explosion (NFPA, 2017).

Fire investigation methodology: The use of a systematic approach and attention to all relevant details when investigating fire (NFPA, 2017, p. 19)

Fire investigation technology: Methods used to organize information collected during the documentation of the incident into a rational and logical format (NFPA, 2017, p. 223).

Fire science: The body of knowledge concerning the study of fire and related subjects (such as combustion, flame, products of combustion, heat release, heat transfer, fire and explosion chemistry, fire and explosion dynamics, thermodynamics, kinetics, fluid mechanics, fire safety) and their interaction with people, structures, and the environment (NFPA, 2017).

Forensic science: The application of science to answer questions of interest to the legal system (NFPA, 2017).

Guide: A document that is advisory or informative in nature and that contains nonmandatory provisions (NFPA, 2017).

Incendiary fire: A fire intentionally ignited in an area or under circumstances where and when there should not be a fire (NFPA, 2017).

Job performance requirement (JPR): A statement that describes a specific job task, lists the items necessary to complete the task, and defines measurable or observable outcomes and evaluation areas for the specific task (NFPA, 2014).

Junk science: Faulty scientific information or research, especially when used to advance special interests (Dictionary.com, 2020).

Origin: The general location where a fire or explosion began (NFPA, 2017).

Protocol: A description of the specific procedures and methodologies used to accomplish a task or tasks (NFPA, 2017).

Scientific method: The systematic pursuit of knowledge involving the recognition and definition of a problem; the collection of data through observation and experimentation; analysis of the data; the formulation, evaluation and testing of hypotheses; and where possible, the selection of a final hypothesis (NFPA, 2017).

Standard: A document, the main text of which contains only mandatory provisions using the word *shall* to indicate requirements and in a form generally suitable for mandatory reference by another standard or code or for adoption into law (NFPA, 2014, 2017).

Thermodynamics: The branch of physics that deals with the relationship between heat and other forms of energy (NFPA, 2017).

Thermometry: The study of the science, methodology, and practice of temperature measurement (NFPA, 2017).

Assumptions

The following assumptions were made in this research:

- the participants were honest,
- the participants' responses were not influenced by outside sources,
- the participants were professional representatives of their career field,
- the participants understood and had a working knowledge of NFPA 1033 and NFPA 921,
- the participants understood and had a working knowledge of the JPRs of NFPA 1033 and NFPA 921, and

- the participants validated their interview responses when approving their transcripts.

Scope and Delimitations

The scope of this study was to interview public fire investigators and identify behavioral indicators that influence public fire investigators when they are conducting fire scene investigations. This was delimited to a purposeful sample in a defined geographical area of the state of Georgia. I focused on public fire investigators and not private fire investigators. When the AHJ adopts the NFPA standard, a public fire investigator acts as an agent of the government. This enables the investigator to act under the color of law, enabling them to place a person in custody and prosecute. Georgia statute Section 25-2-12 (O.C.G.A 2015a) adopts minimum fire safety standards, and these standards are enforced by the office of the state fire marshal. Specifically, the statute states that either the local government entity or the state fire marshal office, depending on census population, will conduct all fire investigations (O.C.G.A., 2015b). If arson is suspected, Georgia public fire investigators may bring charges against and arrest an individual with the crime (O.C.G.A., 1949). Georgia public fire investigators are certified police officers who have arrest powers (O.C.G.A., 2017).

I was certified as a public fire investigator in Georgia and understand the applicable statutes and regulations of the state. As a public fire investigator, I directly heard complaints that arose from other investigators in the industry concerning the ideology of fire scene investigation.

The focus in this study was on public fire investigators; therefore, a purposeful sampling strategy was warranted. Random sampling strategies allow for more generalizability, which was not a focus of this research. A purposeful sample allows for the richness of a study to emerge. Because generalizability was not an issue, sample size was limited; however, variation was central to the maximum variation sampling strategy.

To maximize variation criterion, a selection of participants was delimited to differing organizational structures. I made participant selections from municipal and county governmental entities. Creswell (2013) suggested between five and 25 participants in a qualitative study; however, the goal is to achieve data saturation. Data saturation occurs when a researcher no longer obtains new data to code (Fusch & Ness, 2015; Guest et al., 2020). In this study, I achieved data saturation with 10 participants.

Limitations

There were limitations to the study, including researcher, participant, and organizational acceptance. I had limited practitioner level knowledge of the testing instrument. Familiarity with the testing instrument was gained through the literature review process. According to the literature review, the testing instrument had not been used in a previous study regarding fire investigator behaviors. Participants may have been a limiting factor because of their own personal biases (Patton, 2002). Not knowing their work atmosphere, personal motives, or biases toward their employer or career field, it cannot be known if their answers are biased, embellished, or truthful. Both participant and organizational acceptance presented a limitation. Participants could only volunteer to participate. This led to difficulty in gaining a pool of participants because the

organization was tasked with distributing a flyer for circulation. Then, I had to wait for each participant to reach out to volunteer.

Significance of Study

This study was conducted to further an initial study that uncovered the need for a set of standards and qualifications for fire investigators (Boudreau et al., 1977). The intent of this research was to fill an existing gap in literature by understanding the behavioral indicators that influence public fire investigators when approaching and conducting fire scene investigations. A significant literature gap was identified (Gorbett et al, 2015) concerning the experiences of public fire investigators.

In this study, I used the TDF and COM-B model to explore how public fire investigators' decision making is influenced by behaviors. By targeting these identified behaviors, policy writers and implementers can identify and develop new policy interventions, thus developing a social change mechanism for fire scene investigation with the hope to eliminate wrongful prosecution.

Summary

In this chapter, background information regarding public fire investigators, the problem, the purpose, research question, and theoretical framework was provided. Additionally, I explained the nature of the study, operational definitions, assumptions, scope, delimitations, limitations, and study significance. In Chapter 2, I will provide a review of the literature relevant to the study.

Chapter 2: Literature Review

Introduction

The literature review consisted of searching for the lived experiences of public fire investigators when they investigated fire scenes. I discovered problems in the field of forensic fire investigation (Beety & Olivia, 2019; Gorbett et al., 2015; Hanger & Runkle, 2017; Lentini, 2019, Tobin et al., 2017; Toscano, 2011). One problem that has negatively impacted firefighting, law enforcement, the courts, the field of forensic science, and society is wrongful prosecution for the crime of arson. This problem occurs despite the field of forensic fire investigations having advanced in education and technology (Grisham, 2018; Hanger & Runkle, 2017; Lentini, 2012a; Pitts & Waterfield, 2014; Possley, 2017; Segura, 2017; Tobin et al., 2017). Scholars have attributed this problem to prosecutions rooted in junk science (Beyler, 2009; Gorbett et al., 2015; Grisham, 2018; Lentini, 2019; Segura, 2017) due to the investigation processes of public fire investigators (Davies & Delgarno, 2009; Hewitt, 2014a; Hewitt & McKenna, 2014; Lentini, 2012b, 2019; Reis, 2016; Risinger, 2010a; Toscano, 2011). In this general qualitative study, I investigated the targeted behaviors (Atkins et al., 2017; Davis et al., 2015; Francis et al., 2012; Michie et al., 2013; Michie et al., 2011; Richardson et al., 2019) of how public fire investigators approach and conduct a fire scene investigation in hopes to remedy this problem.

The purpose of this general qualitative study was to identify targeted behavioral indicators of public fire investigators. Targeted behaviors were those when the public investigator approaches and conducts a fire scene investigation. Understanding these

behaviors, through the lived experiences of fire investigators, adds to the current body of knowledge. The addition will allow future policy writers to implement change through the development of new policy interventions that can change the targeted behaviors.

This section includes a review of the literature on SLBT and SLB, policy implementation, development of NFPA 1033 and NFPA 921, fire investigators, fire investigative training, forensic science, and the legal system concerning forensic fire investigation. The primary focus of the literature review concerned how public fire investigators influence implementation of policy standards. The literature review is organized into sections on the theoretical framework for the study, the development of NFPA 1033 and NFPA 921, forensic science, forensic fire investigation, wrongful convictions, and related research methodology. Literature is used to examine methodologies used for the theoretical framework. The literature review supports the theoretical framework and revealed that a study has not previously been conducted to identify the targeted behavioral indicators that influence public fire investigators when approaching and conducting fire scene investigations.

Literature Search Strategy

A primary search was conducted using the Walden University library. Databases included Sage Premier, ProQuest Central, ProQuest Criminal Justice, EBSCO, and Thoreau multi-database. Additional searches were conducted at federal and state websites: the U.S. Department of Justice (DOJ), the National Criminal Justice Reference Service (NCJRS), the White House, the U.S. Department of Labor (DOL), and the Georgia Public Safety Training Center (GPSTC). Professional organizations concerning

fire investigation and forensics, such as International Association of Arson Investigators (IAAI), National Association of Fire Investigators (NAFI), the American Academy of Forensic Science (AAFS), NFPA, National Institute of Standards and Technology (NIST), the National Academies of Sciences (NAS), and the National Registry of Exonerations (NRE) were searched as well. I also reviewed fire service journals and trade publications. Search terms included *policy implementation*, *street level bureaucracy, public policy*, *fire investigation*, *arson investigation*, *NFPA 1033*, *NFPA 921*, *junk science, theoretical domains framework,* and *COM-B model*.

The searches yielded many results for the broad terms of *fire* and *arson investigations*. Few results related to individual fire investigators and NFPA 1033 and NFPA 921 were found. Much of the literature concerning fire investigators and how they approach investigating a forensic crime scene is found in fire service journals, legal journals, and trade publications.

Theoretical Foundation

The theoretical foundation for this study was SLBT, based on Michael Lipsky's (1980) seminal work *Street-Level Bureaucracy: Dilemmas of the Individual in Public Service*, which is cited more than 17,000 times in Google Scholar. Lipsky suggested that typical SLBs are teachers, law enforcement personnel, social workers, judges, court officers, and other public-service workers. These workers provide governmental services to citizens and are identified as frontline public-service workers who directly interact with citizens and have decision-making discretion. The SLB is identified as the true implementor of policy, and they will implement policy to suit their working conditions

(Hill & Hupe, 2002; Linder & Peters, 1987; Lipsky, 1980; Lodge et al., 2015; Loyens & Maesschalck, 2010).

Lipsky is credited for being the "founding father of the 'bottom-up' perspective" (Hill & Hupe, 2002, p. 51) due to his influence on implementation studies of behavior analysis of the SLB. This is contrasted by what many scholars previously assumed for policy implementation as a top-down hierarchy (Pressman & Wildavsky, 1973/1984); a predominate force in implementation theory for existing literature (Linder & Peters, 1987). Lipsky identified the SLB as the person interacting with the public, who is guided by policy yet has great discretion in how they interpret and implement the policy. This latitude is often granted because they must respond to the needs of their client.

Previously Applied Literature

Hill and Hupe suggested the SLB is excluded by the system with no overall control of their outcomes. Due to the pressures and ambiguity of policy, SLBs lower the expectations of clients and themselves, causing SLBs to view themselves as "cogs in a system … oppressed by the bureaucracy within which they work" (Hill & Hupe, 2002, p. 52). According to the title of the seminal work, the *dilemma* that SLBs face is influenced by working conditions of organizational and institutional environments and not self-interest (Lodge et al., 2015).

Busch and Henriksen (2018) analyzed 44 peer-reviewed articles regarding how the SLB effects public values using digital discretion using information and communication technology (ICT). An argument suggested is that through digitization, the SLB is removed from discretionary decision making, thus forwarding the process of street-level

bureaucracy to system-level bureaucracy (Busch & Henriksen, 2018). However, it is suggested that digital discretion is not the desired outcome because human decision making is more desirable to strengthen policy (Busch & Henriksen, 2018). Jensen (2018) described the SLB as a "heterogeneous group performing very different tasks" (p. 1126), and while performing these tasks, the SLB should meet the standards. The foundation of Jensen's (2018) study rests on the assumption that the SLB is influenced by organizational settings.

Even though policy makers attempt to control policy implementation and administer it equitably, it is the SLB that affects it through their decision-making discretion. Saruis (2018) suggested that the results of discretionary decision making produce "irreducible uncertainty" (p. 32) for the SLB. The SLB's decisions can be complex, and the policy systems place incoherent pressures on SLB decision making.

Precious et al. (2017) identified a key element in SLB study as understanding their decision-making ability. The authors identified the SLB role as being affected by incompatible expectations. When an SLB is conflicted, they tend to find new "standard operating procedures" by "combining old logics into new ones" (Precious et al., 2017, p. 2016) to gain the best outcome for the recipient of policy intent. Additional literature has suggested that decision making is influenced by inadequate resources, service demands, vague and conflicting policy goals or organizational expectations, difficult performance indicators, and clients who do not choose their service (Lodge et al., 2015), leaving SLBs to form the policy rather than implement it (Loyens & Maesschalck, 2010; & Kørnøv et al., 2015).

Lodge et al. (2015) profiled empirical studies that evidenced SLB work is incompatible with carrying out the intent of policy due to resource constraints, workload pressures, policy ambiguity, and efforts to control SLB behavior. Hill and Hupe (2002) further reiterated that when an SLB is confronted with vague norms, they act to interpret policy the best way they can to justify their decision making because they see themselves as working for the citizens. Schnack (2016) indicated that SLBs implement policy through their understanding of policy goals. Jensen and Pedersen (2017) suggested that SLBs modify how they perform their job tasks to narrow the "gap between abilities and objectives" (p. 434). Additional SLB strategies of implementation included dividing resources, shifting policy goals, and selectively implementing policy (Schnack, 2016).

Loyens and Maesschalck (2010) conducted a literature review on SLB decision-making discretion and found mixed conclusions. Studies profiled included individual decision-making characteristics, organizational characteristics, client attributes, and extra-organizational factors that include the community, laws and regulations, and the media. These studies suggested that the SLB is a professional and will deviate from the rules and regulations because SLB decision making is influenced more by citizens than by supervisors. Jilke and Tummers (2018) suggested that SLB decision making, due to their discretion, is based on who they perceive as deserving based on client attributes. Additional literature has suggested that SLB decision making is not guided by policy but by the SLB's own cultural beliefs (Jensen, 2018; Raaphorst & Groenveld, 2018).

Hill and Hupe (2002) suggested that when researching SLB implementation, one must look at the factors that affect the behaviors of the SLB. According to Lodge et al.

(2015) there is a great need for more empirical research to understand how SLBs practice. The authors suggested that Lipsky's seminal work continues to be "ground-breaking" and the "untested proposals about how to strengthen the performance of public sector bureaucracies offer value worldwide today" (Lodge et al., 2015, p. 18). Raaphorst and Van de Walle (2018) suggested a need to conduct further studies in how an SLB interprets citizen signals and how the interpretation affects SLB decision making. Additionally, Jensen and Pedersen (2017) suggested that questions regarding the impacts of SLB decision making are lacking in empirical studies. Harrits (2019) suggested that further study of SLB discretion can strategically assist in avoiding "bias and injustice" (p. 94).

Rationale for Theory

Previous studies revealed a direct influence on behavior that affects SLB decision making. These studies help shape the understanding of how SLB decision making influences policy implementation (Saruis, 2018). This study was conducted to advance the understanding of these previous studies relating to the behavioral influences of SLB decision making when attempting to implement policy.

The previous literature has suggested that behavior is a direct influence in how an SLB implements policy and identified that SLBs include government workers, such as public fire investigators. This study attempted to gain insight as to which behaviors influence SLBs when attempting to implement policy when approaching and conducting fire scene investigations. This assisted in answering the research question: What

behavioral interventions can be implemented to aid SLBs—public fire investigators—in their approach to fire scene investigation?

Literature Review Related Key Variables and/or Concepts

In this section, I further examine key concepts related to the world of fire investigation. First, I present an understanding of the need for the development of sound policy for fire investigators and fire investigation. Then I explore an understanding of forensic science and forensic fire investigation, along with its problems. An examination of the results of these problems is then offered. Finally, a methodology and testing instrument is examined for the relevance of this study.

NFPA 1033 and NFPA 921 Development

The NFPA began in 1896 due to three fundamental issues of concern in the U.S. building industry: electricity, water, and fire insurance (Grant, n.d.). During this era, many organizations were attempting to regulate these industries, thus causing overlapping regulations and industry burdens rather than overall safety. The need for more centralized industry codes and standards has made the NFPA what it is today. The NFPA is a nonprofit organization that establishes codes and standards. NFPA codes and standards are recognized worldwide, and in the United States, the NFPA is considered a national consensus standard organization (Hewitt, 2014b; Hewitt & McKenna, 2014; Lentini, 2013; NFPA, 2014; Spoons, 2012).

In 1972, NFPA addressed the need for professional standards in four career areas: fire fighter, fire officer, fire service instructor, and fire inspector – fire investigator (NFPA, 2014) through the Joint Council of National Fire Service Organizations

(JCNFSO) and the National Professional Qualifications Board (NPQB). These standards were to be addressed as a uniform career ladder for fire service personnel. As the career field became more intricate, a need to separate qualifications by discipline were noticed. In 1977, the first edition of *NFPA 1031: Professional Qualifications for Fire Inspector, Fire Investigator, and Fire Prevention Officer* was established. In 1987, the need for civilian entry into certain fire service disciplines was recognized, which led to the birth of *NFPA 1033: Standard for Professional Qualifications for Fire Investigator*.

A growing need for more rigorous standards was recognized, and NFPA established the Professional Qualifications Correlating Committee (PQCC) in 1990 (NFPA, 2014). Birthed from the PQCC, the Technical Committee on Fire Investigator Professional Qualifications (TCFIPQ) was established to address needed expertise for fire investigation (NFPA, 2014). The current edition of 1033 "was approved as an American National Standard on June 17, 2013" (2014, p. 1).

In 1985, NFPA formed a technical committee concerning fire investigation methodology. In 1992, seven years later, NFPA released *NFPA 921: Guide for Fire and Explosion Investigations* (Plummer & Syed, 2016). The introduction of NFPA 921 was not "accepted and implemented" (Plummer & Syed, 2016, p. 493), and there was "much confusion, disagreement, and outright insubordination" (p. 494) toward the publication and its methodology.

It took decades for NFPA 921 to become part of SLB practice; law enforcement being the primary ones to avoid it (Plummer & Syed, 2016). The authors described the period between 1992 and 2004 as dangerous, and no one was truly conducting fire scene

investigation methodology. IAAI formally endorsed the adoption of NFPA 921 in 2000; 8 years after the first edition (Lentini, 2019). Lentini suggested that NFPA 921 was not readily accepted by fire investigators when it was published, because they felt that it was a threat to their careers. Lentini (2019) attributes the advancement of NFPA 921 due to older fire investigator retirements and younger fire investigators understanding the need for a scientific approach.

The goal of NFPA 921 is to provide the fire investigator with a definitive fire or explosion scene investigation methodology. The guide is not all exclusive and states:

> This document is not intended as a comprehensive scientific or engineering text. Although many scientific and engineering concepts are presented within the text, the user is cautioned that these concepts are presented at an elementary level and additional technical resources, training, and education may often need to be utilized in an investigation. (NFPA, 2017, p. 8)

NFPA is suggesting that this guidebook is presented at an elementary level; however, investigators, attorneys, and the courts use it as the litmus for fire scene investigation (Hewitt, 2014b; Hewitt & McKenna, 2014; Lentini, 2013; Lentini, 2019; NFPA, 2017; NRC, 2009; Risinger, 2010a; Segura, 2017; Toscano, 2011; U.S. DOJ, 2000; Varga, 2018).

NFPA 921 includes an array of investigation types and how to properly conduct them. Chi and Peng (2016) argued that the most important task in fire scene investigation is to identify O&C and provide legal documents in criminal law cases. The authors used NFPA921 for fire scene reconstruction. NFPA 921 clearly states the “systematic

approach recommended is based on the scientific method, which is used in the physical sciences" to produce "a basis for legitimate scientific and engineering processes, including fire incident investigation" (2017, p. 9). Lentini (2012b) credits NFPA 921 with providing ground rules that will help in distinguishing between credible and non-credible reporting.

Forensic Science

Forensic science is a subcategory of the physical sciences and is defined by the AAFS as applying scientific principles and practices to resolve criminal, civil, and regulation issues (AAFS, 1993, para. 1). Forensic sciences include many discipline analyses, and are not limited to DNA, forensic odontology, comparative bullet lead analysis (CBLA), friction ridge analysis, biological evidence, hair and fiber analysis, toolmark and firearms identification, digital and multimedia analysis and fire debris analysis (NRC, 2009).

Aronson and Cole (2006) reviewed the phenomenon of age of innocence, proffered by Rosen (2006); research that studied the effects of DNA evidence as an absolute truth in the legal system. Aronson and Cole (2006) argued that DNA evidence is becoming the epistemic truth because it is rooted in science. The researchers utilized a qualitative study, grounded in science and technology studies (STS), using a hermeneutical approach to study key text terms using document and case review. The study was built upon an earlier study of wrongful death penalty convictions conducted by Beau and Radlet (1987). This study was compared to the 2004 Governor's Council Final Report of the Massachusetts Governor's Council on Capital Punishment. The essential

research question is: Do abolitionist and death penalty reformers suggest that scientific DNA evidence centered on death penalty cases is promoted by a "'mythologized' notion of 'science' as a producer of epistemic certainty" (1987, p. 603)?

The conclusions of the study revealed that DNA evidence is rooted in science, thus, it is subject to error, bias, mishandling, and corruption. This contrasted to law, which is rooted in truth. Because the two fields contrast in truth, law does not carry the "epistemic authority as science" (Beau and Radlet, 1987, p. 614). Forensic science is an aid to the legal field in providing scientific data; however, the authors caution that the use of witnesses is claiming a level of certainty that science cannot produce. Philosophers do not even regard science as absolute; therefore, forensics and law should not render certain evidence, e.g. DNA, as epistemological certainty.

Cole (2012) offers an analysis of the phenomenon of convicting the innocent. The article did not provide a research question; however, there was a methodology of multiple case studies and document review. This study supported the Aronson and Cole (2009) study expressing cautionary use in DNA evidence as epistemic certainty. This study continued to look at the credibility of forensic evidence in the legal system. Findings revealed that DNA and serology are the only reliable testing mechanism. Expert testimony, microscopic hair comparison, and voice comparison is unreliable. Cole continues to argue that bias is a significant problem in forensic science.

Cole (2018) stated that the NRC (2009) report – known as the *National Academy of Sciences* (NAS) report – was a pivotal point in American forensics. Cole identified problems that plague the forensic science community, such as governments, controlled by

law enforcement agencies, which included inadequate resources, insufficient education and training (2018, pp. 566–567). The SLB of forensic science is not in the scientific community, driven by peer review papers, grants, and rewards, but rather in the bureaucratic organizations that have productivity requirements (Cole, 2018).

According to the NAS report, if erroneous evidence or testimony is introduced to a jury, they might lack confidence in the system overall. The lack of confidence could result in discounting valid evidence, which could lead to an innocent person conviction, or a guilty person being acquitted (NRC, 2009, p. 37). According to the report, there is doubt growing with accuracy of forensic science due to the number of DNA exonerations (2009, p. 37).

Hanger and Runkle (2017) suggested that the NAS report is intended for multiple disciplined practitioners, including policy makers. Validity is critical in science; the NAS report revealed that forensic science professionals are failing to meet validity of their conclusions, and that the courts are ineffective in confronting this problem (NRC, 2009).

Forensic Fire Investigation

Citing the Law Enforcement Assistance Administration (LEAA) 1977 report entitled *Arson and Arson Investigation: Survey and Assessment*, Lentini (2019) discussed changes to the profession of fire investigation over the last three decades. Lentini (2019) concluded there is "little or no scientific testing" in the field of arson investigation (p. 38). Additionally, the report cited five areas that supported how a fire develops have now become attributed to junk science: leaving the fire investigation field tarnished.

A lack of qualified training to ensure that individuals are performing at an acceptable practitioner level is a problem that has gone unnoticed, ignored, or condoned (Davies & Delgarno, 2009; Hewitt, 2014; Hewitt & McKenna, 2014; Lentini, 2012, 2019; Reis, 2016; Risinger, 2010a; Toscano, 2011). By 1999, published work began to appear and fire debris analysis became a sub-discipline of trace analysis. In 2000, the IAAI adopted NFPA 921. Nine years later the 2009 NAS report was issued with recommendations that practitioners possess minimum qualifications for fire investigation. In 2017 the American Association for the Advancement of Science (AAAS) released a gap analysis report for fire investigation, and the Technical Working Group for Fire and Explosives (TWGFEX) suggested that fire debris and explosive examiners possess the following:

1) "a bachelor's degree in a natural or applied science, with recommended course work in chemistry and instrumental analysis", and
2) "complete a training program that includes analysis of low and high explosives, instruction in the use of instrumentation used in routine analysis, the construction of explosive devices, and participation in a potsblast investigation course" (NRC, 2009, p. 171).

Hanger and Runkle (2017) stated that fire investigation is comprised of two parts: (a) fire debris analysis; the most standardized and reliable and (b) fire scene investigation; the most problematic. According to Tobin et al. (2017), a problem with the scientific practice of fire investigation is that the practitioner is a firefighter or law enforcement officer who is not educated in the sciences.

The role of the public fire investigator is to make determinations as to whether the fire was set (Lentini, 2019). One complication in post-flashover fires is the creation of chemicals that were not present at the scene before the fire, which leads to a conclusion that an accelerant was used to start the fire. The traditional fire scene investigation methodology is to analyze burn patterns to determine the point of origin. However, science has proven this to be insufficient in post-flashover burn patterns, which can have incorrect conclusions more than 75% of the time (Hanger & Runkle, 2017). Lentini (2012b) suggested that the field of fire investigation requires complicated decision making concerning chemistry and physics to present within the confines of the legal system. Even though NFPA 921 is routinely accepted as the standard of care in fire investigation, Lentini (2019) stated that many fire investigator experts consistently fail at providing basic testimony and risk having their testimony excluded in court. Eleven years after the recommendations of the 2009 NAS report, the industry still lacks mandatory accreditation and certification unless it is tied to federal funding. Moving forward, the Organization of Scientific Area Committees (OSAC) is assisting NFPA in developing valid standards for NFPA 921 and NFPA 1033 to ensure a certification program.

Caudill (2018) argued in favor of the SLB, suggesting that an expert is someone trained, experienced, and credentialed in their relevant field, and that an expert does not need to be a scientist to offer credible testimony. Caudill (2018) suggested one reason there is a lack of certification standards is because forensic science was not born out of modern laboratories, but as an aide to assist law enforcement in solving crimes. Caudill

(2018) suggested this becomes an issue of culture. Caudill (2018) argued that the NAS report fails to identify what is "scientific culture" (p. 6).

Caudill (2018) argued against mandates for the forensic scientist that include:

- forensic science does not seek general knowledge claims,
- reproducibility is not a goal,
- rewards are not geared toward publication and prestige,
- it is more adversarial and less transparent than conventional science, and
- the audience is the criminal justice system (p. 8).

Caudill (2018) suggested that the only way to measure expertise externally is through documented certification, which limits the expertise boundaries.

Beety and Olivia (2019) described the field of fire investigation as made-up primarily of persons that are untrained and unreliable. This leads to false conclusions with miscarriages of justice. This miscarriage that the authors posit results in the criminal courts failing to be an effective advocate for the people, leading to several high-profile wrongful convictions.

Beety and Olivia (2019) argued that the civil courts maintain a higher degree of scrutiny than the criminal courts. Specifically, the civil courts routinely require admissibility of expert testimony to face the rigors of the Federal Rules of Evidence 702 and Daubert challenges. If the testimony cannot satisfy these components it is excluded. Yet, the criminal courts continue to allow "unreliable and unsubstantiated arson-expert testimony to be routinely admitted" (2019, p. 489). The criminal courts can invoke Federal Rules of Evidence 706 in which the court appoints an independent expert

witness. It is argued that fire scene investigation should be conducted by non-law enforcement workers (Beety & Olivia, 2019; Hanger & Runkle, 2017). According to Beety and Olivia (2019), 20% of federal judges have done this, and out of these, 10% have done it more than once. Invoking this will ensure due process and possible wrongful conviction avoidance.

Beety and Olivia (2019) furthered the argument and attacked a theory commonly used by fire investigators known as negative corpus. Negative corpus suggests that an open flame caused the fire in an area where there is no known ignition source – hence the negative corpus or no body of evidence. The fire investigator determines the origin of fire in a particular part of the room, examines for ignition sources, finds none and deduces that it was caused by an intentional human act: arson. In 2005, the Alcohol, Tobacco, and Firearms (ATF) conducted a controlled burn experiment for compartment (room) fires in which 94% of the investigators predicted the wrong area of O&C. In 2007, a controlled burn experiment for compartment (room) fires resulted in 76% of the investigators predicting the wrong area of O&C (Lentini, 2012a, 2012b; Beety & Olivia, 2019). NFPA 921 rejects the negative corpus theory, which is contrary to the scientific method.

Beety and Olivia (2019) suggested interviewing witnesses can bias the fire investigator, specifically if the investigator interviews the witness prior to examining the fire scene. The potential for misidentifying witness information can lead to cognitive biases. The authors supported this bias indication from changed eyewitness testimony in the Cameron Todd Willingham arson and murder conviction. Witnesses first described Willingham as “frantic to save his daughters from the burning trailer” (p. 510). Once the

term “arson” was introduced, the witnesses began to “dramatically alter their accounts of what occurred at the scene” (p. 510).

Cognitive biases cause the investigator to maintain focus on one theory, and because they are members of the prosecution, they are unlikely to be objective. Geiman and Lord (2012) refer to this as “anchoring” and “cherry picking” (p. 220), which explains how exculpatory evidence is missed or discarded by the prosecution. Jiahong (2016) posited that investigators must act without bias for a forensic investigation. If investigators form opinions too early, they may be close-minded, and errors will result. Additionally, when the investigator focuses on proving the guilt of the suspect, they tend to overlook exculpatory evidence that will exonerate the suspect.

Gorbett et al. (2015) provided an extensive literature and document review of fire investigation methodology from the period of 1945 to 2015. Due to the lack of formal scientific training for fire investigators, it subjects them to “investigator bias” (p. 2), and the nature of informal training received by investigators, the passing down of myths – junk science – is routine. The progression of fire investigation is supported in the literature; however, texts still report junk science as a form of investigation methods. The majority of training investigators receive is conducted through an informal on-the-job training process. Gorbett et al. (2015) suggested that the average investigator receives 60 hours of training. Data extracted from the Gorbett et al. (2015) literature review, using controlled case studies, demonstrated faults in fire pattern interpretation by investigators.

In support of the Gorbett et al. (2015) literature review, suggesting that fire investigators receive limited training that is handed down by inexperienced unscientific

methodologies, Davies and Dalgarno (2009) offered an analysis of Shultz's social phenomenology (1967) framework. Davies and Dalgarno (2009) used a mixed-methods approach to answer several questions. This phenomenological approach used Likert scales, cognitive written test for student evaluation, and personal interviews to interpret participants' experiences. The study consisted of four experimental groups for new fire investigation students at Charles Sturt University Law Enforcement, New South Wales, Australia. The study examined if a student could successfully learn via a virtual learning environment (VLE) as well as face-to-face classroom; additionally, the practical side of fire scene investigation was offered in VLE.

Data revealed that the VLE proves to be beneficial for the student. Some caution is noted that not all groups were weighted equally, and the higher percentages may be attributed to the lower group numbers. Participants like the VLE approach so that they could go over fire scenes slower and repeatedly; however, they stated that visiting an actual scene, with an experienced investigator, was better. This supported the notion that limited training is offered for fire investigators, and that fire investigators still prefer to be shown how to investigate by an experienced investigator. This practice is not bad, but if the experience does not support policy and requisite standards, then a definitive problem exists.

Toscano (2011) presented an understanding of how fire investigators will be used in a court for testimony. Expert witnesses must be able to form hypothesis to draw conclusions of fire cause determination. The investigation must be systematic and rooted in science. The courts will be the gatekeeper of allowing expert testimony to be heard

using the Daubert challenge. If the investigator does not adhere to this standard, then there is a risk of testimony and evidence being inadmissible. If the courts are to truly act as the gatekeepers for expert witness testimony (Dioso-Villa, 2016; Toscano, 2011), then the standards NFPA 1033 and NFPA 921 must be used (Beety & Olivia, 2019). During pretrial hearings, it will be observed that "fire investigators are often law enforcement officers who have little additional training beyond weekend seminars operated by other scientifically untrained law enforcement officers" (Beety & Olivia, 2019) making them the ideal SLB candidate.

Wrongful Convictions

As a result, from the NAS (NRC 2009) report, the NCFS was established in 2013. The NCFS is to provide recommendations and advice for forensic policy making at the federal level to strengthen the criminal justice system. The NCFS (2017) report suggested that "decisions made as a result of forensic evidence have a direct and permanent impact on the lives of citizens" (p. 11).

Hanger and Runkle (2017) conceded that due to junk science testimony that had not been validated, there are people being wrongfully convicted; suggesting that the number of wrongful convictions might never be known. Tobin et al. (2017) discussed issues surrounding the absence of statistical data in forensic evidence. The study examined a phenomenon of how the public demands forensic evidence, driven by expert witness testimony, as they are familiar with seeing this portrayal in mainstream media. The study further explained that a critical flaw of these citizen demands is the byproduct of junk science in forensics resulting in wrongful prosecutions.

Grisham (2018) offered insight as to his involvement with the Innocence Project as a member of the Board of Directors. Grisham (2018) cited that over the last 25 years, through DNA testing, 349 innocent people have been released from custody; including 20 who were on death row (para. 4). There has been more than 2,000 people released from custody. Out of 330 DNA test releases, between 1989 and 2015, 71% were convicted on flawed, unreliable, exaggerated, and fabricated forensic science (para. 1). Grisham (2018) suggested that "it's a maddening indictment of America's broken criminal justice system, in which prosecutors allowed — even encouraged — flawed forensic testimony because it was molded to fit their theories of guilt" (para. 4).

Beety and Olivia (2019) reiterated the point that innocent persons have been convicted on unreliable fire evidence. One of the failures of applying the Daubert standard in criminal courts is the lack of scientific expertise. The authors hypothesized that the potential for wrongful convictions is due to the same phenomenon proffered earlier by Tobin et al. (2017) of jury expectations and their belief in forensic testimony.

Beety and Olivia (2019) cited the standard for fire investigations is NFPA 921, and that the guide assists with exposing faulty fire scene investigation, which has become a leading cause of wrongful convictions in the United States. It is suggested that civil courts routinely exclude testimony not rooted in sound scientific practices, yet the criminal courts do not. The authors provided the example that forensic odontology (bite mark evidence) is allowed in every criminal trial even though the scientific community discredits it.

The televised investigative report *Burned*, profiled the Phoenix Fire Department's Arson Unit that held the reputation of solving more arson cases than any other organization in the country. During the interview, an arson unit member stated that the "unit has made 10 arrests in the last two or three weeks" (Pitts & Waterfield, 2014, 1:05). The defendants claimed that they were falsely accused through incompetence and misconduct.

The report focused on three members of the unit: one being an accelerant canine handler. Under the commanding officer's direction, the unit soared from a case solve rate of 22% in 2007 to 65% in 2010 – the highest in the country. Jiahong (2016) reviewed a study conducted at the Institute of Evidence in the Law School of Renmin University that reviewed over 100 wrongful convictions. Jiahong (2016) suggested that investigators are prone to solve cases to internal and external demands and as a criminal deterrent. The author suggested that this was due to increased pressure for results, regardless of the result being right or not.

Burned (Pitts & Waterfield, 2014) focused on the two separate investigations of suspected arsonists in 2009. During the first investigation, evidentiary video shows the fire investigator pointing out three separate points of origin and determining that the fire is arson. This is done through preliminary walkthroughs of the structure without any scientific testing as required in NFPA 921. The only scientific testing that was conducted was the use of an accelerant detection canine; the samples ultimately returned negative for accelerants. Additionally, the investigator is articulating eyewitness testimony that may suggest motive for the defendant. This demonstrated how an investigator introduces

cognitive biases to determine the cause of fire. It was determined through scientific study that the fire was accidental and started in the attic, an area far removed from the initial investigator's hypothesis.

In the second investigation, the canine alerted positive to accelerants and the lab results showed negative. The evidentiary video captures the fire investigator giving verbal direction to the canine, and at one point stating, "just put your nose down and at least fake it" (Pitts & Waterfield, 2014, 9:00) for the handler to get a visual positive canine alert. The charges against the defendant were eventually dropped, with the department stating that the fire investigator was inexperienced. While testifying in a civil deposition, the fire investigator was questioned about the reliability of his assigned canine. He stated that he did not keep statistical data because he felt that the canine was superior to the forensic lab because she [canine] was right 100% of the time, another introduction of bias. Pat Andler, of Andler and Associates, called this statement "absurd" (Pitts & Waterfield, 2014, 12:05).

Lentini (2012a) provided two case examples: Amanda Kelly and David Lee-Gavitt. Kelly was arrested for setting a fire and killing her three children in 2001. The investigator testified to the effects of arson indicators and Kelly was sentenced to jail. In 2006, while in her fourth year of serving her sentence, credible scientific evidence was introduced suggesting her innocence, thus, causing the judge to dismiss the charges. Gavitt was arrested and convicted to life in prison for setting a fire and killing his wife and two children in 1985. Due to faulty evidence that was suspected to be gasoline, the

State failed to prove an arson case, and Gavitt was subsequently released after 24 years in custody.

Possley (2017) profiled Adam Gray who was convicted in 1996 for murder, due to the death of two people that resulted from a fire that he was accused of starting. Defense counsel experts were able to justify that the initial proof of arson was based on unsupported beliefs that lack scientific knowledge (2017, para. 16). Gray was 14 years old when he was sentenced to life in prison and was subsequently released in 2017 after serving 21 years.

Segura (2017) profiled an arson conviction case in which the defendant, Angela Garcia, spent 15 years in prison for a crime that was based on junk science. Several participants in the prosecution, including the presiding trial judge, were subsequently arrested for ethical crime violations. According to Segura (2017), more than 50 people have been exonerated of arson charges between 2001 and 2016. Segura (2019) profiled the conviction of Claude Garrett, who was sentenced to prison for arson and murder in 1992. Defense experts are challenging his case due to the conviction in 1992 was the first year that NFPA 921 was released. The testimony and evidence offered at trial is inconsistent with fire investigation methodology of today. Garrett still sits in prison.

Perhaps the two most noteworthy cases, in the fire investigation profession, are that of Ernest Ray Willis (1986) and Cameron Todd Willingham (1991). Willis was able to escape a house fire that two women subsequently died in. The prosecutors suggested that Willis did not have burns on his feet (Beyler, 2009), therefore, he did not try to save the victims and must have started the fire. Additionally, liquid burn patterns were

hypothesized based on methodology that was not even accepted in 1986 through the existing literature. With new testimony and an undetermined fire cause rendering, the conviction was overturned. Willis was released in 2004 after serving 17 years on death row.

Willingham was charged and convicted for the 1991 house fire that he survived but his three children subsequently died in. The fire investigation lacked the rigors of the standard of care of NFPA 921, and it was concluded that a bias to prove arson existed. While maintaining his innocence, Cameron Todd Willingham was put to death by lethal injection on February 17, 2004.

The Beyler report (2009) profiled both defendants and the lack of credible scientific evidence used to convict both men. It was concluded that the public fire investigators testimony did not meet the rigors of fire investigation as an applied science. The conclusion of the report allows for a presumption of innocence; however, one man was freed, and one man was executed (Innocence Project, 2008).

A search of the NRE (2019), using the key term *arson* as a filter, revealed 71 individuals that have been exonerated. Everyone had at least one charge of arson for their conviction. Of the 71 exonerations, 52% were identified as false or misleading forensic evidence that convicted them. These wrongful prosecutions may contribute to the assumptions that public trust has declined within the existing public administration literature (Raaphorst & Van de Walle, 2018).

Research Related to Methodology

To be able to design behavior-change intervention there must be a problem analysis. Current literature suggested that a definitive problem exists with public fire investigators, as a SLB, approach to fire scene investigations. The COM-B model and TDF are tools that address implementation problems, designing interventions, and understanding behavior-change processes (Francis et al., 2012), and have been used in previous qualitative studies (Atkins et., 2017; Michie, et al., 2011).

The COM-B model enables the researcher to gain understanding of how the behavior of a participant is influenced. The TDF enables the researcher to expound on the identified influences and gain deeper insight into the behaviors. I used the TDF to evaluate the participants' answers against 84 theoretical constructs grouped into 14 domains (Cane et al., 2012).

Behavior change interventions are useful when designing policy. The COM-B model was designed from three factors that influence behavior. Michie et al. (2011) used the U.S. criminal justice system, in which to prove the guilt of someone, there needs to be capability, opportunity, and motive. These three factors define the necessary elements of what influences behavior. Each is defined as:

- capability –
    - physical – skill, strength, or stamina
    - psychological – the capacity to engage in the necessary mental process,
- opportunity –

    - physical – controlled by the environment
    - social – controlled by culture and the way we think about things
- motivation –
    - reflective – processes involving plans (self-conscious intentions) and evaluations (good and bad beliefs)
    - automatic – processes involving emotional reactions, desires, impulses, inhibitions, drives, and reflexes (Michie et al., 2011, p. 4).

Atkins et al. (2017) presented contextual text explaining how the TDF is used to understand human behavior. To understand behavior, an understanding of what influences a person to behave is studied. The TDF provides a system of analysis to account for this. This is useful for those looking to implement change in certain behaviors and expounds from the COM-B model (Gainforth et al., 2016). The TDF provides an avenue to identify determinants of behavior.

A benefit to using TDF is that it provides a theory-based approach for implementation studies (Atkins et al., 2016, 2017; Cane et al., 2012; Francis et al., 2012; Gainforth et al., 2016; Michie et al., 2005). Cane et al. (2012) suggested additional advantages to using TDF include: (a) comprehensive coverage of possible influences on behavior, (b) constructs clarify the influence of the domains, and (c) links behavior change theories for implementation.

To change behavior, it is required to understand what influences the behavior, then an individual or organization can change existing practices. Behavior theories are

relevant to implementation problems and informing implementation interventions. The TDF was initially developed to support implementation research that identified the influences on healthcare professionals. TDF has been cited in over 800 peer-review documents as of 2017 (Atkins et al., 2017).

The first version of the TDF was published in 2005 (Michie et al., 2005) with an updated version in 2012. The initial TDF was composed of 33 theories of behavior and behavior change, clustered into 12 domains and 128 theoretical constructs providing a theoretical lens, thus, making it a framework instead of a theory (Atkins et al., 2017). The refined framework includes 14 domains and 84 theoretical constructs (Cane et al., 2012). This lens allows the researcher to understand behavior through cognitive, affective, social, and environmental influences. The most common use of TDF is in qualitative studies with a primary focus on interviews and focus groups.

There have been several uses of the TDF in scholarly literature; the main body of work being in healthcare. There have been several applications of the TDF used, such as identifying influences on behaviors, systematic intervention design, process evaluations of randomized trials to better understand implementing evidence, and guidance on behavior change techniques (Atkins et al., 2017). Additionally, the TDF is emerging beyond the scope of healthcare and can be found in implementation and behavior influence articles discussing recycling (Gainforth et al., 2016), menu guidelines in childcare (Seward et al., 2017), and student inclusion for educators (Tristani et al., 2019). It is the opinion of Atkins et al. (2017) that the intention of the TDF goes beyond many

disciplines. According to Khan (2019), in studies that have little prior research, qualitative studies are preferred for use of the TDF.

Using the TDF and COM-B model, targeted behaviors were cross referenced with the behavioral change wheel (BCW) interventions (Cane et al., 2012; Michie, 2005; Michie et al., 2011). The BCW synthesizes 19 frameworks of behavior change from a combination of the TDF and COM-B model that result in nine intervention targets (Gainforth et al., 2016). These interventions included education, persuasion, restrictions, incentivization, environmental restructuring, training, coercion, enablement, and modeling (Michie et al., 2011). Based on the identified intervention techniques, policy designers can implement constructive policy change. The BCW identifies changes as communication and marketing, guidelines, fiscal, regulation, legislation, environmental and social planning, and service provision.

Summary

The literature reviewed is SLBT, based on the seminal work of Michael Lipsky (1980), and its effect on policy implementation. It is discussed that the SLB is the true implementer of policy that has several limitations. SLB decision making is influenced by inadequate resources, service demands, vague and conflicting policy goals or organizational expectations, difficult performance indicators, and clients that do not choose their service (Lodge et al., 2015), leaving the SLB to form the policy rather than implement it (Loyens & Maesschalck, 2010).

The public fire investigator is a SLB, and is charged with proper implementation of NFPA 1033 and NFPA 921. However, the existing literature suggested that there are

numerous reasons that the public fire investigator is not implementing these policies correctly. These reasons included lack of education, organizational demands, lack of resources, personal biases, culture, fiscal constraints, incorrect public assumptions, and judicial system enablement. There was a significant gap in the literature discussing the public fire investigator's approach to fire scene investigation.

The literature revealed the origins of NFPA 1033 and NFPA 921 as policies. A need was first discovered in 1972 for professionalism in fire investigation. The need for expertise was first identified in 1990, yet credible and non-credible reporting methods were not recognized until 2000. As of today, scholars and industry experts are still arguing the credibility of public fire investigators and how they conduct fire scene investigation.

Forensic science is the application of scientific principles to resolve justice issues (AAFS, 1993) and includes fire scene investigation as a discipline. A problem that plagues forensic fire science is lack of qualified training (Davies & Delgarno, 2009; Hewitt, 2014; Hewitt & McKenna, 2014; Lentini, 2012, 2019; Reis, 2016; Risinger, 2010a; Toscano, 2011). Additional problems include government controlled bureaucracies, law enforcement agencies that are inadequately funded and resourced (Cole, 2018), and the SLB not being a member of the scientific community (Beety & Olivia, 2019; Cole, 2018; Tobin et al., 2017), supporting Lipsky's theory.

Lentini (2019) suggested that fire scene investigation is based upon junk science. A 2017 gap analysis report suggested that the public fire investigator possess a minimum of a bachelor's degree in applied science and complete training in explosion analysis,

analysis instrumentation, construction of explosive devices, and post blast explosion investigation (NRC, 2009). This education void results in the public fire investigator failing to provide basic scientific testimony, risking that testimony being impeached by the court (Lentini, 2019; Toscano, 2011). It is argued that public fire investigators have incorrect conclusions of post-flashover burn patterns greater than 75% of the time (Almirall et al., 2017), and had incorrect O&C conclusions as high as 96% (Beety & Olivia, 2019; Lentini, 2012a, 2012b).

Failures noted in the NAS report (NRC, 2009) spurred the development of the NCFS in 2013. The NCFS suggested that forensic science impacts the lives of citizens. One of these impacts is wrongful convictions of the innocent (Almirall et al., 2017).

It is suggested that both the public fire investigator and the court are pressured by jury demands of expert forensic testimony (Beety & Olivia, 2019; Tobin et al., 2017). It is suggested that evidence and testimony by the public fire investigator is flawed and biased in previous court cases (Grisham, 2018; Beety & Olivia, 2019; Beyler, 2009; Jiahong, 2016; Lentini, 2012a; Pitts & Waterfield, 2014; Possley, 2017; Segura, 2017, 2019; Tobin et al., 2017), which results in wrongful prosecutions.

Nine individuals, wrongfully prosecuted, were profiled in the literature. Of the nine, seven were released, one is still incarcerated, and one was executed. Between 2001 – 2019 more than 71 individuals, convicted of arson, were exonerated. It was determined that 52% of these convictions were due to false or misleading evidence that convicted them. Additionally, the courts are failing by allowing a less than rigorous standard for qualifying public fire investigator testimony in criminal prosecutions (Beety & Olivia,

2019; Dioso-Villa, 2016; Toscano, 2011), thus failing to be a true advocate for the people.

The TDF and COM-B model are helpful tools to address implementation problems, designing interventions, and understanding behavior-change processes (Francis et al., 2012). Qualitative research has been conducted utilizing the TDF and COM-B model (Richardson et al., 2019). Utilizing the TDF enables the researcher to expound upon the identified influences and gain a deeper insight into the behaviors. A benefit to using the TDF is that it provides a theory-based approach for implementation studies (Atkins et al., 2016; Atkins et al., 2017; Cane et al., 2012; Francis et al., 2012; Gainforth et al., 2016; & Michie et al., 2005). Utilizing the COM-B model enables the researcher to gain an understanding of how the behavior of the participant is influenced.

There have been several uses of the TDF in scholarly literature. The TDF has several applications, such as identifying influences on behaviors, systematic intervention design, process evaluations of randomized trials to better understand implementing evidence, and guidance on behavior change techniques (Atkins et al., 2017, p. 3). The TDF is emerging beyond the scope of healthcare and can be found in implementation and behavior influence articles discussing recycling (Gainforth et al., 2016), menu guidelines in childcare (Seward et al., 2017), and student inclusion for educators (Tristani et al., 2019). It is the opinion of Atkins et al. (2017) that the intention of the TDF goes beyond many disciplines.

Focusing on targeted behaviors that need to change for proper implementation will add to the current body of knowledge. This presents an understanding of how SLBs–

public fire investigators–approaches and conducts fire scene investigations. Using the identified behavioral indicators with the BCW (Cane et al., 2012; Michie, 2005; Michie et al., 2011), allows policy writers and implementers to identify and develop new policy interventions to change these targeted behaviors.

In Chapter 3, I explain the research design, rationale, and methodology. Additionally, the role of the researcher, issues to maximize trustworthiness, and ethical concerns are discussed.

Chapter 3: Research Method

Introduction

The purpose of this general qualitative study was to identify the targeted behavioral indicators that influence public fire investigators when approaching and conducting fire scene investigations. A focus on targeted behaviors adds to the current body of knowledge by presenting an understanding of how SLBs—public fire investigators—approach and conduct fire scene investigations. Understanding these behaviors will aid in policy interventions with the goal of reducing wrongful prosecutions for the crime of arson.

Wrongful prosecution was identified in the literature review as a problem, even though the field of forensic science is advancing through technology and education (Grisham, 2018; Hanger & Runkle, 2017; Lentini, 2012a; Pitts & Waterfield, 2014; Possley, 2017; Segura, 2017; Tobin et al., 2017). Junk science has had a direct negative impact on public safety, the judicial system, and forensic science (Beyler, 2009; Gorbett et al., 2015; Grisham, 2018; Lentini, 2019; Segura, 2017). Scholars have suggested this is directly related to the processes used by public fire investigators (Davies & Delgarno, 2009; Hewitt, 2014a; Hewitt & McKenna, 2014; Lentini, 2012b, 2019; Reis, 2016; Risinger, 2010a; Toscano, 2011).

To gain a richer understanding of how public fire investigators conduct fire scene investigations, I conducted semistructured interviews to collect data. By presenting an understanding of how public fire investigators approach and conduct fire scene investigations through a focus on targeted behavioral indicators, the findings of this study

add to the current body of knowledge. The results of the study provide insights for better implementation of NFPA 1033 and NFPA 921 to ensure success of these standards.

In this study, I focused on how policy is implemented by SLBs through the behaviors that influence their decision-making processes. The study of policy implementation began in 1973 with the seminal work of Jeffery Pressman and Aaron Wildavsky. Michael Lipsky's (1980) seminal work suggested the true implementer of policy was the SLB. This study furthered an initial study that first uncovered the need for a set of standards and qualifications for fire investigators (Boudreau et al., 1977). Gorbett et al. (2015) identified a significant gap in the literature concerning how fire investigators perform their jobs. Perspectives of fire investigators and their decision making when approaching and conducting fire scene investigations was missing in the literature reviewed. Therefore, this study was conducted to understand behavioral influences on decision making as to how SLBs—public fire investigators—approach and conduct fire scene investigations and will provide valuable insight for future policy designers.

Research Design and Rationale

The main research question guiding the study was:

RQ: What behavioral interventions can be implemented to aid SLBs—public fire investigators—in their approach to fire scene investigation?

This was a general qualitative design study. Due to the lack of literature and scholarly research for public fire investigators as SLBs and their implementation of *NFPA 1033: Standards for Professional Qualification for Fire Investigator* (2014) and *NFPA 921: Guide for Fire and Explosion Investigations* (2017), a general qualitative study would

provide an understanding of the public fire investigators approach to fire scene investigation (Kahlke, 2014; Merriam & Tisdell, 2016; Percy et al., 2015). The intent of using this method was to gain knowledge of the behavioral indicators that influence the public fire investigators' decision-making approach to fire scene investigation using the TDF and COM-B model (Atkins et al., 2017; Cane et al., 2012; Davis et al., 2015; Francis et al., 2012; Huijg et al., 2014; Michie et al., 2005, 2011; Richardson et al., 2019).

General qualitative studies are further subdivided into interpretive description and descriptive qualitative. To form a general study, four elements must exist: (a) epistemology, (b) theoretical framework, (c) methodology, and (d) methods to gather and analyze data. By using the interpretive description approach (Kahlke, 2014) in this study, I achieved the required elements. First, the design was built on a constructivist epistemological assumption, allowing the public fire investigators to construct their experiences through their lens. A constructivism approach allows people to construct reality (Patton, 2002). Second, an interpretive study allows for a naturalistic theoretical perspective. Third, a primary source of data was used through semistructured interviews conducted with a purposeful sampling of participants. Fourth, constant comparative methods using thematic analysis, within the existing frameworks (Kahlke, 2014; Percy et al., 2015), was used for data analysis.

Using the COM-B model enabled me to gain an understanding of how each participant's behavior is influenced. The COM-B model was designed from three factors: capability, opportunity, and motivation. These conditions present the necessary elements

for behavior to occur (Michie et al., 2011). Using the TDF enabled me to expound upon the identified influences and gain a deeper insight into the behaviors. The TDF provided a system of analysis to account for this. This is useful for those looking to implement change in certain behaviors. The TDF provided an avenue to identify determinants of behavior and enabled me to evaluate the participants' answers against 84 theoretical constructs grouped into 14 domains. Previous qualitative research has been conducted using the COM-B model and TDF (Richardson et al., 2019). The groundwork of this study may lead to additional studies using both qualitative and quantitative approaches.

Role of the Researcher

A researcher should be involved in all aspects of a study, from defining the concept to reporting the thematic analysis (Sanjari et al., 2014). Readers want to know an investigator's interest as the researcher (Creswell, 2014). It is necessary to not overlook the potential impact a researcher may have on participants to not skew the data. A researcher should include personal experiences, knowledge, and connections they share with the topic of study (Patton, 2002). General interpretation of the data by a researcher may be limited if biases are not actively acknowledged.

I share fire scene investigation experience as a public fire investigator. The research was conducted in the state of Georgia, due to my familiarity with this state's statutes and organizations. To limit potential familiarity with participants, the department where I previously worked was not included. This also alleviated potential biases from personal relationships and supervisory roles.

I have personal knowledge and understanding of being a public fire investigator and having to adhere to NFPA 1033, NFPA 921, state regulations, and organizational policies. I held arson investigation certifications at the national level and in the state of Georgia. Additionally, I was certified as a firefighter and police officer in Georgia. This personal knowledge allowed me to establish rapport with the participants during the interview process (DiCicco-Bloom & Crabtree, 2006; Whiting, 2008).

Methodology

Participant Selection Logic

The methodology for this study was a general qualitative design. A purposeful homogenous sampling was used because the target population were fire investigators, who are certified in the state of Georgia as a firefighter, a police officer, and a fire investigator. A homogenous sample allowed for participants who have similar backgrounds and demographics (DiCicco-Bloom & Crabtree, 2006; Miles et al., 2014).

To maximize variation, participants came from differing organizational structures. Participants were chosen from a metropolitan statistical area in the state of Georgia consisting of 29 counties and 145 municipalities with a 2018 population of 5,949,951 (Habersham & Peebles, 2019). This area had a total of 434 reported incidents of arson (Georgia Bureau of Investigation, 2018). These selections were made from municipal and county governmental entities only.

The goal was to gather participants who actively work fire investigations as their daily routine; therefore, participants had to work as a fire investigator for their organization. Participants must regularly be assigned to investigate fire scenes and can

criminally adjudicate the case through the criminal courts. Additionally, participants must have a minimum of 1 year experience as a fire investigator and must work more than five cases per year.

I worked in this defined area as a fire investigator from 2010–2016. Familiarity with the area aided with agencies that employee fire investigators who met the requirements for this study. Telephone contact was made with departments to introduce myself and the purpose of this study. An approved IRB flyer introducing the study for volunteer recruitment was emailed to agency representatives with permission. The flyer was to be distributed within the agencies. This was to allow for potential participants to directly contact me to schedule an interview. During the interviews, participants were free to leave the process at any time.

A total of 10 participants were interviewed for the study. Data saturation was first observed at seven participants. An additional three participants were interviewed to see if any changes in data were observed. When totaling the responses and observing the overarching themes, data saturation was achieved.

Instrumentation and Data Collection

This study is qualitative; therefore, I served as the key instrument (Creswell, 2013; & Patton, 2002). Semistructured interviews were conducted to understand the identified behavioral indicators of the SLB that influence their approach to fire scene investigation. Due to the current worldwide pandemic, semistructured interviews were conducted through a computer conferencing platform that was mutually agreed to and recorded via digital audio. Interviews consisted of one-on-one volunteer participation

between researcher and participant (Creswell, 2013). An interview guide (Appendix A) was used to ensure that each participant was asked the same questions, ensuring consistency among the participants (Patton, 2002), and all questions were reviewed and approved through the Walden University Institutional Review Board (IRB) process (IRB #06-03-21-0446823).

The interview guide featured both forced-choice and open-ended questions. Using forced-choice questions established the requisite qualifiers for participation in the study. Once qualified, participants answered open-ended questions. Each participant was able to confirm their responses for authenticity, using transcripts, prior to coding. This allowed for proper respondent validation through member checking (Maxwell, 2013).

To change behavior, through proper implementation, targeted behaviors must be identified (Kahn, 2019). The interview questions were written to targeted behaviors and supporting TDF domains that have been identified through the literature review that pose problems (Table 3). Open coding for question formulation was based on the literature suggesting that SLBs are unable to perform their job correctly in the field of forensic science due to lack of education, organizational demands, lack of resources, personal biases, culture, fiscal constraints, incorrect public assumptions, governmental controlled bureaucracies, and judicial system enablement.

Table 3

Theory-Based Interview Guide

Problem	COM-B	TDF Domain	Interview Question
Culture	Motivation - Reflective	Social/Professional Role and Identity	What is your gender?
Education	Capability - Psychology	Knowledge	What is your highest level of education? *If you have a degree(s) what are the disciplines in?
Education	Capability - Psychological	Knowledge / Behavioral Regulation	In the State of Georgia, are you certified as a Firefighter, Police Officer, Fire (Arson) Investigator?
Education	Capability - Psychological	Behavioral Regulation	Did you receive your fire investigation certification from Fire Investigator I (GPSTC), Fire Investigator II (GPSTC), National Fire Academy?
Education	Capability - Psychological	Behavioral Regulation	Do you possess certifications from recognized organizations in the field of investigation, Fire Investigation Technician (IAAI-FIT), Certified Fire Investigator (IAAI-CFI), Certified Instructor (IAAI-CI), Certified Fire & Explosion Investigator (CFEI – NAFI), Certified Vehicle Fire Investigator (CFVI-NAFI), Certified Fire Investigator Instructor (CFII NAFI)?
Public Assumption	Motivation – Reflective	Social Professional Role and Identity	How long have you been certified as a firefighter in GA? A police officer in GA? A fire investigator in GA?
Organizational Demands / Bureaucracies / Public Assumption	Capability – Psychological Opportunity – Physical Motivation - Reflective	Knowledge / Behavioral Regulation / Environmental Context and Resources / Social Professional Role and Identity	How long have you been in the role as a fire investigator for your organization?
Public Assumption	Opportunity - Physical	Environmental Context and Resources	Is your primary job to investigate fires for your organization?
Organizational Demands	Opportunity - Physical	Environmental Context and Resources	In the last 12 months, how many fires have you investigated in any capacity?
Bureaucracies	Capability - Psychological	Cognitive and Interpersonal Skills	Are you a supervisor for your investigation unit?
Bureaucracies	Opportunity - Physical	Environmental Context and Resources	What best describes your organization, municipal (city / town) or county?
Bureaucracies	Capability - Psychological	Knowledge / Memory, Attention, and Decision Processes / Behavioral Regulation	Describe, in as much detail, what NFPA 1033 is.
Bureaucracies	Capability - Psychological	Knowledge / Memory, Attention, and Decision Processes / Behavioral Regulation	Describe, in as much detail, what NFPA 921 is.

Problem	COM-B	TDF Domain	Interview Question
Bureaucracies	Capability - Psychological	Knowledge / Memory, Attention, and Decision Processes / Behavioral Regulation	Describe all the prerequisite knowledge and skill set(s) that a fire investigator for Georgia must possess to be compliant with NFPA 1033 and NFPA 921? (List any and all training, knowledge, practitioner assets, education – formal and non-formal certifications, and anything else you can think of).
Organizational Demands	Capability - Psychological	Knowledge / Memory, Attention, and Decision Processes / Behavioral Regulation	Describe all the prerequisite knowledge and skill set(s) that a fire investigator for your organization (employer) must possess to be compliant with NFPA 1033 and NFPA 921? (List any and all training, knowledge, practitioner assets, education – formal and non-formal certifications, and anything else you can think of)
Education / Biases / Organizational Demands / Resources / Fiscal Constraint / Public Assumption / Culture / Bureaucracies	Opportunity – Physical Capability – Psychological Motivation – Reflective and Automatic	Environmental Context and Resources / Social Influences / Physical Skills / Knowledge / Behavioral Regulation / Social Professional Role and Identity / Beliefs About Capabilities / Optimism / Beliefs About Consequences / Intentions / Goals / Reinforcement	Based upon the requisite knowledge and skill set(s) you must possess for the State of Georgia and your organization to be compliant with NFPA 1033 and NFPA 921, what are all the barriers that you, as a fire investigator, face in obtaining these?
Biases / Organizational Demands / Resources / Fiscal Constraint / Bureaucracies / Judicial System	Opportunity – Physical Capability – Psychological Motivation - Reflective	Environmental Context and Resources / Knowledge / Behavioral Regulation / Social Professional Role and Identity / Beliefs About Capabilities / Optimism / Beliefs About Consequences / Intentions / Goals	Concerning the identified barriers from the last question, describe in detail how these barriers affect your ability to perform your role as a fire investigator? (This includes at work, budget preparation, training seminars, time conducting investigations, interviews, document preparation, court preparation, court appearance, etc.)
Biases / Organizational Demands / Resources / Fiscal Constraint / Bureaucracies	Opportunity – Physical Capability – Psychological Motivation – Reflective and Reflective	Environmental Context and Resources / Knowledge / Behavioral Regulation / Social Professional Role and Identity / Beliefs About Capabilities / Optimism / Beliefs About Consequences / Intentions / Goals / Emotion	Concerning the identified barriers, describe in detail how these barriers affect your ability to perform your approach to the actual fire scene investigation? (Preparing to go to the fire scene with your resources before the call and en-route to the call)
Biases / Organizational Demands / Resources / Fiscal Constraint / Bureaucracies / Judicial System	Opportunity – Physical Capability – Physical and Psychological Motivation - Reflective	Environmental Context and Resources / Physical Skills / Knowledge / Behavioral Regulation / Social Professional Role and Identity / Beliefs About Capabilities / Optimism / Beliefs About Consequences / Intentions / Goals	Concerning the identified barriers, describe in detail how these barriers affect your ability to perform your actual fire scene investigation processing? (The actual time on-scene conducting the investigation)
Biases / Organizational	Opportunity – Physical	Environmental Context and Resources / Knowledge /	Concerning the identified barriers, describe in detail how these barriers

Problem	COM-B	TDF Domain	Interview Question
Demands / Resources / Fiscal Constraint / Bureaucracies / Judicial System	Capability – Psychological Motivation – Reflective and Automatic	Behavioral Regulation / Social Professional Role and Identity / Optimism / Beliefs About Consequences / Intentions / Goals / Emotion	affect your ability to perform your post-fire scene investigation? (This includes case development in order to close the case, interviews, crime lab analysis, evidence review, briefings and debriefings within the organization, working with other investigators – internal and external, preparing for civil litigation, or moving to criminal charges for arrest and adjudication)
Education / Biases / Organizational Demands / Resources / Fiscal Constraint / Public Assumption / Culture / Bureaucracies / Judicial System	Opportunity – Physical and Social Capability – Physical and Psychological Motivation – Reflective and Automatic	Environmental Context and Resources / Social Influences / Physical Skills / Knowledge / Behavioral Regulation / Social Professional Role and Identity / Beliefs About Capabilities / Optimism / Beliefs About Consequences / Intentions / Goals / Reinforcement	Describe all the processes that you use when conducting a fire scene investigation? (Include all steps that you actually do when processing a fire scene from start to finish)
Education / Biases / Organizational Demands / Resources / Fiscal Constraint / Public Assumption / Culture / Bureaucracies / Judicial System	Opportunity – Physical and Social Capability – Physical and Psychological Motivation – Reflective and Automatic	Environmental Context and Resources / Social Influences / Physical Skills / Knowledge / Behavioral Regulation / Social Professional Role and Identity / Beliefs About Capabilities / Optimism / Beliefs About Consequences / Intentions / Goals / Reinforcement	Describe all the processes that you would want to use, as a fire investigator, when conducting a fire scene investigation?
Education / Biases / Organizational Demands / Resources / Fiscal Constraint / Public Assumption / Culture / Bureaucracies / Judicial System	Opportunity – Physical and Social Capability – Physical and Psychological Motivation – Reflective and Automatic	Environmental Context and Resources / Social Influences / Physical Skills / Knowledge / Behavioral Regulation / Social Professional Role and Identity / Beliefs About Capabilities / Optimism / Beliefs About Consequences / Intentions / Goals / Reinforcement	If there is a difference between the last two questions, explain in detail why?
Education / Biases / Organizational Demands / Resources / Fiscal Constraint / Public Assumption / Culture / Bureaucracies / Judicial System	Opportunity – Physical and Social Capability – Physical and Psychological Motivation – Reflective and Automatic	Environmental Context and Resources / Social Influences / Physical Skills / Knowledge / Behavioral Regulation / Social Professional Role and Identity / Beliefs About Capabilities / Optimism / Beliefs About Consequences / Intentions / Goals / Reinforcement	Concerning your identified barriers, explain in detail what should be done to correct them?
Education / Biases / Organizational Demands / Resources / Fiscal Constraint / Public Assumption / Culture / Bureaucracies / Judicial System	Opportunity – Physical and Social Capability – Physical and Psychological Motivation – Reflective and Automatic	Environmental Context and Resources / Social Influences / Physical Skills / Knowledge / Behavioral Regulation / Social Professional Role and Identity / Beliefs About Capabilities / Optimism / Beliefs About Consequences / Intentions / Goals / Reinforcement	Concerning your identified barriers, explain in detail what can be done to correct them?

Problem	COM-B	TDF Domain	Interview Question
Judicial System / Public Assumption / Organizational Demands	Capability – Psychological Motivation – Reflective Opportunity – Social	Knowledge / Behavioral Regulation / Social Professional Role and Identity / Social Influences	Have you ever testified in a criminal trial for arson for the prosecution?
Education / Judicial System / Public Assumption / Culture / Organizational Demands	Capability – Psychological Motivation – Reflective Opportunity – Social	Knowledge / Behavioral Regulation / Social Professional Role and Identity / Beliefs About Capabilities / Intentions / Goals / Social Influences	*If you have testified in a criminal trial for arson for the prosecution: …explain how the court qualified you as an expert witness? **How many times? _____ …but the court did not qualify you as an expert witness, explain why? **How many times? _____
Education / Culture / Biases / Public Assumption / Fiscal Constraint / Bureaucracies / Judicial system	Opportunity – Physical and Social Capability – Physical and Psychological Motivation – Reflective and Automatic	Environmental Context and Resources / Social Influences / Physical Skills / Knowledge / Memory, Attention and Decision Processes / Behavioral Regulation / Social Professional Role and Identity / Beliefs About Capabilities / Optimism / Beliefs About Consequences / Intentions / Goals / Reinforcement / Emotion	What are all of the requisite knowledge, education, certification(s), and skills that you believe a fire investigator should possess?

Specifically, identification of who, when, where, how often, and with whom should be addressed when targeting specific behaviors. According to Kahn (2019), it is more important to focus on where you want to go positively with behavior, rather than where you are at with the negative behavior. An identified negative behavioral problem through the literature was that SLBs do not always use the scientific method when processing a fire scene. A desired behavioral change for SLBs could be written as: *The public fire investigator [who], while conducting fire scene investigation [when], will develop a hypothesis of fire cause [behavior], per NFPA 921[with whom], for every fire scene investigation [how often]*.

Data Analysis Plan

Participant responses in the semistructured interviews allowed theme development to arise as to the barriers faced when approaching and conducting fire scene investigations. Interviews were conducted using Freeconferencecall.com, an online conferencing platform. Interviews were transcribed using NVivo transcription services. After participants checked for transcription accuracy of the interview, transcripts were uploaded into NVivo software for open coding (Atkins et al., 2017; Crowley, 2020).

Inductive axial coding was used to develop thematic analysis (Busch & Henriksen, 2018; Gainforth, et al., 2016; Kahn, 2019). Based upon frequency patterns in the data, themes emerged (Gainforth et al., 2016; Kahn, 2019). The identified themes are based upon TDF domains that correspond with the COM-B model (Table 4).

Table 4

Links Between COM-B model and TDF

COM-B Component and Definition	TDF Domain
Physical capability: Physical skill, strength or stamina	Physical skills
Psychological capability: Knowledge or psychological skills, strength or stamina to engage in the necessary mental processes	Cognitive and interpersonal skills
	Knowledge
	Memory, attention, and decision processes
	Behavioural regulation
Reflective motivation: Reflective processes involving plans (self-conscious intentions) and evaluations (beliefs about what is good and bad)	Social/professional role and identity
	Beliefs about capabilities
	Optimism
	Beliefs about consequences
	Intentions
	Goals
Automatic motivation: Automatic processes involving emotional reactions, desires (wants and needs), impulses,	Reinforcement
	Emotion

inhibitions, drive states and reflex responses	
Physical opportunity: Opportunity afforded by the environment involving time, resources, locations, cues, physical 'affordance'	Environmental context and resources
Social opportunity: Opportunity afforded by interpersonal influences, social cues and cultural norms that influence the way that we think about things, e.g. the words and concepts that make up our language	Social influences

Identified themes were then cross referenced with the BCW interventions (Cane et al., 2012; Michie, 2005; Michie et al., 2011). The BCW synthesizes 19 frameworks of behavior change from a combination of COM-B and the TDF (Gainforth et al., 2016, p. 326) that results in nine intervention targets. These interventions include education, persuasion, restrictions, incentivization, environmental restructuring, coercion, enablement, and modeling (Michie et al., 2011). Identifying the targeted behavior, policy designers can apply the aligned behavioral change intervention technique, which answered the research question.

Issues of Trustworthiness

Measures were taken to maximize issues of trustworthiness. This qualitative study is credible, transferable, dependable, and can be confirmed. Ethical concerns are also addressed.

Credibility

Interview questions enabled the participants to expound on their experiences, allowing them to construct their reality (Creswell, 2013). Forced-choice questions

ensured accuracy of the participant pool that was required. Prior to data coding, each participant was allowed to review their responses, using digital transcripts, for accuracy.

Transferability

To establish transferability, a reliable theoretical framework and proven method were utilized (Atkins et al., 2016, 2017; Crane et al., 2012; Francis et al., 2012; Gainforth et al., 2016; Michie et al., 2005, 2011). The sample was purposeful, and rich descriptions of the data collection and analysis is provided (Patton, 2002).

Dependability

This study is rooted in previous grounded research studies that include theory, methods, and instrumentation, which ensures replication. Personal biases, limitations, and delimitations were exposed in this study. The study is triangulated with data sources (participants), method (semistructured interviews), researcher, and theory (Miles et al., 2014).

Confirmability

I have discussed my background and the potential biases that I bring to the study. According to Creswell (2013), reflexivity allows the researcher to "'position' themselves in their writings" (p. 216). I have personal and professional experiences, training, and knowledge, by having experience as an assistant, primary (lead), supervisor, and commanding chief officer of a large metropolitan fire department's fire investigations unit. This experience is not without researcher bias. As an investigator, I often pondered my own qualifications based upon NFPA JPRs.

Additionally, participants had complete control of their responses prior to my submission for data collection. Data were analyzed using existing methodology that has been peer reviewed and accepted (Michie et al., 2005, 2011).

Ethical Procedures

Contact was made with governmental jurisdictions that employee public fire investigators that would qualify for this study. Permission was granted from these institutions to allow potential participants access to an IRB approved flyer for volunteer participation in the research. Volunteers who opted to participate were free to withdraw from the study at any stage. Participant consent forms were available, sent via email, requiring the participant to read and acknowledge consent. Adding to participant trust, personally identifying information (PII) of the participants are safeguarded by this researcher and not revealed in the results.

I will maintain, for a period defined by the educational institution, all documents relating to this study. I own the cloud-based storage device where all data is stored. Walden IRB approval has been granted for this study.

Summary

In this chapter, I provided the purpose of this general qualitative study, which was to identify the targeted behavioral indicators that influence public fire investigators when approaching and conducting fire scene investigations. Focusing on targeted behaviors added to the current body of knowledge, by presenting an understanding of how SLBs–public fire investigator–approach and conduct fire scene investigations. Targeting these identified behaviors, will allow policy writers and implementers to identify and develop

new policy interventions. This allows for a social change mechanism for fire scene investigation with the possibility of eliminating wrongful prosecutions.

The role of the researcher and potential biases were discussed. Methodology to include participant selection logic, instrument and data collection, and a data analysis plan were discussed. Additionally, issues to maximize trustworthiness such as credibility, transferability, dependability, confirmability, and ethical concerns has been addressed.

Chapter 4: Results

Introduction

The purpose of this general qualitative study was to understand the behavioral motivators that influence fire investigators when approaching and conducting a fire scene investigation. By interpreting these motivators, the findings of this study add to the current body of knowledge by presenting an understanding of the public fire investigator, which is supported by SLBT. Policy writers and implementers can begin to develop new policy based on these findings. New policy that supports the identified behavioral interventions could reduce the number of wrongful prosecutions, resulting in positive social change.

The research question I sought to answer was: What behavioral interventions can be implemented to aid SLBs—public fire investigators—in their approach to fire scene investigations? The interview guide (Appendix A) included both forced-choice and open-ended questions. Additionally, each question in the interview guide supported the identified problems in the literature review and testing instrument themes of the COM-B and TDF. This chapter is organized in the following sections: demographics, data collection, data analysis, evidence of trustworthiness, results, and summary.

Demographics

In this study, data were gathered from interviews with public fire investigators who were certified in the state of Georgia as a firefighter, police officer, and arson investigator. All participants met the minimum participation requirements. This included

possessing the necessary certifications, working as an arson investigator for a minimum of 1 year, and having processed a minimum of five fire scenes within the last year.

Participants included male and female public fire investigators from municipal and county-based organizations. Seventy percent indicated having attended college. Firefighter certification years of experience ranged from 6 years to greater than 30 years; police certification years of experience varied from 1 year to greater than 30 years; and arson certification years of experience varied from 2 years to 25 years. Seventy percent of the participants indicated that their primary role is to investigate fires; the remaining participants indicated their primary role functions included fire suppression, fire marshal, public education, and plans and permit review. All the participants had investigated 10 or more fires in the last year.

Data Collection

A total of 10 participants volunteered for the study over a period of 11 months, from July 2020 through June 2021. During this time, I contacted 165 public safety departments in a metropolitan area in the state of Georgia. Many of the departments did not qualify for the study because personnel were still undergoing requisite training, the department shared investigation responsibility with the local law enforcement agency, or the department referred the investigation to the state fire marshal.

Initial contact with the department was made via telephone with either the fire chief or fire marshal office. In this initial contact, I briefly introduced myself, the purpose of the study, and the participation requirements. Departments that met minimum qualifications for the study were forwarded a flyer and consent form for distribution.

After email distribution, I followed up with the department to ensure the documents were received and distributed.

Participants who expressed interest in the study were forwarded a flyer and consent form via email. When a participant was interested in volunteering for the study, I forwarded a consent form to them via email, and they replied with “I consent.” Then a mutually agreed date and time was established to conduct the interview.

A conference call was conducted through FreeConferenceCall.com, which enabled the interview audio to be recorded. Interviews were expected to take approximately 1 hour to complete. The shortest interview was 58 minutes, and the longest interview lasted 1 hour 45 minutes. The audio files have been stored in the cloud and a backup has been kept on a secured removable hard drive. The interview recordings were transcribed utilizing NVivo transcription services. Once an interview was transcribed, I forwarded a copy of the transcript to the participant for member checking. Only one participant made a change to their transcript due to spelling errors. All other participants confirmed the accuracy of their transcript.

There were struggles in gaining study participants. Study participation proved to be a slow process due to the voluntary nature. For example, one department contact seemed to be interested in the study, and after 8 months, I was still awaiting the approval of the fire chief. Additional potential participants agreed to participate but never followed through with providing a time and date to conduct the interview. Departmental representatives stated they forwarded the flyer, but I never heard anything else from them.

Data Analysis

Initial coding was captured in NVivo (Release 1.6 for Mac). Audio transcripts were uploaded, and participant cases were established. The first step was to use cases to establish participant demographic information. The second step was to use coding to establish codes that reflected the instrument. Once all the transcripts were coded directly into NVivo, I used Excel spreadsheets to count the individual node responses to establish thematic analysis.

In initial coding, I drew from inductive processes by reading the transcript and coding directly to TDF constructs. There are 84 theoretical constructs to support the 14 theoretical domains (Table 2). Some responses could be coded into multiple constructs. An example of this would be P04's response:

> While our primary job is fire investigation, we also handle a whole slew of other things … it's difficult to sit down and spend time studying, spend time taking classes, spend time prepping for national certifications and getting things that you need to build that knowledge base.

This statement would be coded to the TDF constructs *ability*, *knowledge of task environment*, *skills development*, and *procedural knowledge* because this identified barrier affected the participant's ability to do their job well and continue to grow professionally. P05 stated, "Our shift investigators … all want to go to, obviously, the seminars, but the money's not in the budget for them to go." This statement would be coded to the TDF constructs *ability*, *knowledge of task environment*, *skills development*, *procedural knowledge*, and *resources/material resources* because this identified barrier

affected the participant's ability to grow professionally and is due directly to fiscal constraints.

TDF constructs were used as child nodes, allowing for an inductive process of coding. Construct coding allowed TDF themes to emerge to support the overarching COM-B model themes (Table 4). Once all child coding was completed, data were transferred to an Excel spreadsheet. A count for each participant's response was tabulated by TDF construct. This allowed to see if there were anomalies, outliers, and consistency. After seven participants' data were tabulated, consistency showed with the identified TDF constructs. To ensure data saturation, an additional three participants were interviewed.

I used Guest et al.'s (2020) methodology to ensure data saturation. The first seven interviews were coded to the 84 constructs. There was a total of 1,606 responses coded. These codes directly reflected at least one coded response for 80 separate constructs; there were four separate constructs that received no coding. These interviews were known as the *base*. Three more interviews were conducted, which yielded 571 additional coded responses. These additional three interviews were known as the *run*. The total coded responses were 2,177 in 10 interviews.

There were four emergent TDF themes in the first interview. The next six interviews were cross referenced for new themes, and an additional three were found. This resulted in a total of seven leading TDF themes for the base. To achieve data saturation, the run should result in ≤5% new data (Guest et al., 2020, p. 6). The next three

interviews were used as the run and resulted in no new theme development (Table 5), thus, reaching data saturation.

Table 5

Data Saturation

Interview Number	1	2	3	4	5	6	7	8	9	10
New TDF Theme	4	0	1	2	0	0	0	0	0	0
New Themes in Run							7	0	0	0
% Increase Over Base								0%	0%	0%
	Base = 7							Run = 3		

Note. Adapted from "A simple method to assess and report thematic saturation in qualitative research." by G. Guest, E. Namey, & M. Chen, 2020, *PLoS ONE, 5*(15), pp. 1–17.

The TDF flows to the COM-B model. The COM-B model presents the overarching themes and is then cross referenced with the BCW (Figure 1). The BCW (Table 6) provides the possible behavioral interventions, thus answering the research question.

Figure 1

Testing Instrument Workflow

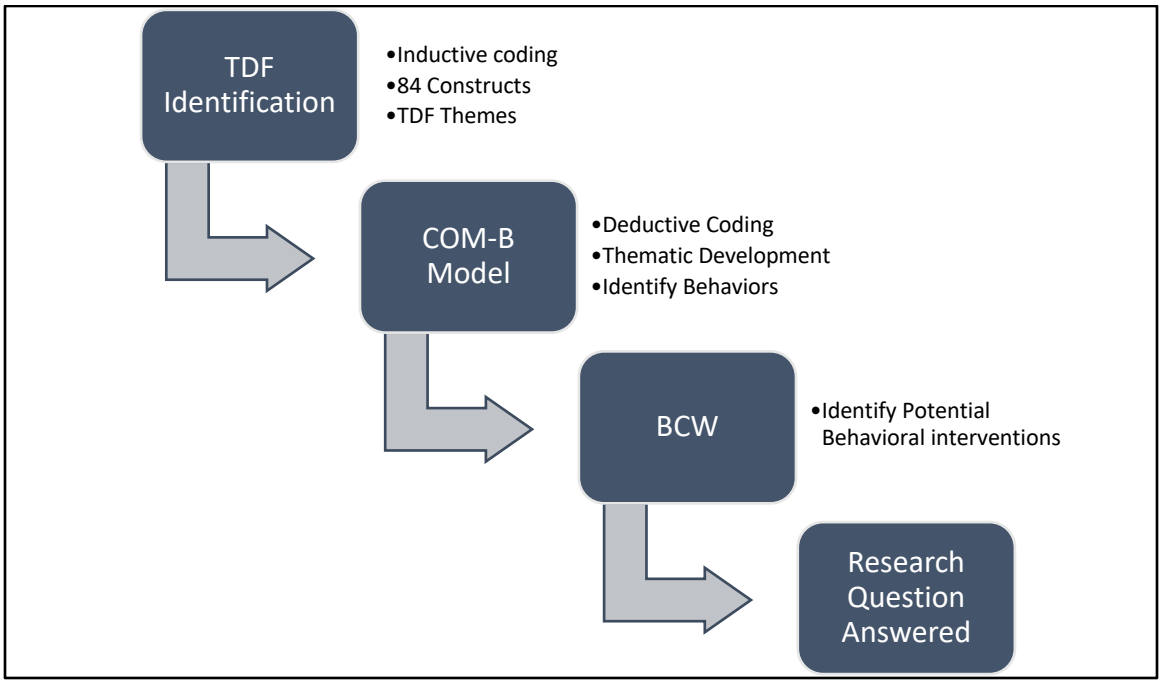


Table 6

Behavioral Change Wheel Interventions Linked to the COM-B Model and TDF

Intervention	Capability Physical	Capability Psychological	Opportunity Physical	Opportunity Social	Motivation Automatic	Motivation Reflective
Education	X					X
Persuasion					X	X
Incentivization					X	X
Coercion					X	X
Training	X	X	X		X	
Restriction			X	X		
Modeling				X	X	X
Enablement	X	X	X	X	X	
Environmental Restructuring			X	X	X	

Additional coding was used to support the problems identified in the literature review and participant identified barriers. The problems identified in the literature review included resources, biases, bureaucracies, culture, education, fiscal constraint, judicial system, organizational demands, and public assumption. The participants' identified barriers included: (a) time constraint; (b) education including formal academia, seminars-CEUs, basic training, and advanced training; (c) external; (d) fiscal; (e) nonsupport including internal, outside agency, prosecution, top-down, bottom-up, and elected officials; and (f) resources including lack of equipment, outdated or old equipment, and personnel. The only discrepancies noted were some participants had more responses coded than others. Cross referencing each of the transcripts showed this was due to some participants elaborating more on certain questions than others.

Evidence of Trustworthiness

There were no issues with credibility and transferability, ensuring trustworthiness for the study. The study also proved to be dependable, and the researcher, participants, and methodology ensured confirmability. The following measures provided evidence of trustworthiness.

Credibility

Every participant freely gave consent to be part of the process, and they knew they could withdraw consent at any time. The forced-choice questions ensured that each participant was qualified to participate in the study. The open-ended questions assured that participants were able to share their behavioral experiences. Each participant was

asked the same questions from the interview guide (Appendix A) to ensure consistency. Each participant was afforded the opportunity to check their transcript for accuracy.

Transferability

A reliable theoretical framework and proven methods were used. The TDF constructs allowed inductive coding to flow through the TDF to the COM-B model. By transferring the data into a count-based tabulation, overarching themes were discovered. The additional coding for identified problems found in the literature and participant-identified barriers provided insight to how the participants perceived their role.

Dependability

Due to this study being rooted in previous grounded research, this study can be replicated in other identified geographical areas by other researchers. The study is triangulated with data sources (participants), method (semistructured interviews), researcher, and theory. Any potential researcher biases were identified, and participant limitations and delimitations were identified.

Confirmability

I brought personal and professional experiences, training, and knowledge to this study by having experience in a fire investigations unit. This experience is not without researcher bias, yet it allowed for a better understanding of participant responses, thus allowing for proper inductive coding. Additionally, participants have complete control of their responses prior to data collection. Data were analyzed using existing methodology that has been peer reviewed and accepted (Michie et al., 2005, 2011).

Results

There was only one research question for this study: What behavioral interventions can be implemented to aid SLBs—public fire investigators—in their approach to fire scene investigations? These behavioral interventions were identified through the BCW once the overarching COM-B model themes have been established. This was accomplished by having the participants identify perceived barriers while approaching and conducting fire scene investigation and I coded these responses to TDF constructs. In this section, I present the overarching identified barriers via TDF constructs with supporting participant statements (Cohen & Crabtree, 2006). Then the predominant TDF domains were used to identify the overarching COM-B themes. Based on the overarching themes, I provide an answer to the research question with potential behavioral interventions from the BCW.

Participants identified six main barriers; three of the barriers had additional subsets: (a) resources, with subsets of personnel, lack of equipment, and outdated/old equipment; (b) time constraint; (c) education, with subsets of basic training, advanced training, seminars/CEUs, and formal academia; (d) external; (e) fiscal; and (f) nonsupport, with subsets of internal, outside agency, prosecution, top-down, bottom-up, and elected officials.

There is direct causality between fiscal and nonsupport with resources and education. For example, participants may be unable to go to a desired training class, purchase new equipment, or have additional personnel assistance without the necessary

fiscal resources. Additionally, participants indicated they do not have the fiscal resources due to nonsupport, predominately from the top-down.

This is observed in P03's response, "The municipality is not really ready to invest in all the equipment and all the needs that an investigator would have." P09 expressed, "We need additional people and the ability to have the time to get the classes.", and P10 stated, "You find yourself all alone digging a fire out, so two people would be ideal." P01 stated:

> We are a small city. So, they have to watch every penny that they have. We don't have a lot of the equipment that you would need. We've got one camera. We don't have the money in the budget for another camera.

P05 added:

> They all want to go to the seminars, but the money's not in the budget for them to go to a seminar. They're not happy with that. Why can't we go to a seminar? Because the money ain't there. Well, the difference is budget, budget, budget. Because without a good budget, obviously, you don't have the staffing that you want to help you process a scene. And without the budget, the equipment that you deem necessary is not going to be there. This is a problem that you want money, the salary, more salary for these people.

P08 said:

> The biggest thing is the continuing education part, I believe for us. Since we only have two full time investigators, if one us were to go away for a class for a week or two at a time, it only leaves one other person here able to respond to fires.

P07 said:

> I don't have any kind of take-home vehicle to respond directly from my house. I have to gather all my equipment. I have to put it in my POV. I have to drive to a location where they have a vehicle for me to take, and then I have to respond from there to the scene. That is not always the case because a lot of the times it's easier for me to just drive my personal vehicle and load my equipment up and go and do the investigation that way.

One participant's barrier identification of fiscal, equipment, and resources was not like the others. P02 responded, "We all have take-home cars, we all have investigator kits, so getting to the fire and investigating the fire, we really have no barriers. We have our radios and phones. I mean, they set us up really well here."

After barrier identification, the 84 constructs were used with inductive reasoning to identify the prevailing TDF domains. The overarching results included *environmental context and resources*, *knowledge*, *identity*, and *skills*. Each of the domains and its constructs can be found in Table 2.

The TDF environmental context and resources is any circumstance of a person's situation or environment that discourages or encourages the development of skills and abilities, independence, social competence, and adaptive behavior. It is supported with the following constructs: (a) environmental stressors, (b) resources/material resources, (c) organizational culture/climate, (d) salient events/critical incidents, (e) person x environment interaction, and (f) barriers and facilitators. The three leading constructs were resources, barriers and facilitators, and organizational culture/climate.

Constructs were observed in the following participants' responses. P01 stated, "I can finish doing my job if we had the money in the budget to get the equipment that we needed." P02 added, "We would love to have somebody who just did fire investigations, but we don't have enough to assign someone permanently. We haven't been fully staffed for years.". P10 expressed, "You need extra personnel…for safety purposes, if nothing else.", and P09 added, "I would love to have the ability to have two people on every fire scene. Not so much, the fact that it helps to see what I don't see and get another opinion". P07 stated, "My current radio that we have is inoperable. They did not provide me with an updated radio. They said it was not budgeted for. I've had to use my own camera for these investigations." P04 added:

> And while our primary job is fire investigations, we also handle a slew of other things. We haven't done a whole lot of anything with any other agency, like reaching out to another department and having them come in and help. And when they have brought somebody in like the state, it's always been a fiasco.

P08 said:

> We're kind of unique because we also have a role of internal affairs, which actually eats up the majority of our time. It kind of does interfere with our fire investigation role…it takes away time from going to get warrants, interviewing people for the actual fires. Sometimes the investigation itself sometimes can suffer…if you don't have the appropriate resources.

P05 stated:

> I have to use my damn iPhone to record their statement. It wasn't until this year I got a camera because of the budget. Believe it or not, I went to a pawn shop, and they had an iPhone and I bought it, it was used and I was using it as a camera.

P06 added:

> I took on the job role that I had before, and it was added to the job role of investigator. So I took on two offices worth of work and that doesn't allow enough time to devote fully to just one profession or one side of the budget preparation.

P03 said:

> It's almost like you compete for your own funds. If you buy too much or you spend a thousand dollars on fire prevention material, or another thousand dollars on public information materials, so that you have stuff to give to the public, when you turn around and want to spend a thousand dollars on fire investigations, the bean counters look at you like, well you just spent $2,000, but I didn't spend $2,000 on investigations, I spent that on the education of the public.

The TDF knowledge is an awareness of the existence of something. It is supported with the following constructs: (a) knowledge – including knowledge of condition/scientific rationale, (b) procedural knowledge, and (c) knowledge of task environment. Constructs were observed in the following participants' responses.

Concerning courtroom challenges P09 stated, "I have been qualified as the expert witness…nobody asked about the Daubert challenge or anything like that." P06 added, "Court preparation? A barrier there to me would be a lack of experienced personnel…to

gain that knowledge." P10 said, "You may very well have to explain to the judge what you believe arson is based on the statute." P03 added:

> Many times fire investigators don't realize and aren't prepared for court because they always think they'll never get there. And it's never the most complex fire that gets you to court, it is something that you thought was utterly ridiculous. NFPA 1033 is a standard. It is a very small book that orients you to what is required to be a fire investigator. It lists your education that you need. Your certification. It also lists the areas of study and discipline that you need to be - to continue your education as a fire investigator. This document is used just as any other document, as a standard in which you are expected to abide by, be compliant with, and it very much is what gets you beat up in court when someone asks you about your qualifications, education, discipline, continuing education, and recertification of being an investigator.

P05 stated:

> It was just this year I was able to order a NFPA 921 and a NFPA 1033. The other ones were 12 and 14 years old that I was having to look at. You know, that ain't worth a flip. Could you imagine because of the budget or because I don't see it being that necessary, going into court with a 14-year-old book, they would eat you alive. So that's one part of the problem.

Additional construct support included P08's response, "I would just say the number of investigators we have kind of makes it difficult to ensure we keep our high school level knowledge on all those 16 categories accurate and up to date." P04 stated:

> I think the hopes of our department to have everyone certified by a national organization, that is not a requirement to get started, but it's something that we have to move to. And that's a difficult task because of the breakdown of what you have to have in order to get the number of fires, to the number of testimonies, to the various things needed there. And so that's a challenge.

P07 added:

> A lot of the issues they've got right now are staffing and they're already running low, so they can't afford to take somebody else off a truck for two weeks to send them down to the Georgia Public Safety Training Center to get trained up.

The TDF identity is a coherent set of behaviors and displayed personal qualities of an individual in a social or work setting. It is supported with the following constructs: (a) professional identity, (b) professional role, (c) social identity, (d) professional identity, (e) professional boundaries, (f) professional confidence, (g) group identity, (h) leadership and (i) organizational commitment. The three leading constructs were professional identity, professional role, and organizational commitment. Constructs were observed in the following participants' responses.

Professional identity and role were observed in P10's response, "It has to be justified through accreditation. Everything has to be done through accreditation. That seems to be the motor that drives public safety now – accreditation. The fire investigation unit…is at the bottom of the rung of importance." P03 said, "I encourage my personnel to at least get their associates and so does my municipality, because they can't move up as officers until they have that." The contrary was offered by P01 who stated, "I think you

can do it without an associate or bachelor's degree. I don't think it takes that to make a good fire investigator."

Organizational commitment was observed in P06's response, "I am the only person in the department that is responsible for the investigations of fires. But I'm also working on other job duties that are completely unrelated to investigations." P07 stated, Once I complete that investigation, amongst working my other job, is trying to find time to build that case, and in a timely manner." P09 said:

> And then the distractor would be getting calls and pulled in a totally different direction. We all have to wear multiple hats and do different jobs. I take the criminal side very seriously because I've seen the outcome of those sometimes, and I'm in fire investigator mode, police officer mindset, and then I'm getting distracted.

The TDF skills is an ability or proficiency acquired through practice. It is supported with the following constructs: (a) skills, (b) skills development, (c) competence, (d) ability, (e) interpersonal skills, (f) practice, and (g) skill assessment. The three leading constructs were ability, competence, and skills development. Constructs were observed in the following participants' responses.

Ability and competence were observed in P05's response, "I don't even have anyone that knows how to interview a witness." P01 said, "I'm still on the engine company…but I also get called in or will come off the engine and investigate fires as well."

Skills development was observed in P07's response, "I think at the end of the day, it's something that is paramount that the investigators really need a lot more, a lot more hands on training versus just sitting behind a computer and looking at a PowerPoint." P10 added, "The field folks cannot determine the cause of the fire. I'm trying to do some training to improve in that area." P03 stated, "The time for training and I mean advanced training is very difficult. The advanced training that a fire investigator needs is not offered." P08 said, "Probably the biggest thing to help fight your personnel barrier is cross-training." P06 added:

> To meet everything in 1033 and 921, requires a great deal of education and maintaining education and classes. The biggest barrier in my organization is going to be, not enough time to focus on that with all the other job roles that are added.

P04 stated:

> We need more training with our suppression personnel as to just exactly what it is we do and how we do it and why we do it. So now they feel a little bit better about coming out and giving us some manpower assistance. They feel better about why it is we're asking the questions that we're asking after a fire and what we're truly looking for. So they assist with that. So we could start in fixing that problem with training both our investigators, myself, and also in training groups that we work with, suppression, the DA's office, CSI, you know, things like that.

Once tabulated, COM-B model themes emerged with its sub-sets from the leading TDF themes. The leading sub-sets of the COM-B model are *capability – psychological, opportunity – physical, and motivation – reflective.* This is due to the identified leading

TDF themes: (a) environmental context and resources, (b) knowledge, (c) identity, and (d) skills as seen in the links between the COM-B model and TDF (Table 4). Applying the overarching COM-B model themes to the BCW interventions (Table 7) the research question is answered.

Table 7

Behavioral Interventions

COM-B Component	TDF Domain	Suggested Intervention
Capability - Psychological	Knowledge, Skills	Training, Enablement
Opportunity - Physical	Environmental Context and Resources	Training, Restriction, Enablement, Environmental Restructuring
Motivation - Reflective	Identity	Education, Persuasion, Incentivization, Coercion, Modeling

Note. Suggested behavioral interventions identified from the overarching COM-B Model and TDF themes.

Summary

I used the TDF constructs to code participant responses. Emergent TDF themes were produced identifying behaviors in the COM-B model. Predominant COM-B model themes were cross referenced with the BCW providing suggested behavioral interventions. This, answered the research question: What behavioral interventions can be implemented to aid SLBs—public fire investigators—in their approach to fire scene investigations?

Some interventions overlap within the COM-B components. The following are offered as possible low-cost intervention strategies based on the defined interventions (Table 8):

- Education: Invest in an investigator becoming certified as both a state instructor and a fire investigation instructor. When the investigator attends a training class or seminar, they will return to the department and then train the necessary staff. This will ensure the delivery of quality instruction, reducing the overall costs of attempting to send multiple personnel to costly training classes.
- Training: Create opportunity for the investigations team to practice its skill sets and share with operations personnel. This increases competence of skill sets among all personnel. The department can host training and seminars at its location, potentially removing any cost associated with sending someone to training.
- Modeling: Have the investigations unit instruct operations personnel in aspects of the investigation process. Explain the importance of evidence preservation, spoliation effects, and the importance of assisting with digging out a fire scene and recreating what happened. Express the importance of the team approach to fire investigation and the vital role each member plays.
- Incentivization: Create a career path for Fire Investigator to inspire operational personnel to prepare for. Internally create a field training officer (FTO) position, with a wearable uniform pin, for the investigator who becomes an instructor.
- Persuasion: Develop policy to reinforce how suppression personnel will assist fire investigators in processing scenes. Require all company officers to be trained in fire origin and cause determination.

- Enablement: Begin short-term and long-term planning for budgetary items for fire investigations. Build contingency plans for equipment replacement. Start a capital purchase line, with a proper rotation schedule, for larger purchases such as take-home vehicles. Use the investigation's unit FTO to train every company officer to be able to determine O&C of a fire per NFPA 921, thus reducing the case load for your primary fire investigators.
- Coercion: Enforce policy.
- Environmental restructuring: Each of the interventions may create a cultural shift in the department, thus creating a possible change in social context.
- Restriction: Monitor FTO performance and expectations. Remove if not meeting performance expectations.

Table 8

Behavior Change Wheel Interventions Defined

Intervention	Definition
Coercion	Creating expectation of punishment or cost
Education	Increasing knowledge or understanding
Enablement	Increasing means/reducing barriers to increase capability or opportunity
Environmental Restructuring	Changing the physical or social context
Incentivization	Creating expectation of reward
Modeling	Providing an example for people to aspire to or imitate
Persuasion	Use communication to induce positive or negative feelings or stimulate action
Restriction	Using rules to reduce the opportunity to engage in the target behavior (or to increase the target behavior by reducing the opportunity to engage in competing behavior)

Training	Imparting skills

This study provided an opportunity for participants to construct their reality as to their perceived barriers when conducting a fire scene investigation. Utilizing the TDF and COM-B model allowed for thematic analysis to emerge, supporting possible behavioral interventions with the BCW. In Chapter 5, I will summarize the study.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The purpose of this general qualitative study was to identify the targeted behavioral indicators that influence public fire investigators when conducting fire scene investigation. This study allows policy writers and implementers a path forward to develop policy that can aid fire investigators in the way they approach and conduct fire scene investigation. Successful policy interventions could lead to the elimination of wrongful prosecution.

The literature review regarding SLBT (Lipsky, 1980) displayed a lack of scholarly research concerning public fire investigators. Research into the implementation of the NFPA standards by public fire investigators lacked as well. A general qualitative study was conducted to provide an understanding of public fire investigators' approaches to fire scene investigation (Kahlke, 2014; Merriam & Tisdell, 2016; Percy et al., 2015) from their lived experiences. The intent of using this method was to gain knowledge of the behaviors that influence public fire investigators' approaches to fire scene investigation using the COM-B model and the TDF (Atkins et al., 2017; Cane. Et al., 2012; Davis et al, 2015; Francis et al., 2012; Huijg et al., 2014; Michie et al., 2005, 2011; Richardson et al., 2019). Identifying the prevailing COM-B model themes allowed the BCW to develop and institute potential behavior interventions.

The following key findings were observed in this study. Participants identified six main barriers in their approach to fire scene investigation. Utilizing the 84 TDF constructs to inductively code participants' responses, there were four overarching TDFs

discovered: (a) environmental context and resources, (b) knowledge, (c) identity, and (d) skills. Tabulating the TDF responses, the following COM-B model themes emerged: (a) capability – psychological, (b) opportunity – physical, and (c) motivation – reflective. The COM-B model themes identified the following BCW interventions: coercion, education, enablement, environmental restructuring, incentivization, modeling, persuasion, restriction, and training.

Interpretation of the Findings

The literature identified three key areas for the study: (a) SLBT, (b) the fire investigator as an SLB, and (c) a methodology with testing instrument to understand what influences the behavior of the fire investigator. An initial understanding of the behaviors that influence fire investigators when they approach and conduct fire scene investigations was missing from the literature. The literature suggested that the SLB is the true implementer of policy (Hill & Hupe, 2002; Linder & Peters, 1987; Lipsky, 1980; Lodge et al., 2015; Loyens & Maesschalck, 2010) and that behavior is a direct influence in how an SLB implements policy. SLB decision making is influenced by inadequate resources, service demands, vague and conflicting policy goals or organizational expectations, difficult performance indicators, and clients who do not choose their service (Lodge et al., 2015). Public fire investigators as SLBs are charged with proper implementation of NFPA 1033 and NFPA 921. However, the existing literature suggests there are numerous reasons public fire investigators are not implementing these policies correctly. Reasons include lack of education, organizational demands, lack of resources, personal biases, culture, fiscal constraints, incorrect public assumptions, and judicial system enablement.

Additional problems included government-controlled bureaucracies, law enforcement agencies that are inadequately funded and resourced (Cole, 2018), and the SLB not being a member of the scientific community (Beety & Olivia, 2019; Cole, 2018; Tobin et al., 2017).

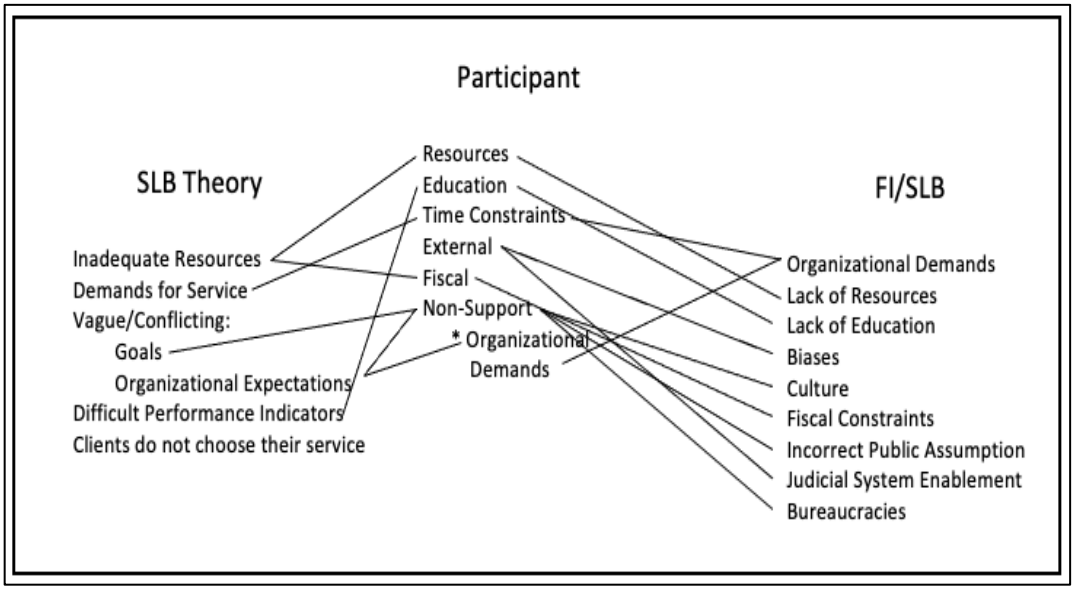
The COM-B model and the TDF are helpful tools to address implementation problems, designing interventions, and understanding behavior-change processes (Francis et al., 2012). Qualitative research has been conducted using the COM-B model and the TDF (Richardson et al., 2019). A benefit to using the TDF was that it provides a theory-based approach for implementation studies (Atkins et al., 2016, 2017; Cane et al., 2012; Francis et al., 2012; Gainforth et al., 2016; Michie et al., 2005). Using the TDF enabled me to expound upon the identified influences and gain a deeper insight into the behaviors of public fire investigators. The most common use of the TDF is in qualitative studies with a primary focus on interviews. Using the COM-B model enabled me to gain an understanding of how participant behavior is influenced.

This study revealed that the participants' responses aligned with the concerns found in the literature review for both SLBT and fire investigators as SLBs (Figure 2). Based on participant responses, it is evident the literature is aligned with fire investigators being identified as SLBs. Public fire investigators are identified as SLBs, and if SLBs are true implementers of policy, it is reasonable to suggest that fire investigators are an implementor of NFPA 1033 and NFPA 921. These policies are the core systems in place to ensure fire investigators carry out the responsibilities of their profession. However, if

there are barriers that cause conflict with proper implementation for fire investigators, and if barriers are identified, interventions must be implemented to correct them.

Figure 2

Barrier Relationship



Note. Identified relationship of participant barrier influences related to the literature review of what influences SLBT and public fire investigators as SLB.

The participants identified six main barriers: (a) resources, (b) nonsupport, (c) fiscal, (d) education, (e) external, and (f) time constraint. The results section demonstrated a causality between barriers fiscal and nonsupport with resources and education. For example, participants are unable to go to a desired training class, purchase new equipment, or have additional personnel assistance without the necessary fiscal resources. Additionally, participants lack fiscal resources due to nonsupport, predominately from the top-down.

The SLB is influenced by working conditions of organizational and institutional environments (Lodge et al., 2015). This was revealed with participant responses suggesting that they need more personnel to assist with fire scene processing, but there is no budget allocation for their unit to meet those needs. Other participants identified that a municipality is not ready to invest in all their needs, and that they have fiscal restraints because they work for a small municipality. Another participant expressed having to compete with their own funds within the unit of prevention, public education, and fire investigation. Another participant expressed a desire to do more test burning but there is a lack of funding.

The lack of resources was another common theme. Resources were divided into personnel and equipment, with equipment subsets lack-of and outdated. It was suggested that the SLB is excluded by the system with no overall control of their outcomes (Hill and Hupe, 2002), they are inadequately resourced (Cole, 2018), and that SLBs modify how they perform their job tasks (Jensen and Pedersen, 2017). One participant expressed how they had to personally purchase an iPhone from a pawnshop to aid in their investigation, and another stated that they used their personal camera to process the fire scene. Participant responses included that they are unable to fully complete their job due to a lack of equipment; some of their equipment is inoperable; they have not had support to fully assign someone to investigations fulltime; they respond afterhours in their personal vehicles; they have been operating from outdated editions of NFPA 921; and they often utilize the assistance of non-trained personnel to assist with fire scene processing, such as operational firefighters assigned to fire engine crews.

Cole (2018) argued there is insufficient training and education in forensic science. Others argued that fire investigators possess a lack of qualified training to ensure that individuals are performing at an acceptable practitioner level (Davies & Delgarno, 2009; Gorbett et al., 2015; Hewitt, 2014; Hewitt & McKenna, 2014; Lentini, 2012, 2019; Reis, 2016; Risinger, 2010a; Toscano, 2011). Participants expressed that attempting to maintain education levels is expensive due to travel and fees for the organization. National seminar training is desired, but it is often too expensive for organizational support. The seminars that participants attended were usually local free seminars, in which they felt like the training was less productive. These responses are consistent with existing literature that investigators training is constrained to weekend seminars (Beety & Olivia, 2019).

Investigators must often rely on operational personnel [firefighters] to assist with fire scene processing. Due to personnel constraints, several participants suggested that there is a need for more cross training with operational personnel. Some participants suggested cross training with external groups, such as the district attorney and crime scene investigation (CSI) units. One study examined limited training for fire investigators, and when given an option of virtual learning or physical learning at an actual fire scene with an experienced investigator, the student will prefer the physical environment (Dalgarno, 2009). One participant expressed that it is necessary to have more hands-on training and less training behind the computer looking at power point slides.

Limitations of the Study

This qualitative study was limited to a purposeful sampling of public fire investigators who conduct fire scene investigation from the initial call-out through suspect adjudication. Additionally, the investigator must have the power of arrest. This limits the population and is not generalizable to a broader population size of fire investigators.

Additional limitations included researcher, participant, and organizational acceptance. These limitations include biases, ethical concerns, and potential pushback from key stakeholders. Multiple steps were instituted in an attempt to limit these.

I identified myself as a fire investigator professional. Additionally, I hold multiple professional certifications. I have held multiple positions within the career fire service, possess identical credentials that the participants possess, an active career firefighter, and was directly involved with more than 1,700 fire scene investigations.

An attempt to limit participant bias was to ensure confidentiality. This confidentiality was for the participant and the participant's organization. This was reiterated in the IRB process and the participant consent form. Participants were interviewed with an interview guide to ensure that the same questions were asked of each participant. Participants were in control of the date and time of the interview and had the ability to end the interview at any time to withdraw from the study. Participants were given a full transcript of the interview for member-checking.

Data was discovered with a theory-based approach for implementation studies by utilizing the TDF, COM-B model, and BCW. These instruments are most often used in

qualitative studies. The training, knowledge, and experience that I possess enabled the inductive analysis for the TDF constructs.

Organizational culture acceptance was mitigated with confidentiality. Organizations were given a flyer requesting volunteers for study participation. Each participant had the ability to contact me on their own terms without peer, supervisor, or organizational influence.

Each interview was conducted via FreeConferenceCall.com, a teleconferencing software platform. The participant and I were limited to the interview setting, and no video source was used. I was limited to trust that the participant had no other influences, such as a colleague or supervisor. During two interviews there was background disturbances such as an active emergency radio and telephone interruptions for the participant.

I was limited to the organization's representative distributing the volunteer recruiting flyer and the participants themselves. I never received responses from several organizations that were contacted and received a flyer. Several potential participants scheduled interviews and never followed through.

Recommendations

This study furthered an initial study that first uncovered the need for a set of standards and qualifications for fire investigators (Boudreau et al., 1977). The intent of this research was to fill an identified gap in the literature by understanding the behavioral indicators that influence the public fire investigator when approaching and conducting fire scene investigation. The identified gap in the literature review enabled the

development of the research question. Utilizing the TDF, COM-B model, and BCW enabled the interpretation of the data to answer the research question. However, this study only initiates the scholarly dialogue.

The limitation of this study was to a purposeful sampling in an identified geographical area. Researchers cannot generalize the findings of this study to other geographical areas. In other areas, participants might be limited to state statute or organizational policies as to what they can and cannot enforce as a public fire investigator. However, this study can be replicated, if the participants meet the same criteria, identifying the same limitations and delimitations and using the same methodology, interview guide, and instruments.

The literature suggested that further study is needed in SLBT, fire investigations, and the testing instrument. The existing literature gap suggests SLB discretion should be furthered studied (Harrits, 2019). Further study in how interpretation affects SLB decision-making should be conducted (Raaphorst & Van de Walle, 2018). Issues surrounding the absence of statistical data in forensic evidence should be studied (Tobin et al., 2017). The TDF goes beyond many disciplines, which enables it to be a reliable testing instrument (Atkins et al., 2017) for future studies, and the TDF is preferred for qualitative studies that have little prior research (Khan, 2019). If policy writers and implementers are to understand the true impact that public fire investigators have on fire scene investigation, further studies are warranted.

The literature review revealed more than just a gap. The predominant literature was found in fire service journals, legal journals, and trade publications. This revealed a

need for scholarly research for the topic of fire investigators. The literature suggested numerous issues revolving around the fire investigator and the adherence to NFPA 1033 and NFPA 921; however, none presented a view from the individual investigator or a generalized view from the investigator field. This lack of scholarly literature warrants the need for further research, both qualitative and quantitative.

Implications

There was an overall lack of scholarly literature concerning perspectives of public fire investigators. Therefore, a general qualitative study was warranted. This study is supported with theory, methodology and a testing instrument.

SLBT (Lipsky, 1980) identified who an SLB is. Literature supported that the public fire investigator met the conditions of an SLB. The literature suggested that the SLBs decision making is influenced when implementing policy by certain identified barriers. This study concluded that these participants' shared experiences align with the identified barriers in the literature. This furthered the scholarly literature of SLBT.

This qualitative study was limited to a purposeful sample of 10 participants in a defined metropolitan statistical area in the state of Georgia. This study used the COM-B model and the TDF as a testing instrument, supported with an interview guide, to better understand the behavioral motivators from individual participant perspectives. Using the BCW revealed possible policy interventions to change behavior.

The ability to change policy can change behavior. With policy interventions in place, policy writers and implementers have the ability to design new policy, which may assist the SLB in the performance of their duties. With the possibility of behavioral

change, through effective policy implementation, the SLB may adequately perform their job. If the SLB can conduct proper fire scene investigation, they may become a change agent for positive social change. This positive social change may lead to the elimination of wrongful prosecution.

Conclusion

It is not practical to suggest that this study will alleviate all wrongful prosecutions, a by-product of faulty fire scene investigation though improper implementation of NFPA 921. However, it is practical to suggest that this study begins to bridge the gap in understanding what influences the public fire investigator, a necessary footing in understanding the larger identified problems.

The public fire investigator is responsible for proper implementation of NFPA 921. Therefore, this study identified targeted behavioral indicators, using the COM-B model and the TDF that influence public fire investigators when approaching and conducting fire scene investigation. Focusing on targeted behaviors that need to change for proper implementation added to the current body of knowledge, by presenting an understanding of how SLB–public fire investigators–approach and conduct fire scene investigations. Targeting these identified behavioral indicators, may allow policy writers and implementers to identify and develop new policy intervention strategies with the BCW. The interventions identified in this study are feasible to introduce to any organization and are easily adaptable to policy writing.

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Appendix A: Interview Guide

Q1: What is your gender? ☐ M ☐ F

Q2: What is your highest level of education?

☐ GED ☐ HS ☐ Associate ☐ Bachelor's ☐ Master's ☐ Doctorate

Q2A: If you have a degree(s) list the discipline that they are in:

Q3: In the State of Georgia, are you certified as a…? (Mark all that apply):

- ☐ Firefighter
- ☐ Police Officer
- ☐ Fire (Arson) Investigator

Q4: Did you receive your fire investigation certification from…? (Mark all that apply):

- ☐ Georgia Public Safety Training Center (GPSTC)
  - ☐ Fire Investigator Module 1
  - ☐ Fire Investigator Module 2
- ☐ National Fire Academy

Q5: Do you hold certifications from recognized organizations in the field of fire investigation? (Mark all that apply)

- ☐ Fire Investigation Technician (IAAI-FIT)
- ☐ Certified Fire Investigator (IAAI-CFI)
- ☐ Certified Instructor (IAAI-CI)
- ☐ Certified Fire and Explosion Investigator (CFEI-NAFI)
- ☐ Certified Vehicle Fire Investigator (CFVI-NAFI)

☐ Certified Fire Investigator Instructor (CFII-NAFI)

Q6: How long have you been a certified firefighter in Georgia?

_____ years _____ months

Q7: How long have you been a certified police officer in Georgia?

_____ years _____ months

Q8: How long have you been certified as fire investigator in Georgia?

_____ years _____ months

Q9: How long have you been in the role as a fire investigator for your organization?

_____ years _____ months

Q10: Is your primary job to investigate fires for your organization? Y / N

Q11: In the last 12 months, how many fires have you investigated?

Q12: Are you a supervisor for your fire investigation unit? Y/ N

Q13: What best describes your organization?

☐ Municipal ☐ County

Q14: Describe, in as much detail, what NFPA 1033 is.

Q15: Describe, in as much detail, what NFPA 921 is.

Q16: Describe all the prerequisite knowledge and skill set(s) that **a fire investigator** for Georgia must possess to be compliant with NFPA 1033 and NFPA 921? (List any and all training, knowledge, practitioner assets, education – formal and non-formal, certifications, and anything else you can think of)

Q17: Describe all the prerequisite knowledge and skill set(s) that a fire investigator for **your organization (employer)** must possess to be compliant with NFPA 1033 and

NFPA 921? (List any and all training, knowledge, practitioner assets, education – formal and non-formal, certifications, and anything else you can think of)

Q18: Based upon the requisite knowledge and skill set(s) you must possess for the State of Georgia and your organization to be compliant with NFPA 1033 and NFPA 921, what are all the barriers that **you**, as a fire investigator, face in obtaining these?

Q19: Concerning the identified barriers from the last question, describe in detail how these barriers affect your ability to perform your ***role*** as a fire investigator? (This includes at work, budget preparation, training seminars, time conducting investigations, interviews, document preparation, court preparation, court appearance, etc.)

Q20: Concerning the identified barriers, describe in detail how these barriers affect your ***approach*** to the actual fire scene investigation? (Preparing to go to the fire scene with your resources before the call and en-route to the call)

Q21: Concerning these identified barriers, describe how these barriers affect your ***actual fire scene investigation processing***? (The actual time on-scene conducting the investigation)

Q22: Concerning these identified barriers, describe in detail how these barriers affect your ***post-fire scene investigation***? (This includes case development in order to close the case – interviews, crime lab analysis, evidence review, briefings and debriefings within organization, working with other investigators – internal and external, preparing for civil litigation, or moving to criminal charges for arrest and trial)

Q23: Describe all the processes that ***you use*** when conducting a fire scene investigation. (Include all the steps that you actually do when processing a fire scene from start to finish)

Q24: Describe all the processes that ***you*** would ***want to use***, as a fire investigator, when you conduct a fire scene investigation.

Q25: If there is a difference between the last two questions, explain why?

Q26: Concerning your identified barriers, explain in detail what ***should*** be done to correct them?

Q27: Concerning your identified barriers, explain in detail what ***can*** be done to correct them?

Q28: Have you ever testified in a criminal trial for arson (for the prosecution)? Y / N

Q28A: If not, explain why?

Q29: If you have testified in a criminal trial for arson for the prosecution:

Q29A) …explain how the court qualified you as an expert witness?

Q29A1) How many times?

Q29B) …but the court ***did not*** qualify you as an expert witness, explain why?

Q29B1) How many times?

Q30: What are all of the requisite knowledge, education, certification(s), and skills that ***you believe*** a fire investigator should possess?