POLICE INNOVATORS, THOUGHT LEADERS, AND ROLE MODELS: AN
EXAMINATION OF THE IMPACTS OF ORGANIZATIONAL CHARACTERISTICS
AND ENVIRONMENTAL FACTORS ON EARLY BODY-WORN CAMERA
ADOPTION

by

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Police Innovators, Thought Leaders, and Role Models: An Examination of the Impacts of Organizational Characteristics and Environmental Factors on Early Body-Worn Camera Adoption

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## DEDICATION

A work of science, such as mine, invariably borrows heavily from the work of previous scholars and practitioners. I can only aspire to make a modest contribution to the cause while also assisting others in return. The ultimate goal is to benefit the community and individuals who would find the work interesting, not only specific academics but the entire academic community. This is dedicated in their honor, and I would like to express my sincere gratitude. Thus, for those who might be interested, here is my doctoral dissertation in philosophy: enjoy!

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# ABSTRACT

POLICE INNOVATORS, THOUGHT LEADERS, AND ROLE MODELS: AN EXAMINATION OF THE IMPACTS OF ORGANIZATIONAL CHARACTERISTICS AND ENVIRONMENTAL FACTORS ON EARLY BODY-WORN CAMERA ADOPTION

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Police often turn to innovations for solutions to problems, and a small percentage of police departments embrace innovations well in advance of the majority and without knowledge of evaluation research that supports adoption. These groups, innovators and early adopters, are responsible for introducing new technologies to the law enforcement community. Diffusion of innovation theory may help explain this well-documented trend in policing, namely that innovations are likely to be adopted without thorough review because the majority adopt based on subjective assessments of early adopters. The early adopters are seen as thought leaders or role models within their social networks and, therefore, reduce the uncertainty surrounding a new idea by adopting it and then sharing their subjective assessment with their social network. Additionally, they provide valuable feedback on the advantages and disadvantages of new technologies and thus communicate their confidence in the value of new ideas to their peers.

Research on body-worn cameras has primarily concentrated on outcomes (e.g., citizen complaints, officer use of force incidents, officer perceptions) and their widespread adoption. Few studies, however, have examined how and why some police departments adopted BWCs while others did not. In addition, the factors influencing police innovation adoption have long been debated within the policing research community. Disputes about the causes and correlates of organizational innovation illustrate this point. While a few studies have identified factors influencing law enforcement officers' adoption of body-worn cameras or other innovations in police technology in general, none have examined early adopters in detail and examined organizational and environmental factors within the same model. Several factors identified in organizational theories and literature are likely to be significant; however, the specific relationship between these factors and early body-worn camera adoption is not clear.

This project is designed to fill these gaps by investigating the relationship between organizational and environmental factors and early adoption decisions in a national sample of law enforcement agencies drawn from the Law Enforcement Management and Administrative Statistics surveys conducted in 2007 and 2013. Descriptive analyses revealed that nearly 22% of agencies in the sample had adopted BWCs by 2013. Moreover, the binomial logistic regression models predicting early BWC adoption indicated that departments with prior innovation adoptions, specifically patrol car cameras and community policing activities, were associated with early adoption. Furthermore, the findings indicate that region, collective bargaining, and internal forms of regulation may be associated with early BWC adoption, thus supporting the hypothesis that stakeholders inside and outside of an organization have the most substantial influence on the adoption of early innovations.

**CHAPTER ONE**

A series of civilian deaths at the hands of police in 2014 ignited acrimonious national debate over police use of force and sparked a public demand for changes in law enforcement practices. Eric Garner died in July after a New York City police officer used an illegal chokehold while arresting him on suspicion of selling untaxed cigarettes. Michael Brown was shot and killed by an officer one month later in Ferguson, Missouri, during a confrontation over suspicion of convenience store theft. The narrative that an unarmed black teenager was shot and killed by a white officer ignited community tensions that quickly spread throughout the country, prompting public outrage and legal action by the Department of Justice (DOJ).

Three months later, a grand jury concluded that the officer's use of force was reasonable and did not violate Mr. Brown's constitutional right to be free from unreasonable force, and thus did not support an indictment (*State of Missouri v. Darren Wilson*, 2014). This incident sparked widespread protests that devolved into arson, looting, and violent riots (Buchanan et al., 2014; Halpern, 2015; Wasserman, 2015). Ferguson Police responded to the protests with tear gas, riot gear, and rubber bullets. In response, the Justice Department initiated an investigation and determined that Officer Wilson was authorized to use lethal force when he shot and killed Michael Brown (Federal Bureau of Investigation, 2015). However, their investigation of the Ferguson Police Department (FPD) revealed a pattern of unconstitutional stops, arrests, and excessive force, demonstrating racial disparities and discriminatory intent toward Ferguson's Black residents (Civil Rights Division, 2015).

These events galvanized activists and sparked widespread public outrage over police misconduct, excessive force, and racial injustice. Equipping police officers with body cameras quickly gained popularity as the ideal solution to these perceived problems and to avert a repeat of what occurred in Ferguson. Advocates asserted the videos would serve as an objective record of police-citizen encounters and would foster greater police-citizen civility (*Floyd v. City of New York*, 2013; Miller et al., 2014), increase public perception of police accountability (Katz et al., 2014), expedite lawsuits, and reduce assaults on officers (ODS Consulting, 2011). The critics of body-worn cameras (BWCs) raised a variety of concerns, including the evidentiary quality of camera footage (Santora, 2013), citizen privacy concerns, the potential to discourage witnesses from cooperating with police (D. A. Harris, 2010; Hinds, 2013), heightened emotional trauma for victims (Hinds, 2013), officer safety concerns (Celona, 2013; Goodall, 2007), and high resource costs (ManTech, 2012). However, in 2014, there was scant evidence to substantiate these claims or to assess the effects and consequences of implementation. Only five empirical studies on pilot programs involving officer-worn cameras were found in the available evidence (White, 2014a).

For many years, police officers used video cameras such as closed-circuit television (CCTV), vehicle systems, and hand-held devices, but wearing cameras as part of their uniform was a new practice—an innovation. In 2005, police departments in the United Kingdom began small-scale pilot programs experimenting with wearable cameras. As a result of the findings, the innovation quickly spread to over 40 police forces throughout the United Kingdom (ODS, 2011). The timing of early adoption in the United States is less certain, as studies on new technology in law enforcement are frequently reviewed internally and are not typically made public. Preliminary evaluation studies of BWC use began in 2012 in Rialto

(Farrar, 2013), Mesa (Mesa Police Department, 2013), and Phoenix (Katz et al., 2014). The results produced empirical support for decreased citizen complaints (Farrar, 2013; Goodall, 2007; Mesa Police Department, 2013; ODS Consulting, 2011), decreased police use of force (Farrar, 2013), and decreased assaults on officers (ODS Consulting, 2011). These early studies bolstered support for BWC adoption, though subsequent evidence has been more mixed (Lum et al., 2020; Lum, Stoltz, et al., 2019).

Another critical factor in innovation adoption is officer perception, as police departments have historically been slow to embrace technological innovations. Predictably, beat cops resisted GPS, dashboard cameras, and Tasers until their utility was demonstrated (Young & Ready, 2015). Although experimental research on officer perceptions of the body camera systems was non-existent in 2014 (White, 2014a), a nationwide survey of 785 officers conducted by Police1 and TASER International (now Axon) provided preliminary evidence that most police wanted the cameras and believed BWCs could protect them from false complaints of misconduct and reduce the likelihood of litigation (Wyllie, 2012).

Despite the paucity of research and evaluation on citizen and officer perceptions of the benefits and consequences of BWC technology for police use, the innovation garnered widespread support from a diverse range of stakeholders. After concluding that the New York City Police Department's stop-and-frisk policies violated minorities' rights and were thus unconstitutional, the U.S. District Court for the District of Manhattan expressed support for officer-worn cameras by ordering the NYPD pilot a program in high-volume precincts (*Floyd v. City of New York*, 2013; Santora, 2013). In 2013, the Police Executive Research Forum (PERF) hosted a conference to develop best practices for implementation

(Lovett, 2013) and in 2014, released guidance for departments implementing a BWC program (Miller et al., 2014).

President Obama proposed funding law enforcement agencies for the purchase of 50,000 BWCs (Executive Office of the President, 2014). Following the White House announcement, the federal government awarded grants totaling $23.2 million to 73 police departments for the acquisition, training, and evaluation of BWC pilot programs (Department of Justice, 2015). Ultimately, the percentage of agencies that equipped officers with BWCs increased rapidly across the country, from 32% in 2013 (Reaves, 2015a) to nearly 50% (47%) in 2016. (Hyland, 2018). Although the popularity and support for BWC adoption increased in the aftermath of the 2014 controversies, few studies have examined how and why some police departments adopted BWCs prior to 2014 while others did not. By examining the factors and forces that shaped early police innovation, we can gain a better understanding of how law enforcement organizations change and the specific external forces or internal characteristics that drive innovation.

<p style="text-align:center"><strong><u>Problem Statement</u></strong></p>

There is a glaring shortage of literature attempting to explain police innovation. Lessons learned from a few prior studies indicate a variety of factors may contribute to police innovation and frequently vary according to technology, time, and the unique characteristics of law enforcement agency environments. Additionally, researchers frequently discover that significant factors identified in one study are less significant or not statistically significant in another study. Generally speaking, this body of research indicates that larger departments are more innovative (Lum, Stoltz, et al., 2019; Mastrofski et al., 2003; Morabito, 2010; Randol, 2012; Rogers, 2003), and more likely to adopt innovations that complement

their organizational structure (Braga & Weisburd, 2007). Collective bargaining (Morabito, 2014; Nowacki & Willits, 2016), the use of computer technologies (Leong & Chan, 2014; Skogan & Hartnett, 2005), and attendance at professional conferences (Weisburd & Lum, 2005), or membership with professional organizations (Burruss & Giblin, 2014; Skogan & Hartnett, 2005) also highlight characteristics of police organizations that are more likely to adopt specific innovations. Most of the available research has concentrated on the spread of community policing (Burruss & Giblin, 2014; Gayadeen & Phillips, 2014; Mastrofski et al., 2003; Morabito, 2010; Zhao, 1996) and crime analysis technology (Leong & Chan, 2014; Randol, 2014; Weisburd & Lum, 2005), but little is known about the adoption patterns across the country (Morabito, 2010). Additional innovations have been investigated including license plate readers (LPRs) (Lum, Koper, et al., 2019), the New York City Police Department's computer statistics (CompStat) program (Weisburd et al., 2003), and TASERs (White, 2014b). What is less understood are the organizational characteristics or community forces that promote early adoption of these innovations, particularly BWCs.

Everett Rogers pioneered a general framework for understanding the adoption and diffusion of new technology or practices called diffusion of innovations. Diffusion studies using this model have consistently identified distinct groups of adopters based on their attitudes toward innovation in comparison to other social system members (Rogers, 2003). The first group to adopt and test new technology is referred to as innovators. They are risk-taking experimentalists with a strong interest in technology. This is the smallest group in the system, comprising only 2-3% of the population, but these innovators are responsible for introducing innovations into the system. The next group, dubbed early adopters, is more likely to seek out information about new technologies and frequently advise other potential

adopters within their networks. Innovators and early adopters are followed by the early late majority, which is one of the largest groups. This group adopts innovations ahead of the average system member. The late majority is skeptical about new ideas and adopts them only after the average member of a system, commonly because of growing peer pressure. Finally, laggards place a premium on traditional values and are wary of innovation. As a result, laggards wait to see successful evaluations from preceding groups before adopting and do so only after risk perception is reduced (Rogers, 2003; Wejnert, 2002).

The majority adopt innovations based on the subjective assessments of those who have already adopted the innovation, particularly the early adopters (Rogers, 2003). Innovations are therefore likely to be adopted without rigorous evaluation. For example, police frequently adopt technologies without conducting research or seeing evidence of their effectiveness (Koper et al., 2014; Lum et al., 2012; Lum, Stoltz, et al., 2019). If this theory is correct, then it is critical to study innovators and early adopters, as these groups may shed light on the emergence and initial spread of innovations in law enforcement.

There are few studies on the adoption of BWCs, and most of them are focused on agencies that adopted the technology after its initial emergence and spread. Nonetheless, these studies' findings suggest that BWC adoption and diffusion are linked to internal police organizational characteristics and external environmental factors. While Nowacki and Willits (2016) and Schuck (2017) look at samples known to include early adopter groups, their findings do not provide a complete picture of early BWC adoption. Using a 2012 data set that included agencies of all sizes and included the innovators, early adopters, or early majority categories, Nowacki and Willits (2016) investigated the relationship between police organizational structure and BWC adoption. However, the authors acknowledge that their

research was limited to organizational characteristics and suggest that future research incorporate external factors that influence police innovation. In comparison, Schuck (2017) found that environmental factors were better predictors than organizational characteristics of mobile video recorder (MVR) and dashboard camera adoption between 2000 and 2007. Schuck's findings regarding in-car camera systems could influence BWC adoption. Further research into BWC-specific factors is necessary to close gaps in early BWC research.

Hendrix et al. (2017) investigated the relationship between policing strategies and reported technology adoption (e.g., car cameras, BWCs, and others) in law enforcement agencies that used BWCs between 2012 and 2014. Due to the absence of statistically significant relationships, the authors concluded that agencies did not select these technological innovations following their strategic objectives. Finally, Nix et al.'s (2020) study examined the diffusion of BWCs from 2016 to 2018 and identified factors associated with widespread diffusion. These studies examine diverse data sets and theoretical constructs that are not predictive of early innovation adoption, but the researchers identify variables that may be associated with the subsequent adoption of body cameras. Based on existing research, a comprehensive understanding of early BWC adoption requires analysis using a general diffusion of innovation theoretical construct that incorporates relevant internal and external factors consistent with prior policing research.

## **Purpose of the Study**

This quantitative cross-sectional study aims to determine the factors that contributed to the early adoption of BWCs in large U.S. law enforcement organizations. The scope necessitates limiting the sample to large agencies with more than 100 officers and assesses whether agencies reported using BWCs on at least a limited basis, not the extent to which

they were used. Historically, larger agencies have been more innovative, and most of the literature focuses on agencies with 100 or more sworn full-time officers. As a result, this data sample enables a comparison of these findings to a larger body of research on police innovation. Using data from the 2013 and 2007 Law Enforcement Management and Administrative Statistics survey (LEMAS), this dissertation builds on prior research on BWC and other mobile camera adoption. LEMAS 2013 was the first survey to collect data on BWC use from a nationally representative sample of agencies, thus allowing for the study of early innovations.

The approach builds on a general diffusion of innovation model and incorporates organizational structure variables and environmental predictors specific to law enforcement. The organizational constructs examined in this study are size, slack, complexity, formalization, centralization, innovativeness, and interconnectedness. Environmental constructs include geographical contexts, socioeconomic factors, political conditions, and cultural contexts. This research aims to advance the conceptualization and measurement of these constructs so that researchers and practitioners can compare and draw conclusions about the factors that influence the early adoption of policing innovations.

**Research Questions**

This study uses secondary data to examine a nationally representative sample of large police agencies, which is sufficient to allow for analysis of the factors that may predict early innovation adoption. The research questions and hypotheses examine the internal and external characteristics of early BWC adoption as reported. While this research will focus on BWCs, it is anticipated that answers to these research questions will shed light on the early

stages of law enforcement innovation adoption and will be broadly applicable to other

policing innovations. More specifically, questions explored in this study are:

1. What are the relationships of internal characteristics and early adoption of BWCs in large law enforcement agencies?

2. What are the relationships between external factors and early adoption?

3. How did prior adoption of video cameras impact early adoption of BWCs?

To explore these questions, data were collected from six sources:

1. National LEMAS surveys conducted periodically by the federal Bureau of Justice Statistics (BJS)

2. Uniform Crime Reporting (UCR) program data on crime rates and violence against the police

3. Census of Local Law Enforcement Agencies (CSLLEA)

4. U.S. Census Bureau's American Communities Survey

5. Commission on Accreditation for Law Enforcement Agencies (CALEA)

6. Atlas of U.S. Presidential Elections

Then, logistic regression analysis is conducted to understand the relationships between the

dependent variable (BWC adoption) and the independent predictor variables by estimating

probabilities. Logistic regression is an appropriate statistical test to assess whether a set of

independent variables predicts a dichotomous dependent variable (Weisburd & Britt, 2014).

This analysis permitted the evaluation of the adoption odds based on the combination of

independent variable values.

## Significance of the Study

The small body of literature on police innovation adoption identifies variables

associated with the diffusion of specific innovations. However, such approaches have failed

to address early adoption, and more specifically, early BWC adoption. This study will contribute to and advance existing knowledge regarding the early adoption of innovations in policing. To begin, the theoretical model, variable selection, and methodology will be more firmly rooted in the organizational structure of the police, the surrounding environment, and innovation theory. Second, the data set includes a previously understudied group of early BWC adopters in large law enforcement agencies. Additionally, the present study extends the work of Schuck (2017), Nowacki and Willits (2016), Hendrix et al. (2017), and Nix et al. (2020).

Examining the factors that influence adoption may aid in bridging the divide between research and practice. By increasing our understanding of the factors that influence the success and failure of innovations, we may be able to forecast how future innovations will emerge and spread. By providing information and analysis about the target group's characteristics, the study's findings may aid researchers in identifying avenues for translating or disseminating practices, programs, or policies. By developing a better understanding of police innovation, the factors influencing adoption, and the factors that predict adoption, we can more effectively target our message and assist in identifying potential partners for future evaluations. Additionally, it enables the manipulation of new ideas for maximum effect and informs the development of a strategy and policy for rapidly enacting system-wide change, and advises researchers, practitioners, and policymakers on the most effective ways to promote the adoption of new technology or research (Lum et al., 2012).

As evidence of network influence is emerging, policymakers should do their best to leverage network structure when advocating for beneficial changes in agency practices (Roberts & Roberts, 2007, 2009). Investigating BWC adoption can also illustrate areas where

policy could address legal ambiguity with camera use. At the very least, the innovations merit consideration because they have the potential to alter police practices and effectiveness (C. J. Harris, 2007).

## **Chapter Overview**

This dissertation is composed of five chapters. Chapter 1 has introduced the research through an overview of BWCs and the diffusion of innovation framework used in this study. Chapter 2 reviews the innovations and organizational literature relevant to the current study and provides a background for the research. This includes a discussion of the adopter categories and their characteristics. Then, a detailed analysis of innovations, organizations, and environmental conditions provides the framework to create a model to examine how these elements influence early adoption. Next, an investigation of contingency and institutional perspectives of organizational theories provides the context to develop variables for analysis specific to law enforcement organizations.

Chapter 3 focuses on prior adoptions of advanced camera technologies. Furthermore, relevant case studies draw attention to police adoption of advanced surveillance technology leading up to BWCs and a thorough discussion of the few studies that have examined BWC adoption and diffusion. The research hypotheses are developed to provide additional context for the research. It concludes with an explanation of the regression models used in the analysis.

Chapter 4 presents an overview of the data and analysis employed in this study. This chapter describes the transformation of theoretical constructs into measurable factors for quantitative analysis.

Chapter 5 describes the data preparation, model development, statistical tests, and logistic regression analysis. Then, it presents the empirical results of the organizational, prior experience, and environmental factors and their relationships with early BWC adoption. The main findings suggest significant relationships with BWC adoption for prior dashboard camera adoption, region, administrative control, community policing activities, and social disadvantage.

The final chapter analyzes results from the regression models concerning the components of diffusion of innovation theory. The statistical evidence is interpreted and discussed. This is followed by a research conclusion highlighting the main contributions to the theory, practice, and methodology in the policing innovations field. It concludes with recommendations and directions for future research.

**CHAPTER TWO**


After the 1999 Columbine High School shootings, Richard Sparks, an electronic engineer at Sandia National Laboratories, came up to develop dog collar cameras to aid SWAT officers on the scene. Sparks developed a prototype and proposal, but the cameras were not manufactured ("K-9 Camera Collar," 2002). Following the collapse of the World Trade Center towers on September 11, 2001, the National Institute of Justice (NIJ) contacted Sparks to ask if these cameras could be sent to Ground Zero to search for victims' remains in areas too dangerous for rescuers to enter (Clark, 2001; "K-9 Camera Collar," 2002). While in New York, Sparks constructed eight camera collars attached by Velcro to the K-9 handlers' dogs. These miniature cameras weighed less than an ounce and wirelessly transmitted audio and imagery from the dog's perspective outside the rubble to an operator's video receiver (Clark, 2001; "K-9 Camera Collar," 2002). Sparks' concept of equipping K-9 units with small, wireless cameras was a first in policing—an innovation.

Why was the innovation not commercialized? The public was demanding change considering the dangers associated with active shooter scenarios and the national attention garnered by several highly publicized school shootings. Many departments have K9 units, and the innovation appears to be simple to understand and operate. The innovation promised significant benefits for officer safety and evidence collection. Was a more cost-effective alternative already available and in use? An innovation's diffusion requires more than its relative advantages, even when those advantages are clearly demonstrated (Rogers, 2003). The reality is that we know very little about what motivates and inspires innovation in law enforcement. Our understanding of police innovations continues to develop, and

research to date has not provided a comprehensive picture of why some departments adopt innovations more readily than others, or why some innovations succeed while others fail.

A new idea can arouse interest simply by virtue of its novelty or that it is technologically cutting-edge (Lum et al., 2016). Some organizations have an established reputation for innovation and may be compelled to implement new programs and policies to preserve that reputation (Weiss, 1997a). Certain individuals may hold the belief that new is superior to old or traditional. Others believe the novelty factor outweighs the evidence that the new will outperform the old or traditional (Byrne & Marx, 2011). Generally, police departments want to appear progressive and modern to maintain legitimacy with the public (Manning, 2008). Technological innovation has become synonymous with progress. Therefore, to be opposed to new technology is to be a heretic, a regressive, or out of step (Corbett & Marx, 1991). Others see a form of competition or requirement to "keep up with the Joneses," because we cannot afford to fall behind (Strang & Soule, 1998). Over time, organizations begin to resemble one another, as external pressures compel them to perform certain actions to maintain legitimacy, and they choose from the available options (DiMaggio & Powell, 1983).

Evidence suggests that police departments have innovated because an innovation works theoretically (Weisburd & Neyroud, 2011), or as tools to assist in routine task performance (C. J. Harris, 2007; Maguire & King, 2004). Law enforcement roles of promoting safety, responding to emergencies, maintaining order, and combating crime revolves around interactions between officers and citizens. Core technology refers to how police handle or react to these encounters (Maguire, 2003). As a result, fundamental technology in policing is social in nature. Social technologies are the result of strategic

decisions about how police work should be performed, whether they are traditional notions

of police work, such as responding to calls for service, or those that result in fundamental

shifts in traditional practices, such as community policing (Maguire, 2003).

Police departments supplement their traditional organizational structures and

practices with technology (Lum et al., 2016). That is, police departments are more likely to

adopt innovations that complement their established incident-driven and reactive strategies

(Braga & Weisburd, 2007). Officers feel much more at ease using technology to perform the

activities they are most familiar with (Koper et al., 2014). The diversity of police work creates

numerous motivations to embrace new approaches. The challenge is understanding the

motivations for the adoption of different innovations by departments at different times.

A crisis often sparks change by bringing to the surface the concerns of a diverse

range of stakeholders. For instance, scandals, riots, or civil unrest in response to police use

of deadly force may serve as catalysts for reform, implying that police appear more adaptable

when confronted with external threats (Sherman, 2015). When these tragedies are coupled

with public outrage, a U.S. Justice Department investigation, or private litigation, they

frequently prompt police reform (Adegbile, 2016). The modern era of police reform began

in the 1960s when a perceived crisis in policing established a context for understanding

periods of rapid policing innovation (Weisburd & Braga, 2006). The prevalence of police

violence, police discretion (Skolnick, 2011), and the efficacy of traditional policing tactics

(Kelling et al., 1974) all indicated that police were ineffective at deterring crime or reducing

fear of crime (Weisburd & Eck, 2004). Additionally, rising crime rates, increased disorder,

and social unrest cast doubt on the effectiveness and legitimacy of the police force. These

attitudes contributed to a performance gap between law enforcement and stakeholder goals,

which agencies often addressed by adopting innovations (Weisburd & Eck, 2004; Willis & Mastrofski, 2011). Police leaders frequently look to technological innovation to accomplish their missions, and as a result, technology has been a driving force behind reforms to crime prevention and crime control strategies (Byrne & Marx, 2011).

Shocking events, either internal or external to the organization, stimulate innovation because, when people reach a point of dissatisfaction with existing conditions, they will take action to address their dissatisfaction (Van de Ven et al., 2000). For example, a perceived increase in police misconduct and citizen complaints has piqued the interest of activists, the courts, the media, and federal authorities. In recent years, much of the debate over police use of deadly force has centered on the idea that police disproportionately kill black citizens. When citizens perceive police practices as unjust, such as excessive force or discrimination against minorities, public support for the police dwindles (Fagan & Davies, 2000; Gould & Mastrofski, 2004). This is unfortunate for the police, who rely on positive interactions with citizens to carry out their duties.

Several highly publicized police use of force incidents in the summer of 2014 heightened activist, citizen, judicial, and political awareness of a need for police reforms. These interested stakeholders protested, called, ordered, and funded BWCs for officers as a measure of reform. The public pressure and new funding sources sparked by national concern supercharged the diffusion of BWCs and between 2013 and 2016, the number of law enforcement agencies with BWC programs increased dramatically from 32% of local departments (Reaves, 2015) to 47% of the 15,328 general-purpose U.S. law enforcement agencies (Hyland, 2018). Their popularity is also reflected in the commercial market's response to demand, as market evaluations of available camera systems for police use reveal

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an increase from 7 models in 2012 to 66 available camera models in 2016 (ManTech, 2012) (ManTech, 2012, 2016). The volume of academic studies further confirms the diffusion, as the five evaluations in White's 2014 assessment quickly grew to 119 empirical studies and evaluation reports by 2019 (Gaub & White, 2020).

Although the popularity and support for adoption increased in the aftermath of the 2014 controversies, few studies had examined how and why some police departments adopted BWCs before 2014, while others did not. Who was adopting before 2014, and what factors may have influenced their decision? Studies of later stages of adoption after 2014 indicate that factors, such as agency size, region, community demographics, and stakeholder support influenced diffusion (Nix et al., 2020; White et al., 2018; White & Malm, 2020). Do these findings hold for the early BWC adopters, those who embraced the technology before government funding and widespread political and national support became available? By examining the forces that shaped early police innovation, we can better understand how law enforcement organizations change and the influences that drive innovation.

Fundamentally, there is a knowledge gap in policing research regarding our understanding of the relationship between technology and law enforcement's behavioral, cultural, organizational, and political dimensions (Koper et al., 2014; Mastrofski & Willis, 2010). To examine the factors influencing policing innovation adoption and diffusion, researchers have drawn from organizational, sociological, and communication theories and cross-disciplinary frameworks. Consequently, a review of prior research reveals significant differences in how innovations are defined and classified, the types of organizations studied, the focus of research streams, and the theoretical frameworks used. These distinctions have

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resulted in contrasting findings complicating the task of generalizing and comparing the findings of previous studies.

This empirical instability may be a result of disparate theories for various types of innovations involving additional explanatory variables (Downs Jr. & Mohr, 1976) because we lack a standardized framework for examining key factors influencing police innovation. Prior research on policing innovation has identified these deficiencies (King, 2000; Matusiak & King, 2021; Weisburd & Braga, 2006; Willis & Mastrofski, 2011), but key concepts are consistently left open to individual interpretation. As a result of this ambiguity and variation, the scientific development of diffusion theory is hampered. Collectively, diffusion theory and organizational literature suggest that the choice to innovate is a function of characteristics of the innovation (Rogers, 2003; Wejnert, 2002), organizational structure (Damanpour, 1991; Kimberly & Evanisko, 1981; Maguire, 2003), institutional characteristics (DiMaggio & Powell, 1983; Meyer & Rowan, 1977), resource availability (Scott & Davis, 2007), and external constraints (Sampson & Grove, 1989; Shaw & McKay, 1969).

The following section discusses the theories and research supporting this dissertation. This includes the four elements of diffusion theory: innovation, communication channels, time, and social system. Following that, the diffusion research typology (diffusion, innovativeness, and processes), primary foci, variables, and units of analysis are examined to determine where and how the current study fits within the existing body of knowledge. Then, before delving into the organizational theories that provide a framework for analyzing police organizational structure, it is necessary to discuss the theoretical foundations for diffusion. Finally, the organizational framework will be combined with diffusion theory to create a conceptual model to fill gaps in the existing literature on policing innovation. The

model will be discussed in Chapter 3 along with an examination of police camera innovations.

## Elements of Diffusion Theory

Diffusion theory reframes our thinking about innovations, enabling us to analyze the factors that influence individual and organizational interest in innovations and identify factors that influence adoption (Dearing & Meyer, 2006). This sociological perspective dates to Gabriel Tarde (1903), who postulated that innovation adoption follows a standard, S-shaped distribution over time. When an innovation emerges, a few individuals adopt it immediately, followed by more significant numbers of adoptions if the innovation is accepted, and finally, the rate of adoption slows as fewer individuals remain to adopt.

Rogers (2003) further developed these ideas by analyzing a variety of innovations, ranging from farmers' use of new hybrid seeds to physicians' use of a new drug to the global adoption of kindergarten. Innovation diffusion is primarily a social process in which subjective information about new ideas is communicated from person to person. A diffusion process is a specialized form of communication comprised of four central components: innovation characteristics, communication channels, time, and the social system.

### Innovation, Communication, Time, and Social System

Scholars disagree on what constitutes innovation, and the debate rages on. Some studies do not provide a definition, which could be considered a significant misstep in the scientific process (Matusiak & King, 2021). Rogers (2003) identified innovation as anything that a social system views as new, fulfills a need or challenge, or resolves a problem. To put it another way, innovation is the act of introducing something new to a system of potential adopters. However, researchers have used a variety of other terms to define innovation. For

example, "an innovation is any reasonably significant change in the way an organization operates, is administered, or defines its basic mission" (M. Moore et al., 1997, p. 276), which is perceived as new by a collective of potential adopters (Kimberly, 1981), or individuals within a social system (Rogers, 2003). Policing studies have also defined innovation as a fundamental change in a significant number of tasks, new to policing (Weiss, 1992), and state-of-the-art (M. Moore et al., 1997; Mullen, 1996; Zhao, 1996). According to the most recent definition, police innovations are "things that are currently viewed by the field of police practitioners as new, be they technologies, processes, services, tools, products, tactics, policies, programs, or practices" (Matusiak & King, 2021, p. 1988); and this is the definition adopted here.

As an innovation is invented, adopted, diffused, or rejected, and consequences are realized over time, changes occur in the structure and function of the affected social system (Rogers, 2003). Thus, diffusion is a process of universal social change. Communication is necessary for diffusion, and how information moves within a social system constitutes a communication channel. Innovative ideas are rarely adopted until their viability has been established and word has spread through the communication channels (Rogers, 2003).

Communication channels include interpersonal communications, media (magazines, newspapers, and television), and electronic communications (email, the Internet, and social media platforms). Informal relationships, also known as social networks or communication networks, determine the timing of adoption. Networks are formed due to exchanging resources, alliances, and shared directors (Scott & Davis, 2007). Leveraging interpersonal networks can help accelerate the dissemination of innovations and should be used more prominently in change strategies (Foote et al., 2014). Mass media are effective tools for

disseminating information about new products. However, interpersonal channels are more effective at forming or changing attitudes (Rogers, 2003). Though we may occasionally learn about innovations through impersonal media, we ultimately adopt them after consulting with or observing someone we know, trust, or regard as an expert (Singhal & Dearing, 2006). In other words, innovations are primarily assessed by subjective peer-review rather than scientific research.

Social systems are interconnected units that work together to solve problems and accomplish common goals. Individuals, organizations, and associations all contribute to forming a social system (Rogers, 2003). Organizations are composed of individuals who have been formally organized through a hierarchical structure and division of labor to meet common goals (Rogers, 2003). Formal organizations are defined by their structure and job design, while informal organizations are characterized by their culture, norms, values, social networks, power structures, and the actions of their leaders (Scott & Davis, 2007). Lastly, consequences are changes within society due to the adoption or rejection of an innovation.

Rogers' (2003) diffusion model has three different functions associated with the element of time. First, time is a factor in the decision-making process by which an individual or organization passes from first awareness of an innovation to adoption or rejection. The innovation decision-making includes all the decisions, actions, and consequences that arise during the entire process of identifying a need or problem, through research, development, and commercialization of the innovation, to its diffusion and acceptance by users.

Communications within the system and through other channels are crucial to decision-making. In the second instance, time is a measure of the innovativeness of adopters as to the earliest or latest adoption relative to other members of the system. Third, an

innovation's adoption rate in a system is typically measured by the number of members who adopted within a given period. Many factors influence adoption rates, including the characteristics of the innovation, individual and organizational communication channels, and the social system structure. An S-shaped curve can be observed when plotting the time of adoption for successful innovations that reach many potential consumers. Numerous studies have identified this predictable pattern as innovations spread over time. Innovations that are unsuccessful lack an S-curve because they only reach a small percentage of potential users before they are rejected or phased out. While some innovations achieve widespread acceptance relatively quickly, others take longer or fail altogether.

The following section examines three different focuses of innovation research: diffusion, innovativeness, and process. Each of these types has unique research questions, units of measurement, and methods of analysis. Therefore, distinguishing between streams is critical for conceptual framework development, research synthesis, and generalization of results.

**Diffusion, Innovativeness, and Processes**

Researchers have used diffusion theory to gain a better understanding of how new technologies and ideas are introduced and spread across the various segments of law enforcement, from computerization (Mullen, 1996), to community-oriented policing (COP) (Burruss & Giblin, 2014; Gayadeen & Phillips, 2014; Morabito, 2010; Owens et al., 2018), and most recently to the diffusion of BWCs (Nix et al., 2020; White & Malm, 2020). However, the academic community has not yet reached a consensus on how or why organizational innovation occurs. Methodological differences in theoretical frameworks,

variables, and populations sampled have largely contributed to the field's current state (Rogers, 2003).

      To focus the research, innovation studies are consistently divided into three distinct streams: (1) diffusion of innovation, (2) determinants of innovation (innovativeness), and (3) the process of innovation. Diffusion studies are used to determine how and why innovations spread over time, organizational innovativeness research is used to differentiate early and late adopters, and process research is used to determine the stages and processes involved as innovations are implemented (Wolfe, 1994). These three types of innovation studies each have a specific research question, unit of analysis, method of analysis, and dependent variable to consider. Research suggests that the determinants of organizational innovation differ across these different research streams; therefore, the ability to distinguish between streams is critical for research synthesis and comparison. A lack of understanding of these streams is common in the literature, resulting in research designs that combine elements from these distinct streams and generate incorrect generalizations.

      Diffusion research aims to understand how, why, and at what rate innovations spread throughout a social system using the innovation as the unit of analysis. This framework does not assume a simple, linear progression from product development to adoption and thus allows us to explore the stages of spread in detail. These studies investigate the pattern of diffusion and try to explain or predict how innovation spreads over time and space (Wolfe, 1994). For example, a recent diffusion study on BWCs concluded that after a slow period of early adoption, a crisis in policing and an increase in state and federal funding influenced their widespread and rapid diffusion (White & Malm, 2020). Researchers found that computerized crime mapping diffused rapidly, and there was a

significant relationship between the likelihood of early adoption and a department's openness to scientific research (Weisburd & Lum, 2005). The findings from these studies indicated rapid diffusion of innovation; however, the overall trend for innovations in policing suggests that innovations are initially adopted slowly but accelerate over time.

Innovativeness studies investigate the factors that contribute to an organization's willingness to adopt new ideas compared to others in the social system and why some organizations are more innovative than others (Frambach & Schillewaert, 2002; Rogers, 2003). In other words, an organization's adoption style is a function of both change readiness and risk tolerance. Organizational innovativeness is associated with the leader's attitude towards change, organizational characteristics, and the openness of the organization's external network or the degree to which members are connected to individuals outside the organization (Rogers, 2003). An earlier adopter is more willing to take risks, thrives on novelty, and is the first to adopt a new idea (Rogers, 2003). Conversely, late adopters are risk-averse, frequently emotionally invested in the status quo, and are more likely to see the downside of change (Rogers, 2003).

Cross-sectional data is frequently used in innovativeness research, which may explain why this research stream is gaining traction in the policing literature, as cross-sectional data from governmental organizations is readily available. The current study examines the innovativeness of large law enforcement organizations and the factors that contributed to early BWC adoption. The sample was sourced from cross-sectional data collected by the BJS 2013 LEMAS survey.

Finally, process research examines the processes by which organizations implement, adapt, or reinvent innovations. These studies investigate how innovations emerge, develop,

and evolve throughout their adoption and implementation (King, 2000; Willis et al., 2007; Wolfe, 1994). The innovation process is the unit of analysis, and the study focuses on the sequence of activities in the development and implementation of the innovations (Wolfe, 1994). Data gathering tends to be qualitative based on events and determinants at each stage. For example, innovation reinvention occurs when users adopt a prior innovation for use in unanticipated ways. Willis et al. (2018) examined one agency's reinvention of license plate readers and discovered they were being used to facilitate rapid response to crimes, identify crime patterns, and corroborate alibis. The results indicated that factors contributing to reinvention included their widespread availability and compatibility with other information systems, lack of complexity, characteristics of their users, and the role of leadership in promoting their use. An important contribution of process research is the identification of the organizational determinants correlated with reinvention and how they might compare to the same determinants in other innovation research streams.

This section discussed the four components of diffusion theory (innovation, communication channels, time, and social system) and the innovation research typology (diffusion, innovativeness, and process). This summary of the literature characterized the diffusion of innovation as a social process in which subjective information about new ideas is communicated from earlier adopters to other potential adopters within the system. The importance of understanding the characteristics of early adopters and the influence their assessments have on the success or failure of an innovation within their system. From this perspective we can see the role of earlier adopters. The following section examines the theoretical foundations for assessing the organizational innovativeness of early adoption; it

then delves deeper into the innovation attributes, innovator characteristics, and environmental conditions linked to early adoption.

## **Building a Theoretical Framework**

Diffusion theory appeals to multiple disciplines such as anthropology, economics, education, health sciences, and political science. These studies provide researchers with a substantial body of research on innovation adoption and diffusion that examines a wide variety of variables and identifies critical process predictors. For example, Damanpour (1991), Rogers (2003), and Wejnert (2002) conducted independent meta-analyses of the existing literature to develop conceptual frameworks for integrating the diverse variables defined in diffusion research and interpreting their effect on an actor's decision to adopt.

Policing researchers have more recently used variations of diffusion frameworks to understand how new ideas and technology spread through different aspects of U.S. law enforcement, including community policing (Gayadeen & Phillips, 2014; Mastrofski et al., 2003; Morabito, 2010, 2014; Zhao, 1996), and technical innovations such as crime mapping applications (Leong & Chan, 2014; Randol, 2014; Weisburd & Lum, 2005), Tasers (White, 2014b), and LPRs (Lum, Koper, et al., 2019). Others have studied patterns of adoption (Morabito, 2010; Weiss, 1997a, 1997b), impacts of innovations (Byrne & Marx, 2011; Chan et al., 2001; Koper et al., 2009; Lum et al., 2017), and the diffusion of innovations (Klinger, 2004; Oliver, 2000; Skogan & Hartnett, 2005).

As a cross-disciplinary theory, researchers have often analyzed diffusion in isolation from the insights of scholars in other disciplines, with a few exceptions (see Damanpour, 1991; Rogers, 2003; Wejnert, 2002). Therefore, it is suggested that studies address the following elements in research to increase consistency and generalizability (Wolfe, 1994):

1. Stream of innovation research relevant to the research question,
2. State of the innovation process upon which the study focuses,
3. Types of organizations in the study,
4. Conceptualization of the outcome variable, and
5. Attributes of the innovation.

The present study falls in the innovativeness research stream and focuses on examining the organizational and environmental determinants of law enforcement's early BWC adoption—that is, adoption prior to January 1, 2013. The most significant predictors of innovation adoption fall into three broad categories: innovation attributes, adopter characteristics, and environmental context (Damanpour & Schneider, 2006; Rogers, 2003; Wejnert, 2002). These categories are discussed in the sections that follow. This includes an examination of structural contingency and institutional theories, which are frequently used in police innovation research to investigate the relationship between organizational and environmental factors and police innovation adoption.

**Attributes of Innovations**

The innovation-development process consists of six stages which typically occur before the first adoption: identification of the need for innovation, research and development, commercialization, adoption, diffusion, and consequences (Rogers, 2003). In summary, the process of conducting research begins with the identification of a need or problem, which leads to the conception, development, and commercialization of an innovation. Potential adopters of technological innovation may be directly marketed to through media channels, or vendors may approach them independently. Personal networks and professional media outlets, such as conferences or magazines, spread process or policy innovations. These early adopters then inform their contacts about the innovation via various communication channels, such as peer groups and professional associations. The

early group of adopters share their experiences with emerging innovations throughout their personal networks. Next, as potential adopters become aware of innovations, they seek additional information from earlier adopters about possible advantages, disadvantages, and expected consequences, to mitigate uncertainty and assist in decision-making. Finally, diffusion occurs in response to these choices and events.

The first stage in the innovation-development process is deciding to seek alternatives to an identified problem. In some cases, a future problem is identified as the catalyst for the process, while in others, a perceived problem or need is identified. Recognizing a problem or need in law enforcement often leads to developing or adopting an innovation to achieve reform goals. A problem may, for example, rise to the top of a system's list of social issues, influencing the spread of an innovation (Rogers, 2003). For instance, in the 1980s, drunk driving became a significant social issue when it was reported that drunk drivers were responsible for half of the 50,000 highway deaths and 750,000 injuries each year (Reagan, 1982b, 1982a; EO 12358, 1982). Mothers Against Drunk Driving (MADD), a single-issue interest group, championed this cause by increased lobbying, media coverage, and public awareness of the dangers of drunk driving, elevating the social issue to a high priority (Pearl, 1985; Presidential Commission on Drunk Driving & Presidential Commission on Drunk Driving, 1983). These alarming statistics, combined with the efforts of organizations such as MADD, increased public awareness of the dangers of drunk driving, and alcohol-related crash fatalities steadily decreased from 53% in 1982 to 34% in 1997 (Dang, 2008). As driving while intoxicated (DWI) became a divisive social issue, advocacy groups pushed for more cameras in police patrol vehicles to document the infractions preceding the stop and field

sobriety test (IACP, 2004). These recordings eventually became accepted as the best evidence to support a DWI conviction, increasing police use of dashboard cameras.

Manufacturers and scientists are frequently credited as the originators of technological innovations sold to consumers. However, in some cases, a lead user develops a solution to address a specific need, which manufacturers then design and build (Rogers, 2003). An excellent example of the latter is the K-9 camera collars designed by Richard Sparks. While Sparks developed the prototype and proposal in 1999, the collars were not created until the NIJ approached him about using K-9 collar cameras at Ground Zero to search for victims' remains in areas too dangerous for rescuers to enter. Lead users have needs for innovations that are well ahead of the general market and play an essential role in the innovation-decision process by developing the innovation and then convincing a manufacturer to produce the innovation (Rogers, 2003).

Research and development (R&D) are followed by commercialization. Research can be conducted in laboratories or universities and by lead users. In either case, research comes first, followed by innovation development, which is transforming an innovative concept into a form that is expected to meet the needs of potential adopters (Rogers, 2003). Following the development, practitioners or end-users gain knowledge about the meaning of the technology through communication mechanisms such as journals, conferences, and professional associations.

Law enforcement officers have unique technology requirements because of their duties, including nightsticks, fingerprint identification, and devices that allow them to use less-than-lethal force to control unruly individuals, stop fleeing vehicles, and detect concealed weapons and contraband in non-intrusive ways (SeaSkate, Inc, 1998). However,

police also face significant challenges that often do not have readily available solutions (Hollywood et al., 2019). As a result, numerous technologies have been discovered in the commercial marketplace, such as automobiles, radios, computers, firearms; and military or government agencies, such as robots, facial recognition, and drones, which are then adapted to serve law enforcement needs (Nunn, 2001, 2003). Federal agencies, such as the NIJ and the BJA facilitate the conversion of ideas, or reinvention, into research and products suitable for law enforcement use (Nunn, 2003).

After R&D, commercialization, which includes production, manufacturing, packaging, marketing, and distribution, places technological innovation in the hands of law enforcement (Rogers, 2003).[1] Communication channels are critical in this step because how an innovation is promoted to end-users can affect its likelihood of success. Technological change is not always favorably embraced as employees' opinions about their agency's past with technology can moderate receptivity and impede adoption (Koper et al., 2015).

Orlikowski and Gash (1994) coined the term 'technological frame' to refer to users' interpretations of technology and how that interpretation accounts for their interactions with it. Through technical framing, users develop specific expectations, beliefs, and knowledge about technology, influencing their subsequent behavior toward the technology (Orlikowski & Gash, 1994). For example, line officers initially opposed dashboard cameras out of fear of being observed by superiors, and some may have even sabotaged their equipment. When telephone call boxes were first introduced to speed police communications, some patrol

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[1] A policy or process innovation may not necessarily complete each of these commercialization steps, such as manufacturing, which seems specific to technology; however, packaging, marketing, and distribution through communication channels are applicable.

officers resisted and would cut or short the call box wires (Maghan et al., 2002). An internal audit of the Los Angeles Police Department found that half of the estimated 80 squad cars were missing antennas leading to speculation that the officers intentionally removed the antennas to not record their voices (Kelliher, 2014). These examples demonstrate the incongruity in technological frames between leadership or management and line officers.

Nevertheless, telephone call boxes became an essential police tool (Maghan et al., 2002), and the dashboard cameras were installed to protect officers while also documenting traffic stops and drunk driving arrests. Officers were more receptive to using the cameras after learning about the benefits for officer safety and improved evidence documentation. Therefore, the IACP (2004) suggested that framing technology through training and communication with officers would help shift officers' perceptions away from a surveillance purpose. Ultimately, an innovation's failure could be attributed to a lack of support from the target audience.

Adoption and diffusion of the innovation to potential adopters is the fifth stage of the innovation process. The adoption phase is often broken up into initiation and implementation stages. The initiation stage includes all activities leading to a decision to adopt an implementation and pertains to activities that facilitate putting an innovation into use and continuing to use it (Damanpour, 1991). Identifying the appropriate stage is critical because the direction in which specific determinants influence innovation varies according to the stage. Inconsistent and sometimes contradictory research findings result from the misidentification of the innovation stage for the research focus (Wolfe, 1994). Rogers (2003) notes that perhaps the low correlations between organizational structural variables and organizational innovativeness reflect the possibility that the former were associated with

innovation in one direction during initiation and in the opposite direction during implementation. While organizational constructs such as low centralization, high complexity, and low formalization facilitate innovation, they make it more difficult for an organization to implement innovations successfully.

New ideas can be challenging to adopt; even when the benefits of such ideas are clear, it may take a considerable time from the point of the idea's dissemination until it has been widely adopted (Rogers, 2003). Many of these situations arise from the inherent uncertainty associated with introducing innovations. Among the uncertainties is the likelihood that the idea will be superior to the prior innovation or the unknown consequences of its implementation. Accordingly, specific individuals or organizations engage in peer-to-peer networking to gather information about the innovation and manage the uncertainty it generates more effectively.

This leads to the final phase, which is the discovery of the consequences of changes in behavior because of an innovation's adoption or rejection (Rogers, 2003). Consequences refer to the effects caused by the adoption or rejection of an innovation within a social system (Rogers, 2003). Innovations can have public and private consequences, including the costs and benefits of adoption (Wejnert, 2002). The distinction between public and private consequences refers to the impact of an innovation on those who may adopt it and on others (Klinger, 2003).

A cost-benefit analysis considers the monetary, non-monetary, direct, and indirect adoption costs. *Direct consequences* are the changes to a social system that occur in immediate response to the adoption of an innovation. The direct costs are usually transparent and based on the economic status of the potential adopter, such as acquiring the innovation, new

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equipment, or reform of policies or institutions (Wejnert, 2002). *Indirect costs*, however, are often difficult to identify, and they can significantly increase the cost or risk of adoption, such as software upgrades and modernization or training and labor costs (Wejnert, 2002). Indirect costs occur due to the direct consequences of the innovation (consequences of consequences) (Rogers, 2003). Another indirect cost associated with adoption is social costs, such as innovation-induced social conflict (Wejnert, 2002). For instance, unionization is often associated with less innovation because union representatives resist change that reduces officer discretion or alters the relationship between the officer and administration (Schuck, 2017).

Changes expected due to an innovation recognized and intended by members of the social system are referred to as *anticipated consequences*. For example, evidence was discovered to support the conclusion that police departments with a stronger commitment to community policing were less likely to be sued than those with a weaker commitment (Worrall, 1998). In addition, agencies that placed a greater emphasis on recruiting minorities saw a decrease in the number of lawsuits filed (Worrall, 1998). However, a typical innovation process occurs over a long time and is difficult to quantify; therefore, individuals are often unaware of the consequences of adoption (Rogers, 2003).

*Unanticipated consequences* are changes caused by an innovation that the members of the social system did not intend or recognize. They represent a lack of understanding of how an innovation works and the internal and external forces in the social system. For example, implementing some innovations may unintentionally increase lawsuits and complaints against the police. Worral (2001) found evidence of this in his examination of the innovation experiences in a nationwide sample of 1,400 municipal police chiefs and county sheriffs. He

contended that the confusing and contradictory underlying causes of community policing resulted in inconsistencies in practice, specifically that order maintenance and crime control philosophies alienated specific segments of the population. If the innovation was symbolically adopted to deflect attention from police or to emulate more progressive agencies, the purpose of implementation may have also contributed to an increase in lawsuits and complaints against the police (Crank & Langworthy, 1992; Worrall, 2001). Worrall's findings indicated that agencies that liberally implemented community policing practices were targeted more frequently by civil liability suits and citizen complaints in aggregate of all agencies and in the smaller agencies, but not for larger agencies (100 or more sworn officers).

However, everyone in a social system is usually touched by the consequences of technological innovation, whether they are adopters or rejecters. Rejecters of a new idea may be affected because an innovation benefits other system members who adopt it, widening the socioeconomic gap between adopters and rejecters (Rogers, 2003). For example, by becoming more innovative, police departments place less innovative departments at greater risk for civil litigation simply because they have not adopted the latest technologies (Archbold & Maguire, 2002; Kappeler, 2006) or philosophies (Worrall, 1998, 2001). Accordingly, police administrators should recognize that innovation has unanticipated consequences and should analyze innovations for the possibility of potential liability (Kappeler, 2006).

However, rather than being concerned about the long-term effects of adoption, Rogers argues that early adopters are frequently unconcerned about consequences, assuming that they will be positive. It is often through the early adopters' testing of the innovation that

consequences are discovered. After information about implementation and consequences has spread and imitation models have become more prevalent, innovations with significant social consequences are more likely to be adopted (Wejnert, 2002). This process is most effective when norms, values, or expectations about innovation become deeply embedded in society (institutionalized) and reflect a shared understanding of social reality (Meyer & Rowan, 1977; Wejnert, 2002). In Wejnert's view, the media can be influential in spreading innovations primarily when they address well-defined and widespread problems. Media effects promote institutionalization by disseminating information about institutionalized practices and generating public interest.

### *Innovation Classifications*

The literature on innovations lacks a standardized classification scheme. While developing one may be a future goal (Rogers, 2003), there is no reason to believe that a given set of variables will be related to adopting different types of innovations in the same way (Kimberly & Evanisko, 1981). Essential factors in one study are frequently significantly less important, unimportant, or inversely necessary in another study (Downs Jr. & Mohr, 1976). Some have argued that the adopter categories are limited in application to policing because the categories are not mutually exclusive; therefore, an agency could be a "laggard with regard to LPR usage but an innovator in the use of BWCs" (Hendrix et al., 2017, p. 2). How is it possible for the same agency to be a leader or early adopter in BWCs while lagging in LPR implementation? The organizational determinants of innovation adoption vary depending on the characteristics of the innovation (Wolfe, 1994), which is why innovation attributes should be specified in innovation research and identified in analyses and comparisons.

The nature of the technology and how technological change is managed are also factors to consider (Chan et al., 2001). Researchers would benefit from innovation categorization because it would provide a consistent frame of reference and aid classification efforts (Wolfe, 1994). While defining innovation characteristics makes it easier to generalize and compare studies and interpret study results (Kimberly & Evanisko, 1981), Willis and Mastrofski (2011) warn that conceptualization is one of the most difficult challenges facing police scholars.

The instability of the factors associated with innovation has been extensively documented and critiqued in the organizational literature. This instability is not due to a lack of effort, as numerous attempts to classify innovations have been made. Researchers have identified three broad categories: administrative and technical, product and process, and radical or incremental innovations. Additionally, studies on police innovation have introduced new types, such as programmatic and strategic (M. Moore et al., 1997). These are not exhaustive categories, as placement is often based on the researcher's perception or knowledge of current policing strategy trends (Moore et al., 1997). However, the various categories of innovation are logically connected. For example, administrative and technical innovations are associated with fundamental work activities and may involve a product or a process (Damanpour, 1991). Administrative innovations are changes in the way the police department manages itself. They include methods for recruiting and training officers and evaluating the performance of individual offices, subordinate commands, and the department (M. H. Moore, 2003). In contrast, programmatic innovations shape the way police use their resources to address specific problems or operations to accomplish a

particular organizational goal, such as creating new units, DARE, directed patrol, and neighborhood watch (King, 2000; M. H. Moore, 2003; Willis & Mastrofski, 2011).

Technological innovations entail adding new pieces of technical equipment, capacity, and officers' tools and machines for carrying out their duties or improving their performance (Damanpour, 1991; King, 2000). Certain researchers have distinguished between "hard" (weapons, body armor, tracking devices) and "soft" (crime mapping, crime analysis, software programs) technologies[2] (Byrne & Marx, 2011; C. J. Harris, 2007; Hummer, 2007), as well as controversial or visible innovations such as community and problem-oriented policing (National Research Council, 2004; Roberts & Roberts, 2009). Others have grouped technological innovations into two categories based on their appeal to police managers (management technical), such as CompStat (Weisburd et al., 2003; Willis et al., 2007), and those that appeal to patrol officers (line-technical), such as handguns and tasers (King, 2000).

Radical and incremental innovations refer to how they alter the organization's practices (Damanpour, 1991). Because incremental innovations generate less uncertainty and require less technical expertise to implement, they are more readily adopted (Rogers, 2003). CompStat, for example, is a managerial approach that combines management principles with crime analysis to direct the organization's efforts toward crime reduction. According to Weisburd et al. (2003), CompStat quickly spread, perhaps unusually quickly, because police departments were already implementing components of the approach before the formal program's adoption.

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[2] Additional classifications exist throughout the literature. For example, Manning (2003) describes five technological innovations: mobility, training, transformative, analytic, and communicative.

On the other hand, a radical innovation necessitates additional knowledge from organization members, resulting in increased uncertainty and implementation difficulty (Rogers, 2003). As radical innovations require additional knowledge or technical expertise on the part of organization members, the organization's collective expertise has proven helpful in facilitating radical innovations over the years. A radical innovation also called disruptive or discontinuous innovation, instills a high level of uncertainty in an organization because it represents a paradigm shift in how specific basic tasks are performed (Rogers, 2003). Indeed, many police agencies resisted implementing community policing tactics, which require the most radical changes to the policing profession (Braga & Weisburd, 2007). Adopting departments must change their relationships with the public, take on new community responsibilities, and rethink the manager-officer relationships as part of a severe community policing program (Skogan & Hartnett, 1997). The high uncertainty created by a radical innovation is an uncomfortable state that may foster more resistance to the technology.

Scholars have argued that empirically distinguishable categories would help to explain why the same predictor variables vary and why the explanatory power is unstable (Downs & Mohr, 1976). To test for empirically distinguishable categories of innovation types, King (2000) used factor analysis within a sample of large police departments in 1993. King evaluated five distinct categories of innovation (radical, management technical, line technical, administrative, and programmatic) and concluded that the evidence did not support four or five different types of police innovation. Instead, all but one of the innovation types split into further subgroups. The study's results revealed that programmatic innovations are divided into three types. First, the crime-oriented type included innovations related to handling domestic violence, victim assistance, and hate crimes. Innovations aimed

to increase efficiency were asset forfeiture, crime analysis, and call screening. Finally, community-based innovations for crime prevention, school drug education, and foot patrol were the third type. These findings indicate that different motivations, challenges, and stakeholders are involved and should be considered when adopting innovations to implement successfully and when conducting innovation characteristics research.

Technology use is shaped by organizational structure and culture. Examining shared beliefs about technology can be a highly effective way of articulating and tracing the influence of specific technologies within organizations (Orlikowski & Gash, 1994). Orlikowski and Gash (1994) classified these shared cognitions, or technological frames, into three domains. The first domain is inherent in technology and the public's perception of technology capabilities. The second domain includes their technology strategy or the justification for incorporating technology into their organizations. The third domain is the technology in use, their perception of how technology should be routinely used, and the associated risks. Police use of technology could depend on how they view that technology in relation to their organizational perspective (Koper et al., 2015).

These frames can be influenced by officers' roles and functions, connected to organizational structure, culture, and activities (Koper et al., 2015). For instance, many officers view policing through the lens of reactive response to calls for service, reactive arrest in response to crimes, and compliance with standard operating procedures; as a result, they place a premium on the use of technology to accomplish these goals (Koper et al., 2015). The distinctions between innovations can aid in predicting reactions and understanding how innovations relate to the beliefs and prior experiences of potential adopters (Rogers, 2003). Furthermore, presenting the frames and packaging innovations appealingly increases the

likelihood of diffusion (Willis & Mastrofski, 2011). Technological frames appear to articulate the theoretical bases of innovation, contingency, and institutional theories discussed later in this chapter.

The debate continues over the importance of distinguishing between primary inherent attributes such as size and cost and secondary attributes such as complexity and relative advantage, the latter of which is perception-dependent (Damanpour, 1991; Downs Jr. & Mohr, 1976; Kimberly & Evanisko, 1981; King, 2000; Wolfe, 1994). The research indicates that perceived innovation characteristics cannot predict the adoption of innovations with consistency across varied settings. The existence of an innovation classification scheme and the extent to which the content or character of the innovation is a more powerful predictor than adopter and cultural characteristics remain open questions (Willis & Mastrofski, 2011). However, some have argued that policing researchers should identify intrinsic factors or finer-grained distinctions between them, as this would help explain the differences in how innovations are adopted (Willis &. Mastrofski, 2011). This argument has merit because it is best to begin with a broad understanding that further studies can narrow down based on circumstance-specific factors.

The lack of empirically distinguishable categories and their multidimensional or subjective nature does not preclude the study of innovations. Prior categorizations can provide adoption trends and innovation characteristics to inform hypotheses testing. Classification of the innovation as a radical innovation, one that is controversial, or one that is visible and interesting to the public merely suggests that we look for studies of prior radical innovations to determine whether there are any links between the stages of adoption, types of results, and the innovation of interest.

*Innovation Characteristics*

Scholars should define innovation attributes clearly to ensure that innovation research is comparable and generalizable. These characteristics represent the perceived costs and benefits of a favorable adoption decision (Singhal & Dearing, 2006), and they have a significant impact on the rate of innovation adoption. For example, Rogers (2003) identified five innovation characteristics: relative advantage, compatibility, complexity, observability, and trialability that account for between 49% and 87% of the variance in adoption rates.

In the eyes of adopters, relative advantage refers to how much better an innovation is than a competing option or a last generation product (Dearing, 2009; Rogers, 2003). Prospective adopters must understand how an innovation advances their present situation. Innovations are most successful when they outperform the existing product or idea they replace. While relative advantage can be quantified economically as the ratio of expected benefits to adoption costs, other variables such as social prestige, convenience, and satisfaction also play a role (Rogers, 2003). However, if members of the social system believe an innovation is objectively beneficial, it is more likely to be adopted; and the greater the perceived relative advantage, the faster the innovation is adopted compared to other innovations (Rogers, 2003).

As perceived by the adopters, the compatibility of an innovation is positively related to its adoption rate. *Compatibility* refers to how an innovation is perceived to be compatible with the existing values, prior experiences, and needs of potential adopters and impacts the innovation's success within the social system (Rogers, 2003). If an innovation requires a huge lifestyle change or the adopter must acquire additional products to make it work, it is more likely to fail. When individuals are confronted with change, they must adjust to the

uncertainty and alter their routines and behavior; therefore, their concerns should be considered.

Innovations that are intuitive to many of the members of a social system are more readily adopted than those that require new skills and understandings (Rogers, 2003). *Complexity*, or how difficult it is for adopters to learn to use an innovation, can significantly impede its widespread adoption (Rogers, 2003). The more complex an innovation, the more difficult it will be for potential adopters to incorporate it into their lives. Still, the more intuitive and innovative, the more likely it will be adopted (Rogers, 2003). For example, a 2007 technology needs assessment of a national sample of PERF-affiliated police departments discovered that most respondents found the in-car video was effective. In addition, nearly half found the systems simple and easy to use, thereby increasing the likelihood of adoption (Koper et al., 2009).

In contrast, resistance is more likely when officers perceive the innovation as complex or cumbersome (Chan et al., 2001). For example, in a multisite study on the implementation of police technology, Koper and colleagues (2015) found that officers struggled to use an innovation because of technical issues, difficulty to use, and the need to learn new processes or systems. Thus, complexity contributes to resistance by increasing the perceived risks associated with the innovation. These technical difficulties and officer resistance further complicate adoption and implementation. Furthermore, the more technologically advanced an innovation is, the greater the likelihood that it will produce a variety of consequences after introduction (Rogers, 2003).

When a new technology is adopted, integrating it into the organization's operations is critical in determining the technology's actual, long-term effect on organizational

productivity or effectiveness. Even the most powerful technology is ineffective if its intended users cannot use it due to the need for technology training. In 2001, RAND conducted a Law Enforcement Technology Survey of police, sheriff's departments, and forensic laboratories to ascertain objective information about the technologies used (Schwabe et al., 2001). Training was cited as one of the top three factors influencing technology acquisition decisions by local and state-level government agencies. However, less than 10% of local police officers believed that training requirements were significant in determining use. Because potential adopters typically do not budget much time for technology training, Rogers (2003) suggests that larger agencies employ more technically trained specialists and are more likely to adopt radical innovations.

In addition, factors intrinsic to the technology itself will influence its success and adoption. For example, emerging technology is more likely to succeed if it closely mirrors a proven technology in the market, such as predictive analytics software or geographic information systems (GIS) (Strom et al., 2017). Familiarity with a previous successful innovation likely alleviates some of the uncertainty associated with the new technology. Low-risk innovations with a higher probability of success will be more readily adopted. As a result, certain technologies rapidly gain widespread adoption, while others lag or fail entirely.

Therefore, communication is critical in the adoption process because innovations are new and unfamiliar to potential adopters. Awareness of a new idea creates uncertainty about how the innovation will function. This uncertainty motivates active information seeking, usually from peer networks, to reduce uncertainty regarding consequences (Rogers, 2003). Consequently, some adopters carefully weigh the experiences of prior adopters or their own experiences with prior innovation adoptions before acting.

Observability and trialability innovation characteristics are associated with the level of risk that a potential adopter is willing to take. The *observability* of innovation refers to how its outcomes of others' use are visible to prospective adopters. This means that an innovation has a greater chance of being adopted if it produces easily observable or discoverable outcomes for potential adopters (Rogers, 2003). Visible results can spark peer discussion, increase innovation awareness, and encourage potential adopters to seek additional information (Rogers, 2003). *Trialability* refers to how innovation can be evaluated before being fully committed (Dearing, 2009; Rogers, 2003). A limited-evaluation innovation alleviates uncertainty for the prospective adopter and enables learning through experience (Rogers, 2003).

Later adopters benefit from the innovation trials of prior adopters. Observability is more critical for later adopters as seeing the benefits of an innovation from earlier adopters will positively influence adoption. Conversely, trialability is less vital to this group, as the perceived risk of full-scale adoption is lower for later adopters, who typically move quickly from test to full implementation (Rogers, 2003). In addition, early adopters usually have a more significant financial cushion to absorb the costs of failed innovation trials.

Understanding how new ideas, policies, and practices diffuse within a social system is critical for innovation diffusion, as adoption rates are determined by system members' perceptions of the innovation's characteristics. Recognizing how individuals react to an innovation based on its perceived characteristics can aid in forecasting future behavior (Rogers, 2003). Generally, innovations with perceived relative advantages, compatibility, trialability, and observability and those that are less complex will be adopted more rapidly. Chapter 3 provides a detailed analysis of BWC characteristics.

The characteristics of an adopter can have a significant impact on how an innovation's costs and benefits are perceived, thus interacting with the innovation's characteristics (Wejnert, 2002). The following section discusses the five adopter categories identified in the literature on innovation diffusion and the characteristics associated with each category. It discusses the framework for analyzing potential adopter characteristics, which includes structural and institutional theories. According to research, these elements can have a significant effect on how an innovation's costs and benefits are perceived, thus interacting with its attributes (Wejnert, 2002).

**Characteristics of Innovators**

Research outcomes vary depending on whether the organization is public or private and whether it provides a service or produces a product (Damanpour, 1991). Profitability, efficiency, and competitiveness are critical for commercial organizations but not for public service organizations such as law enforcement agencies. Police departments function in complex environments with values and norms that reflect the communities they serve. Therefore, they are often required to look outward to gain legitimacy. By contrast, business or technology organizations can turn inward and focus on the bottom line.

Efficiency and effectiveness are more challenging to measure in a noncompetitive field such as public service (Morabito, 2014), making innovation in the public sector more challenging (Darroch & Mazerolle, 2015). Police departments are directly accountable to and influenced by the public (Skogan et al., 2004), and the policing environment is shaped by "multiple, conflicting, and ambiguous values" (Mastrofski & Willis, 2010, p. 106). Public service organizations are judged more by cultural beliefs about what they should do in their environments than by efficient performance. There has been an increase in the idea that

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public officials need to be more responsive to the people they are sworn to serve (Willis et al., 2007).

Adopter categories are used to classify members of a social system based on their *innovativeness*, which is how an individual or organization adopts new ideas more rapidly than other members of the system (Rogers, 2003). Each category demonstrates a comparable level of innovation, and their distinctions can be summarized in three categories of characteristics: socioeconomic status, personality values, and communication behaviors (Rogers, 2003).

### *Innovativeness and Adopter Categories*

The research on innovativeness focuses on the relationship between organizational structures and the proclivity to adopt innovations, as well as the influence of external factors such as community and political demands. Within a social system, organizations do not adopt innovations concurrently. Instead, they adopt innovations sequentially and can be classified based on the length of time required to implement an innovation in comparison to other organizations within their system. As a result, innovativeness serves as the criterion for classifying adopters. Innovativeness refers to an organization's willingness to adopt new ideas in comparison to other adopters in the social system, and organizations can have more or less of it. Adopters can be classified into five categories according to their innovativeness: innovators, early adopters, early majority, late majority, and laggards.

The adopter categorization is statistically represented using the system's mean and standard deviation of adoption as shown in Figure 1 below. The diffusion model uses both statistics to categorize the adopter distribution. The mean is the average time for a system's members to adopt new technology. The standard deviation is a statistic that indicates the average amount of spread or dispersion from the mean (Rogers, 2003; Weisburd & Britt,

2014). The mean minus two standard deviations, for example, identifies the population's first 2.5 percent of adopters—innovators.
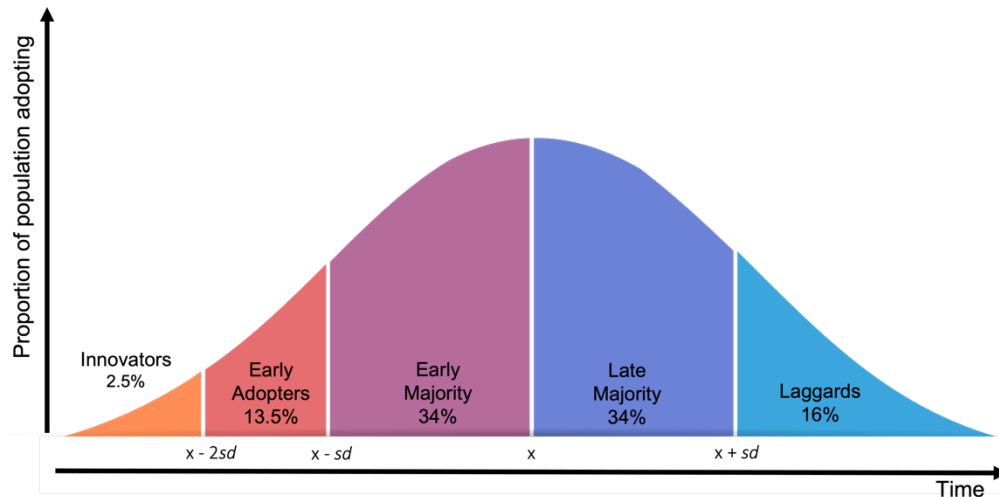


**Figure 1: Adopter Categorization Based on Innovativeness (Rogers, 2003)**

Described as venturesome (Rogers, 2003) risk-takers (Gayadeen & Phillips, 2014), innovators want to be the first to try or develop new ideas. This characteristic often requires understanding and applying more complicated concepts, accepting higher levels of risk, and having the resources to mitigate unsuccessful innovations and absorb possible losses (Gayadeen & Phillips, 2014; Rogers, 2003). Actively scanning information environments, identifying new ideas from various sources, and conducting experiments are all actions characteristic of innovators (Dearing & Meyer, 2006). Innovators are often the first to develop new ideas, and it does not take much to pique their interest. This group is more cosmopolitan than the others, which means they are exposed to various media sources, and their interpersonal networks include ties outside their local group (Rogers, 2003). They are

more likely to network with researchers and colleagues outside their system, for example, through police technology-related listservs and conferences (Weisburd & Lum, 2005).

Although innovators account for only 2.5 percent of the population, their greater degree of interconnectedness enables them to act as gatekeepers, bringing fresh ideas in from outside the system's boundaries (Gayadeen & Phillips, 2014; Rogers, 2003). Thus, innovators are critical for innovation adoption because they introduce new ideas into the social system. They do not advise other adopter categories regarding which innovations to use. Rather, the early adopters serve as leaders who help spread the word of the innovation throughout their social networks.

Early adopters account for 13.5% of the adopter population and are instrumental in popularizing new ideas by endorsing innovations (Rogers, 2003). They, like innovators, have more disposable income, are often well educated, and enjoy a high social standing within their groups (Rogers, 2003). Early adopters recognize the critical nature of an innovation or change. That is, they are aware that a particular problem requires a solution, and they embrace change. Early adopters are more circumspect than innovators in terms of what they adopt. All they need to make adoption decisions is documentation of a product's utility, typically in how-to manuals or information sheets on implementation.

Members of this group seek information and, as a result, are more knowledgeable about scientific evidence in their fields than later adopters (Weisburd & Lum, 2005). Studies on police innovation adoption have noted that research plays a minor role in policy decisions to adopt technology (Byrne & Marx, 2011). Others have argued that police adoption occurs in the absence of knowledge of the pro-adoption research (Lum, Koper, et al., 2019; Lum & Koper, 2017; Willis et al., 2007) or in a 'black box' environment having not been assessed

(Weisburd & Neyroud, 2011). Diffusion theory may help explain this well-documented trend in policing, namely that innovations are initially likely to be adopted without thorough review because most potential adopters base their decisions on subjective assessments of the early adopters.

Within their social networks, early adopters are viewed as thought leaders, enjoy widespread respect in their communities, and are frequently referred to as the "individual to check with," "a role model" by potential adopters seeking advice and information about new technologies (Rogers, 2003, p. 283). They reduce the uncertainty by adopting the new idea and then sharing their subjective assessment with their social network. Additionally, they provide valuable feedback on the benefits and drawbacks of emerging technologies. Early adopters validate a new idea with their endorsement, communicating to their peers their belief in the value of new ideas (Rogers, 2003).

The S-shaped curve begins to accelerate at approximately 10% to 20% adoption when interpersonal networks are triggered and a critical mass of adopters begins to use the innovation, (Rogers, 2003). The population's two largest groupings are labelled the early and late majority, with each representing 34% of potential adopters. Early majority organizations represent one-third of all potential adopters and adopt at a faster rate than the average member of the system. They usually build relationships within their society, but are rarely leaders (Rogers, 2003). This group observes early adopters and is willing to take certain risks but feels more comfortable experimenting with new ideas when there is evidence of the innovation's effectiveness. They are prepared to adopt after hearing a success story and observing what works. Members of this category implement policies and procedures ahead of the average organization, but only after much consideration (Rogers, 2003).

Comparably, the late majority also makes up one-third of the population but is less socially integrated than the early majority (Dearing & Meyer, 2006). Skeptical or cautious of uncertainty, they adopt new ideas only after being thoroughly tested by the majority (Rogers, 2003). While this could be due to economic necessity, Rogers suggests that it is almost certainly due to increasing peer pressure. This group wishes to observe how situations develop and fully understand the consequences prior to adopting.

The laggards are the remaining 16% of organizations that have yet to adopt and are the most localized as their networks mainly consist of other organizations in their group. Laggards are deeply rooted in tradition and hold very conservative values. They are incredibly resistant to change and are the most challenging group to persuade to adopt. This small and frequently isolated group has limited resources and thus requires assurance of success prior to adoption if they adopt at all (Rogers, 2003). Pressure from the other adopter groups and financial incentives from state or federal grants have encouraged this group's adoption of innovation (Gayadeen & Phillips, 2014). The laggards are risk-averse and require certainty of success that a new approach will not fail before adopting it (Rogers, 2003).

Innovators and early adopters are critical for diffusion because they introduce innovations into the social system, conduct testing, and communicate information influencing how innovations spread throughout the system. As a result, these two groups are essential for conceptualizing why innovations succeed or fail. Scholars have questioned whether specific modes of communication are more effective than others and whether specific communication patterns can be mapped (Willis & Mastrofski, 2011). Perhaps by identifying agencies that fall into the early adopter category and their communication networks, diffusion patterns in the law enforcement community can be deduced.

Accelerating adoption in any segment of the population becomes possible through more intensive and targeted communication and outreach to early adopters (Dearing & Meyer, 2006; Singhal & Dearing, 2006). This process is called "seeding" innovation in a social system. By designating these organizations as innovators and early adopters, an innovative technology, process, or idea can be targeted, allowing for its introduction into the system and subsequent spread through early adopters' cosmopolitan networks.

Rogers (2003) further streamlines these categories into two main groups: earlier adopters and later adopters. The earlier adopters include the innovators, early adopters, and early majority, while the second group, later adopters, includes the late majority and laggards. This study is concerned with the first group to adopt and test BWCs during the initiation phase. This section established that the first group is critical because they are responsible for introducing the innovation into the social system, conducting initial assessments of the innovation's value, and communicating those subjective assessments throughout the system. As a result, interested parties could target this group with tailored communications to influence innovation adoption and acceptance, discussed above as seeding the innovation.

Few studies have examined police innovation using a framework for the diffusion of innovation. In contrast, this body of literature was primarily developed through variations of structural contingency and institutional theory organizational frameworks. Collectively, these studies provide examples of adopter characteristics and environmental factors that may have contributed to innovations in law enforcement. The section that follows examines these organizational theories and findings from this body of research.

*Organizational Efficiency and Legitimacy Constraints*

Organizations are social structures composed of individuals who have been formally organized through a hierarchical structure and division of labor in pursuit of common goals. The generally accepted notion is that organizational characteristics influence innovative behavior in ways that go beyond the influence of individual members (Rogers, 2003) as an organization is both a context that influences the activities of individuals and an actor (Scott & Davis, 2007). Innovation is an organizational transformation strategy, whether in response to changes in the organization's internal or external environment or as a proactive effort to influence the environment (Damanpour, 1991). In general, factors determining organizational innovativeness fall into three categories: (1) the characteristics of the internal organizational structure, (2) the characteristics of the individual leader, and (3) the external characteristics of the organization (Rogers, 2003).

Diffusion theory has been criticized for failing to account for "idiosyncratic differences" in decision-making processes or perceptions of impact among law enforcement agencies (Strom et al., 2017, pp. 3–1). While it is true that how and why police innovations are chosen is unknown, diffusion of innovation theory is universal, and its general nature permits scholars to incorporate social system-specific factors. Organizations of all types adopt innovations to respond to changes in their internal and external environments. Thus far, researchers have drawn from various organizational, sociological, and diffusion theories and applied a diverse set of theoretical frameworks to examine police organizational structure and innovation. Scholars have used competing theoretical models such as rational (contingency theory, knowledge-based trust) and natural (institutional theory, resource dependence). The rational perspective is prevalent in the organizations' field and serves as a

large part of the foundation for defining organizations in diffusion theory. Likewise, contingency and institutional theories are the dominant organizational theories in contemporary policing scholarship.

*Structural Contingency Theory*

Several researchers, including Damanpour (1991) and Kimberly and Evanisko (1981), have argued that structural variables are the primary predictors of organizational innovation. The supposition is that formal organizations exhibit predictable patterns of behavior that are independent of that of individuals (Blau, 1970). This body of literature applies structural contingency theory to the assessment of innovativeness, with a particular emphasis on the relationships between organizations and their environments and their impact on organizational performance. Thus, researchers attempt to discover which contextual dimensions influence an organization's characteristics, the extent to which these characteristics are influenced, and the effects of these characteristics on organizational performance. For example, organizational structures are frequently shaped by the demands or constraints of the external environment, the extent to which technology is used, and the size of the organization (Blau, 1970; Donaldson, 2001).

A central tenet of contingency theory is the notion that an organization's objectives should be to maximize its effectiveness and efficiency. To accomplish this, the organization focuses on technical activities and shapes work processes to facilitate them while safeguarding the organization against external environmental uncertainties (Crank, 2003). As such, no one structure or type of structure is optimal for all organizations. The most effective system is tailored to the organization's specific circumstances. The organization will adopt innovations in response to its circumstances and in furtherance of its objectives.

The political system that oversees law enforcement, social disorganization within the population served, and crime rates contribute to the organization's ability to facilitate its goals and maintain performance (Donaldson, 2001; Giblin, 2006). On the other hand, variability in the environment indirectly impacts organizational structure. For instance, it is assumed that increased environmental variability increases the uncertainty of a task, consequently altering organizational structural elements (Donaldson, 2001). Organizations that do not adapt to organizational contingencies increase their chances of ineffective performance (Donaldson, 2001). Thus, structure and efficiency are key concepts of contingency theory.

Organizations develop rational plans for controlling and coordinating the activities that enable them to adapt more effectively to the unique environment in which they operate. A basic consensus has developed around two fundamental dimensions of internal structure: structural complexity (levels of differentiation) and structural coordination and control (formalization and centralization) (Maguire, 2003). These primary structural characteristics of interest aim to reduce uncertainty, manage complexity, and coordinate independent tasks (Scott & Davis, 2007). Organizational size, tasks, special programs, and formal rules are combined with the goals and policies of their rational plan to complete their work activities (Maguire, 2003). Findings such as the influence of hierarchy and specialized units on innovative practices (Randol, 2014), organizational age, and turnover rate (Wilson, 2005) fit this view.

Several policing innovation studies suggest that technological innovation aims to improve efficiencies and effectiveness (Petersilia, 1987), meet new forms of accountability, and satisfy external demand for information (Chan et al., 2001). Generally, police will

rationally choose an innovation to improve their functioning (Weisburd & Braga, 2006), improve performance, increase efficiency, and improve outcomes. Some scholars focused on technologies meant for patrol and information gathering and processing because patrol gets the most resources, and many innovations focus on information processing for their success (Mastrofski & Willis, 2010).

This organizational structure framework complements the structural features identified in the innovations literature that correlate with innovation, specifically: size and slack, interconnectedness, attitude toward change, complexity, centralization, and formalization (Rogers, 2003). Specialization of activities and functions, objective qualifications for jobs, adherence to rules and regulations, and a hierarchical structure characterize the bureaucratic organization of police departments. However, the structural characteristics that differentiate innovative law enforcement agencies from less innovative ones are poorly understood. Research indicates that organizational structural variables may be related to innovation in one direction during the initiation phase and in the opposite direction during the implementation phase of the innovation process (Rogers, 2003). Adopter characteristics influence adoption and diffusion; therefore, caution is recommended when interpreting innovation studies' findings (Wolfe, 1994).

Policing scholars have frequently disputed the role of organizational qualities and environmental elements in influencing policing outcomes. For example, Wilson (2005) argued that organizational characteristics such as age, funding, and turnover rates were the primary determinants of community policing adoption. In contrast, Zhao (1996) concluded that environmental factors such as community needs and problems were the primary determinants of community policing adoption. However, evidence suggests that

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organizational and environmental factors are significant (Burrus & Giblin, 2014; Morabito, 2010; Schuck, 2017).

While the literature on policing frequently emphasizes the role of the individual, organizational, and environmental factors in shaping police innovation (Koper et al., 2014; Willis & Mastrofski, 2011), it has not been studied consistently in this manner. Most studies focus on either organizational or environmental factors, and only a few include both in the same model. Furthermore, only a few scholars have argued for a combined perspective that acknowledges institutional and contingency effects and views the individual or organizational actor as both a cause and a recipient of various effects (Crank, 2003).

The works of Langworthy (1986) and Maguire (2003) are the most complete collections of defined law enforcement organizational structures. Combined, these studies indicate that organizational context (size and slack), complexity (differentiation), and control (centralization and formalization) are the three core elements necessary to understanding formal police structure. This framework provides context for the structural organization of police, which can then be integrated with diffusion theory. A 2014 meta-analysis of studies using LEMAS data suggested that these models are "the norm" because they contribute frameworks for police organizational structure that are frequently tested in other studies in policing innovation (C. Matusiak et al., 2014, p. 633). For example, a structural contingency framework was used to examine the adoption and diffusion of several policing innovations, including crime analysis technology (Randol, 2014), in-car and mobile surveillance cameras (Schuck, 2017), and BWCs (Nowacki & Willits, 2016).

Size is used as an indicator of an organization's capacity to mobilize the resources necessary to meet the needs of the population it serves (Rogers, 2003). *Slack* resources are

the extent to which an organization has more resources than are required for ongoing operations, including financial, human capital, and technical resources and are sometimes used as a proxy for size. As a result, size is likely related to several dimensions that lead to innovation, including total resources, slack resources, technical expertise of employees, and organizational structure (Rogers, 2003).

In policing, agency size is critical because the largest departments have the most complex responsibilities and operate as complex bureaucracies, making them extremely difficult to manage and change (Skogan et al., 2004). Research indicates that larger organizations require more complex organizational structures to manage employees and coordinate work (Maguire, 2003). Formal organizations cope with large-scale operations by subdividing responsibilities in numerous ways to facilitate work for employees (Blau, 1970). Subdividing into smaller groups allows performance improvement when you can separate simple tasks from more complex tasks, allowing less-skilled employees to perform the routine duties and for skilled employees to get the specialized training and experience to handle the difficult tasks. These differentiated structures require that management tasks and responsibilities are subdivided among managers and supervisors on different hierarchical levels.

A larger size allows leaders to delegate authority to other managers, such as unit leaders, for easier supervision and a more comprehensive control range for supervisors. A larger organization is likely accountable for a variety of additional job functions. This could result in greater adoption of specialized technologies. For example, specialized units such as crime analysis, investigations, and cybercrime, require specialized technologies and highly skilled employees to operate effectively (Randol, 2012; Skogan & Hartnett, 2005; Strom et

al., 2017). The organizational structure becomes more complex as the agency establishes more specialized units. In contrast, a smaller agency is more likely to employ generalists and not as many specialists; thus, the structure can be less complex.

The diffusion of innovation research generally indicates that size is positively associated with innovativeness as nonadopters tend to have fewer resources. Conversely, research on law enforcement innovation has revealed inconsistencies in the relationship between the size of an agency and its adoption of new ideas. There is some evidence that organizational size (Burruss & Giblin, 2014; M. Morabito, 2008, 2010; Randol, 2012) and slack (Nowacki & Willits, 2016; Randol, 2012, 2014) can influence police innovation adoption, implying that larger organizations have more resources to invest in innovation and are thus more innovative (Mastrofski et al., 2003; Randol, 2014). This could be due to a larger workforce to assist with adoption, more slack resources to invest in new or expensive technology acquisitions, or a more diverse network. However, recent studies on advanced camera technology diffusion reported non-significant (Strom et al., 2017), negative (Lawshe, 2022; Nowacki & Willits, 2016), and positive (Nix et al., 2020) relationships between size and early adoption. These studies will be examined in greater detail in Chapter 3; generally, differences in organizational size and type, as well as adoption timing, contributed to these findings.

While some evidence suggests that larger size frequently influences adoption likelihood, the direction of the relationship appears to be quite uncertain. For instance, several studies on community policing adoption discovered a positive correlation between the conceptualization of size as the number of full-time sworn officers and innovation (Burruss & Giblin, 2014; Morabito, 2010), but not when conceptualized as authorized new

hires and operating budget per capita (Morabito, 2014). Additionally, size was positively correlated with LPR adoption as measured by full-time sworn officers (Lum et al., 2016, 2019), but size measured by patrol vehicle count was not associated with mobile surveillance camera use (Schuck, 2017), and the natural log of the agency's operating budget was negatively associated with BWC diffusion (Nowacki & Willits, 2016). These inconsistencies suggest that additional factors such as innovation characteristics, the timing of adoption, or other adopter circumstances could be at play. Then again, these studies developed different independent variables in their statistical models and possibly examined different types of agencies (e.g., local, state, and county sheriffs), making it more difficult to generalize these results to agencies of different sizes or types.

Structural complexity is the extent of differentiation in the organization and should be conceived as a cluster of related variables (Maguire, 2003). This includes the degree of specialization, or division of labor (functional differentiation), the number of levels in the organization's hierarchy (vertical differentiation), and the extent to which the organization's units are dispersed geographically (spatial differentiation). The more an organization becomes differentiated in those components, the more complex its nature (Maguire, 2003). Research is divided on the relationship between size and organizational complexity, but generally, increasing sizes generates structural differentiation along various dimensions and decelerating rates. While some researchers have identified weak relationships, most of the literature supports the notion that larger organizations have more complex structures (Blau, 1970; Donaldson, 2001).

Prior organizational research on hospitals (Kimberly & Evanisko, 1981) and police organizations (Maguire, 2003) supports functional differentiation as a factor influencing

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innovation adoption because increased specialization provides the necessary information for innovation. Specialization increases the number of people within an organization who are familiar with cutting-edge innovations and therefore possess the empirical sufficient knowledge to support adoption (Kimberly & Evanisko, 1981). Damanpour's (1991) meta-analysis corroborated this finding, demonstrating a positive correlation between specialization and organizational innovation. In the policing literature, specialization was correlated with technical and strategic innovations such as crime analysis techniques (Randol, 2014) and community policing (Morabito, 2014).

Vertical differentiation focuses on the nature of the hierarchy within an organization. For example, organizations with elaborate chains of command are more vertically differentiated than those with less complex command structures. All law enforcement agencies share a quasi-military organizational structure that is hierarchical and rigidly structured along clearly defined lines of authority and responsibility (Nolan, 2019; Skogan & Hartnett, 2005). A hierarchy is often depicted as a pyramid, with the width signifying the number of workers and the distance from the base to the apex representing the number of layers (Maguire, 2003). The distance from the bottom to the top represents the social space between the lowest- and the highest-ranking employees (Langworthy, 1986). Smaller organizations tend to be flatter, and large organizations tend to be taller (Maguire, 1997).

Spatial differentiation concerns the geographic distribution of the organization, and thus departments with more patrol beats and stations are more spatially differentiated (Maguire, 2003). Like size, studies have reported contrasting results for spatial differentiation. Schuck's (2017) findings indicated that adoption of dashboard and mobile surveillance cameras were positively associated with greater spatial differentiation. Zhao

(1996) reported that community policing was not associated with spatial differentiation. Moreover, Randol (2012) found a negative correlation between spatial differentiation and terrorism response preparations indicating that agencies with a lower number of facilities and sites were more likely to have higher scores on the terrorism response preparedness index. Randol's results were not consistent with existing models of organizational structure. Randol's results were likely affected by the tragic events of September 1, 2001, which led to an increase in national terrorism preparedness. However, the differences in the innovations themselves, the sizes and types of organizations examined, and the timing of these innovations along the adoption S-curve are not considered.

Bureaucracy is an organizational structure founded on rationality, characterized by standardized processes, well-defined hierarchies, formal division of labor, and professional but impersonal interactions. Max Weber, a German sociologist, described bureaucracies as an ideal management and administration model because they place a premium on technical proficiency, specialized expertise, and continuity. Thus, an organizational hierarchy with transparent chains of command is a critical principle for efficiency. Specific organizations have more rules and regulations than others, and while some have a standard operating procedure for nearly everything, others are laxer and more adaptable (Black, 1976). The extent to which an organization is formalized varies significantly. The more formalized an organization is, the more rules and regulations it has, and the easier it is to achieve uniformity and better coordinate employee efforts.

Controlling a bureaucratic organization, such as the police, is complex. Under our criminal justice system, police are public servants responsible for the ethical performance of law enforcement duties, exercise a significant amount of power in their decisions, and often

exhibit high levels of unchecked discretion in unstable and dangerous situations.

Nevertheless, police organizational management depends on a highly regimented hierarchy

for the supervision of subordinates. This structure may work in a closed environment where

all employees are visible to supervisors, but police spend most of their time out in public on

their own. Rules exist to regulate behavior; however, police have much room to deviate from

expected behavior. Legislation and rulemaking, investigation and enforcement, criminal

sanctions, and organizational discipline are the predominant control modes (Chan et al.,

2001). Structural control mechanisms such as centralization (extent of concentrated decision-

making) and formalization (degree of emphasis on specific rules) are tools that an

organization uses to control and coordinate its work and its workers (Maguire, 2003).

Moreover, innovations may be implemented to facilitate greater supervision, such as placing

cameras in patrol vehicles or on officers, thereby promoting adoption.

      Centralization is when power and control are concentrated in a system to the point

where decision-making authority is "concentrated in the hands of a relatively few

individuals" (Maguire, 2003; Rogers, 2003, p. 412). For example, in bureaucracies such as

police departments, positions are organized according to a hierarchical authority structure

that establishes who is accountable to whom and who has the authority to issue orders. Due

to this tighter managerial control, employees are less likely to use their originality and

provide non-routine input during the organizational decision-making process (Zhao, 1996).

Higher centralization is typically negatively associated with innovation adoption because an

organization's range of new ideas is limited to a few strong leaders who dominate the system.

Top leaders can be ill-equipped to identify operational-level problems or suggest relevant

innovations to address these needs (Rogers, 2003). Once the decision to adopt has been

made, however, centralization can facilitate the implementation of innovations (Rogers, 2003).

Formalization improves the rationality of organizations by attempting to standardize attitudes and enabling predictability. By providing employees with clear objectives and guidelines, formalization may benefit innovation by reducing uncertainty and clarifying expectations. Furthermore, organizations with a high degree of formalization may be better suited to adopt radical innovations because dissent can be stifled (Morabito, 2010). This study's emphasis on early adopters examines large police departments during the adoption initiation phase, not the implementation phase. Thus, more formalization at the organization's initial decision-making point may positively affect early adoption.

Nevertheless, formalization can also stifle creativity and improvisation, which are critical to innovation. Moreover, higher levels of power concentration in an organization are negatively associated with innovation in general. Conversely, Randol (2014) found that when examining crime analysis technology adoption in municipal police departments, the most innovative departments exhibited many characteristics of a classical Weberian idealized bureaucracy. Given the conventional belief that smaller organizations are more adaptable and thus more agile, and that mechanistic structures are rigid, inflexible, and therefore insufficiently flexible to foster innovation, these results may appear surprising. Nevertheless, innovation has often been associated with a larger size.

Centralization and formalization may serve as alternating control mechanisms, implying a compensatory relationship (Maguire, 2003). Formalized rules and procedures may enable organizations to decentralize decision-making without losing control. Larger organizations are required to decentralize or delegate to subordinates. On the other hand,

formalization is a relatively straightforward mechanism for achieving control in larger police organizations (Maguire, 2003). Less formal organizations allow lower-level employees greater discretion making decisions in difficult situations.

Organizational control structures can enable or constrain innovation (Maguire, 2003; Rogers, 2003). From an innovation theory perspective, centralization and formalization may inhibit innovation, but these control structures can support implementation once the decision has been made to adopt an innovation (Rogers, 2003). Communication becomes more complex and challenging as an organization becomes more hierarchical. As a result, critical information about timely innovations may be lost or muddled because of communication channels (Zhao, 1996).

Even though police organizational structures became increasingly functionally diverse in the twentieth century, they remained relatively constant over time (Reiss, 1992). However, community policing strategies were accompanied by recommendations to change their organizational structures by decentralizing leadership, reducing formalization by eliminating unnecessary rules and policies, reducing specialization and developing more generalists, shortening rank structures to reduce tall hierarchies, and increasing civilian participation in clerical and professional roles (Maguire, 1997). As a result, Maguire (1997) projected that organizations implementing community policing would experience less vertical and functional differentiation and more significant geographical differentiation due to non-routine social technology. Social technology is non-routine because people are complex and unpredictable, requiring police to interact and engage with citizens to identify and solve local issues. As a result, the department's structure becomes more adaptable, allowing officers to use their judgment and imagination to deal with many social issues.

Contrary to expectations, Maguire's (1997) six-year study of 236 police agencies revealed an increase in functional differentiation, despite reformers' encouragement of de-specialization and the development of uniformed generalists; however, formalization remained constant. Maguire also discovered no statistically significant differences in organizational complexity between organizations that had implemented community policing, were considering implementing community policing or were not considering implementing community policing. Therefore, these results indicate that these organizational complexity and control measures were not predictors of community policing implementation.

One of the flaws in contingency theory is the idea that organizations are only motivated by efficiency concerns. Thus, it presupposes that organizations are impersonal machines whose sole objective is to maximize efficiency and do not account for the social identity or culture that shapes its members' behavior. Moreover, aside from contingencies, the theory overemphasizes the technical aspects of an organization and overlooks the daily pressures on law enforcement organizations (Worrall, 2010), whereas, in reality, police frequently respond to their constituencies and the values they represent (Crank, 2003).

*Institutional Theory*

While early adopters (and contingency theorists) may be motivated by a desire to improve performance efficiency, the institutional perspective holds that an organization's primary goal is to produce and maintain legitimacy with internal and external stakeholders. As a result, an innovation's diffusion may be influenced by external pressures, needs, and uncertainties that shape subsequent adoption. Apart from technical proficiency and efficiency, organizations must also adapt to influential individuals (sovereigns) and cultural aspects in their environment to gain legitimacy, resources, and survival (Meyer & Rowan,

1977). Sovereigns are stakeholders with significant perspectives, i.e., entities with the ability to impact the organization's fundamental well-being (Crank & Langworthy, 1992). They establish standards for the structure and behavior of "good" police agencies. Specific organizational structures and procedures are adopted in conformity with societal norms prescribing how that profession's organizations should be constituted, what it believes it should accomplish, and how it should operate. This includes socially sanctioned means and ends, common-sense conceptions, unchallenged ways of reasoning, and unreflected knowledge connected with habit (Crank, 2003). Myths are untested ideas and beliefs regarded as truths or social realities in the institutional environment because they are generally known and accepted (Meyer & Rowan, 1977). Even if the actor was not aware of them, the values they symbolize significantly impact the ability to make decisions (Crank, 2003).

A police department must have a clear mission statement that outlines management's commitment to achieving specific goals for which the organization can be held accountable, such as a 10% crime reduction in a year (Weisburd et al., 2003). Specific performance indicators such as crimes reported to police, crimes cleared by arrest, or response times to service calls are frequently used to quantify police activity (M. H. Moore & Braga, 2003). However, while these are admirable goals, they lack a clear mandate for the actual work, and thus no one has a clear plan for achieving them (SeaSkate, Inc, 1998). Therefore, organizations that are unable to demonstrate efficiency and effectiveness through performance measures can demonstrate value by conforming to the demands of external actors (Giblin, 2006). For example, Mastrofski et al. (1987) observed that officers in large, bureaucratized departments were less likely to make DUI arrests than those in smaller

departments. Mastrofski and colleagues contended that small departments sought arrests to demonstrate their professional worth. In contrast, larger departments could rely on institutional forms that signaled a commitment to DUI arrests without requiring officers to make them.

Police agencies incorporate myths and rituals embedded in their institutional environments to maintain legitimacy with their constituents, even when such actions are not necessary for day-to-day operations (e.g., preventive patrol, rapid response to calls for service) (Meyer & Rowan, 1977), and despite empirical evidence that such activities do not result in increased crime control and prevention (Crank & Langworthy, 1992). If they cease these activities, they risk losing the sovereigns' legitimacy, support, and resources due to the near-universal perception that these actions are consistent with what an appropriate police agency should do. As a result, organizations maintain gaps in their formal structures to safeguard themselves against the inherent uncertainties of technological activities by loosely coupling them from day-to-day operations (Meyer & Rowan, 1977).

Loose coupling is a critical component of institutional theory; it is the idea that organizations would dissociate formal practices from actual behavior to maintain good connections with their constituents (Worrall, 2010). Loose coupling enables street-level officers to perform essential police functions while the organization turns outward toward external constituencies (Crank, 2003). Consequently, some efforts may be symbolic gestures to pacify constituencies, while others may be reasonable endeavors guided by organizational self-preservation.

Katz (2001) examined the principles of institutional theory by evaluating a chief's decision to create a specialized gang unit in a Midwestern police department. The chief did

not believe the town was facing a severe gang threat at the time. However, the department's efforts to combat gang-related offenses were questioned due to pressures from many influential community elements (e.g., the Chamber of Commerce, community leaders). Katz stated that multiple news pieces acknowledged the police's lack of effort. Those institutional pressures were successful, and the chief was pressured to integrate the views and beliefs of the local sovereigns, which had a substantial impact on the decision to create the gang unit.

Furthermore, the unit's response was primarily motivated by a desire to establish its organizational legitimacy once it was formed. This viewpoint illustrates the unquestioning acceptance of an innovation based on legitimacy (Zucker, 1987) and has also been used to explain the motivation for other innovation adoptions, such as community policing (Burruss & Giblin, 2014; Morabito, 2014; Zhao, 1996), LPRs (Lum et al., 2019), and the greening of policing (Worrall, 2010). According to Worrall, the institutional perspective establishes the conditions for a commitment to sustainability through greening initiatives as a means of representing a specific location's environmental concerns. The police department will implement reforms to allay concerns about rising fuel prices and their associated fiscal consequences.

A second linkage between innovation and institutionalization occurs when the innovation directly affects reputation (Zucker, 1987). According to this scenario, an innovation becomes more commonly recognized as an option as it is more widely disseminated. This leads to the similarity among organizations in the same field, resulting in widespread adoption of the supporting structures. When rational actors attempt to transform their organizations, they make them more and more alike (DiMaggio & Powell, 1983). According to DiMaggio and Powell, there has been a shift in organizational

motivations away from efficiency and effectiveness. Competing against one another, structurally equivalent actors pay close attention to each other to keep up with the Joneses (Strang & Soule, 1998). Isomorphism is a constraining mechanism that drives one unit to resemble other units in the population that confront the same set of external variables. DiMaggio and Powell identify three types of pressures—coercive, mimetic, and normative.

*Coercive* isomorphism stems from an authoritative or political body that enacts a law, rule, or regulation that all organizations must comply with (Crank, 2003; DiMaggio & Powell, 1983). For example, a sequence of US Supreme Court decisions eroded liability protections, limited police use of force, and established new legal standards for evaluating police operations. With the increased exclusion of evidence (*Mapp v. Ohio*, 1961), interrogations (*Miranda v. Arizona*, 1966), and limits on the use of deadly force (*Tennessee v. Garner*, 1985), the U.S. Supreme Court established legal precedents that focused on the rights of the accused and curtailed the powers of police. Police reform predominantly comes from outside forces such as courts, civilian review boards, the federal government (Bayley, 2008), and local governments (Morabito, 2010). As public servants, police officers are held accountable in the U.S. criminal justice system for the ethical discharge of law enforcement duties, the proper use of discretion, and a responsibility to uphold constitutional protections (Pollock, 2004). As a result, legal attitudes towards policing are critical considerations when exploring police innovation.

When technologies are poorly understood, goals are ambiguous, or the environment creates symbolic uncertainty, mimetic processes induce organizations to model themselves on other organizations (DiMaggio & Powell, 1983). Thus, organizations tend to model themselves after more legitimate or successful organizations in their field. Lum et al. (2019)

reported that the increase in LPR adoption from 40% in 2010 to nearly 70% in 2014 was consistent with mimetic isomorphic processes, as surveys indicated that word-of-mouth support from other law enforcement agencies and professional policing organizations were significant motivators.

The third source of isomorphic organizational change is *normative* pressures which stem primarily from professionalism. The need to set formal standards for training and education and the requirement to be active in a communicative network with other organizations are both normative demands (Crank, 2003). Morabito (2014) examined institutional isomorphism proposed by DiMaggio and Powell (1983) as a possible explanation for union influences on community policing adoption. The findings supported normative isomorphism as a factor in community policing adoption, implying that police unions may facilitate, rather than obstruct, the implementation of innovation. The need for innovation to combat a negative public image may have influenced police unions, which served as a stabilizing force in an environment characterized by frequent leadership changes. Giblin (2006) examined institutional isomorphism as support for crime analysis technologies and found support for normative isomorphism through the influence of accreditation and mimetic pressures because agencies indicated they consider the practices of other departments.

Organizations are faced with efficiency and legitimacy constraints that influence innovation adoption. Per contingency and diffusion theories, early adopters of organizational innovations are commonly driven by a desire to improve performance. Motivations for adoption change as new practices become infused with value beyond the technical requirements of the task at hand. As an innovation spreads, a threshold is reached beyond

which adoption provides legitimacy rather than improves performance (DiMaggio & Powell, 1983). Isomorphic change occurs because the innovation becomes institutionalized and the likelihood of adoption increases.

### *Leader Characteristics*

Adopting an innovation can be the direct result of managerial choice. The innovation approach implies that highly structured organizations, such as police departments operate within a framework of authority-driven innovation decisions (Rogers, 2003). Within this framework, decisions about whether to adopt or reject an innovation are made by a small number of individuals with authority, high status, or expertise within a system. To that end, top executives retain the power to make innovation-related decisions. The NIJ funded a study on the impact of technology on 21st-century policing strategies, which included an executive panel, a nationally representative survey, and in-depth site visits (Strom et al., 2017). The evidence suggests that police chiefs' and other senior staff's perspectives on new purchases and the role of technology influence acquisition and implementation. In most agencies visited during the study, it was clear that the police chief acted as the "gatekeeper" for new technology.

Generally, the fastest adoption rate of innovations stems from authority decisions (Rogers, 2003). Indeed, prior research indicates that some innovations (e.g., COP, POP, broken windows, hot spots, mandatory arrest for spouse assault, enhancement of internal discipline, external oversight, CompStat, and increased diversity of personnel) occurred from the top down or from the outside and were not the products of collaboration with the rank

and file (Bayley, 2008). Furthermore, in all but two cases (hotspots targeting[3] and CompStat), innovations were not instigated by the police themselves but were formulated by people outside and brought to the police for adoption. Here is another link between diffusion and institutional theories. While the agency's leadership makes the decisions whether to adopt or reject an innovation, those individuals are also subject to institutional pressures.

Attitude toward change is a diffusion variable that measures individual leader characteristics. This variable is frequently referred to as familiarity with technology or prior adoption of technology in research on policing innovation, suggesting that that concurrent or previous technology adoption may indicate a department's receptivity to new tools or practices. For instance, some police departments have a long history of being on the cutting edge and are constantly on the lookout for new developments and technologies. In addition, scholars have suggested that large agencies with pre-existing interests and expertise in related technologies are habitually early adopters of police technology (Weisburd & Lum, 2005; Chamard, 2006). According to Matusiak and King's (2021) findings, chiefs assess innovativeness based on novelty or newness and appear to classify innovativeness in terms of the utility innovations provide to organizational operations. Studies have shown that the adoption of new information technology is predicted by an agency's prior technological experience (Skogan & Harnett, 2005; Strom et al., 2018).

Charismatic individuals who champion an innovation can overcome resistance and influence innovation decisions. Additionally referred to as *opinion leaders*, they act as change

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[3] Bayley (2008) credits uniformed patrol officers with initiating hot spot policing, which was later institutionalized through the research of Lawrence Sherman and David Weisburd. According to Bayley, police have known for generations that crime and disorder are not evenly distributed across jurisdictions, as police pin maps illustrating crime clustering have been used since the inception of police stations.

agents, accelerating innovation diffusion through their advocacy and example (Rogers, 2003).

Willis et al. (2007) make a similar observation that "the emergence of an entrepreneurial

police leader in an internally visible police agency (the NYPD) generated strong incentives to

adopt CompStat" (p. 177). Innovation champions act as change agents that can steer an

organization in the desired direction (Rogers, 2003). For example, a focus group participant

recalled that a command staff member was particularly passionate about the advantages of

LPRs for crime control possibilities. The member encouraged their use, pushed the

technology through the organization, and sold the initially skeptical chief on use beyond a

stolen vehicle recovery tool (Willis et al., 2018). Thus, diffusion is influenced by social norms

and opinion leadership, or the capacity to influence others' attitudes or overt behavior.

*Professionalism*

From a diffusion theory perspective, organizational complexity concerns an

organization's collective knowledge and expertise and its level of professionalism as

evidenced by formal training. The breadth and diversity of an organization's knowledge base

foster creativity, increase awareness, and facilitate the cross-fertilization of ideas

(Damanpour & Schneider, 2006). To measure organizational complexity in innovation

studies, members' occupational specializations (functional differentiation) and levels of

formal education, training, and experience are frequently used.

Organizations with a high level of professional complexity are more likely to

innovate. Early adopters have higher formal education, intelligence, and rationality than late

adopters, and they are more oriented toward research and technology (Rogers, 2003).

Education promotes the adoption of innovative ideas, and one explanation is that individuals

with a high level of knowledge and competence value innovation and can understand

complicated technical concepts (Rogers, 2003). Officers with a four-year degree may have had more exposure to technology throughout their undergraduate programs, making them more open to new ideas (Willis & Mastrofski, 2011). As a result, the quality of resources, in this case educated officers, is positively correlated with the adoption of police innovation. Furthermore, greater financial strength enables the agency to offer higher annual base salaries to recruit innovators or more qualified, experienced chiefs.

While police chiefs were once commonly selected from within department ranks, there is a growing reliance on executive recruiters to locate quality candidates (Mastrofski & Willis, 2010). The greater the availability of technical resources, the easier it is to grasp new technical concepts and build and implement procedures for their acceptance and application. Thus, professionalism instills an appreciation for innovation, education, and training in organizational members, thereby influencing adoption decisions (Rogers, 2003).

There are several ways to assess law enforcement professionalism. Skogan and Hartnett (2005) discovered, for example, that agencies with a more significant percentage of college graduates are more likely to use information technology in their study of the adoption of a Chicago Police Department Data Warehouse by 122 local police departments in Illinois. Two police innovation studies that used education variables each employed a different measurement. Leong and Chan (2014) identified a link between web-based crime mapping and the amount of recruit training hours. Morabito (2010) discovered evidence supporting the idea that in-service training encourages community policing implementation. These indicators reflect the professionalism of an agency, and data for them are available through national administrative surveys such as LEMAS.

*Communication Behavior and Interconnectedness*

Communication is frequently cited as a critical component of diffusion theory; however, it is frequently overlooked in frameworks for studying innovation. Communication of information about an innovation's characteristics within the social system has a significant effect on its adoption rate. Rogers (2003) distinguishes two distinct modes of communication: localite versus cosmopolitan and interpersonal versus mass media. Earlier adopters have more social participation than later adopters, are more highly interconnected through interpersonal networks in their social system, and have more networks outside their system. Additionally, they travel extensively and engage in activities not limited by their local systems. Networks linking an individual with sources outside their local system are called cosmopolite communication channels (Rogers, 2003). This external perspective enables the adopter to incorporate innovations from a larger society into the local system. Thus, a cosmopolitan organization is constantly looking for new solutions outside of its established social system (Rogers, 2003), which is frequently referred to as *cosmopolitanism*, or the degree to which an organization is oriented outside of its established social system (Weiss, 1997). Earlier adopters are more cosmopolitan than later adopters, and their networks frequently extend beyond their organizational system (Rogers, 2003). Weiss (1997) evaluated cosmopolitanism using a measure of contact outside the organization and discovered that police involvement in policy communities resulted in innovation adoption and increased peer emulation.

Cosmopolitanism in law enforcement also includes interactions with academics and consultants, publishers or editors of journals and magazines, representatives from business firms, legislative staff members, legislators themselves, other elected officials, and lobbyists

(Maguire & King, 2004; Weiss, 1992), professional memberships or associations, accreditation, policy think tanks, conferences (Maguire & King, 2004), and listservs (Weisburd & Lum, 2005). According to Lum et al. (2016), agencies were influenced to buy LPRs through other law enforcement agencies (46%), a professional policing organization (20%), or LPR vendors (25%). White (2014b) also found that vendors served as a good source of information on tasers because company vendors attend national police conferences, support law enforcement leadership organizations, issues press releases, and publish studies to increase familiarity with innovations.

Professional associations and policy think tanks both stimulate the need for change and facilitate the adoption of innovation (Burruss & Giblin, 2009). Additionally, they receive the most attention because of their visibility; however, national police professional associations are underexamined as sources for promoting innovation (Willis & Mastrofski, 2011). Organizations most often included in police innovations research to measure cosmopolitan networks or professionalism are the Police Executive Research Forum (PERF), the International Association of Chiefs of Police (IACP), and the Commission on Accreditation for Law Enforcement Agencies (CALEA).

PERF is an independent research organization that focuses on critical issues in policing. Studies have shown that PERF agencies are pioneers in community policing and advanced information systems (Mastrofski et al., 2003; Skogan & Hartnett, 2006). Furthermore, PERF agencies represent an important and influential group of the nation's largest police forces[4] (Koper et al., 2009). For these reasons, PERF agencies may be more

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[4] https://www.policeforum.org/membership-eligibility

technologically advanced than many non-PERF agencies, and they may also serve as a good predictor of future trends in police technology use (Koper et al., 2009).

The IACP is a professional association for law enforcement worldwide, with more than 31,000 members in over 165 countries.[5] The IACP supports law enforcement through advocacy, outreach, education, and programs, all of which are made possible by the collective efforts of its members. Additionally, this organization provides resources and assistance to members in all facets of policy and operations. However, some have argued that because small community chiefs have the same voting power as major city chiefs, small-town chiefs have dominated officer elections, tend to be more conservative, and have alienated major city chiefs from the organization (Weiss, 1992).

CALEA is a non-governmental entity formed to oversee an agency accreditation process like officer certification. Being accredited by CALEA has been shown to help organizations overcome challenges in implementing innovation (Mastrofski et al., 2007). Professional associations support innovative practices in general, and past research has shown that membership or accreditation were indicators that an agency was part of the progressive network linking many police departments (Skogan & Hartnett, 2005).

Communication channels vary for earlier versus later adopters. Thus, the best methods to communicate new ideas to early and late adopters serve different purposes, such as knowledge creation versus persuading individuals to adopt new practices. Earlier adopters tend to learn basic information about innovations from mass media or from their greater exposure within their communication networks (Rogers, 2003). Early adopters can grasp

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[5] https://www.theiacp.org/about-iacp

abstract concepts and adopt new ideas when exposed to abstract stimuli generated by the media. For instance, the IACP publishes the monthly magazine *Police Chief*, which members of law enforcement read. Each issue and on its website, the magazine features a topics section on technology, research, and evidence-based policing, as well as innovative global policing initiatives.[6]

Individuals communicating with one another via interpersonal channels enable bidirectional information exchange. These networks are composed of other system members linked primarily through patterns of information exchange. Internal diffusion occurs because of the movement of information and influence within the adopting population. The term *interconnectedness* measures the degree to which the constituents of a social system are linked through interpersonal networks (Rogers, 2003) illustrated in Figure 2 below.
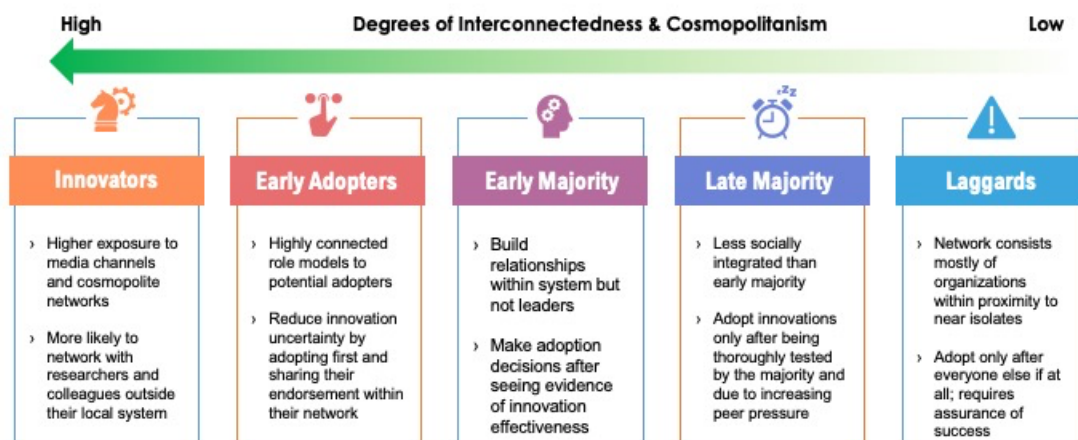


**Figure 2: Degrees of Interconnectedness and Cosmopolitanism of Adopter Categories**

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[6] www.policechiefmag.org

Instead of conducting rigorous scientific testing or reviewing the research literature, police officers are more likely to contact their colleagues in other departments to gather information (Lum et al., 2012; Weiss, 1997a). Indeed, employees who lack research skills are more likely to contact their peers (Weiss, 1997b). For example, Lum et al. (2012) found that three-quarters (76.9%) of the 523 Sacramento Police Department officers had not read any of the seven well-known academic and professional publications in the preceding six months; whereas most officers (46%) were more likely to have read the information provided by their own departments.

Additionally, there is a division of labor between those who conduct and those who study police work (Skogan et al., 2004). According to researchers, police rely on peer review rather than scientific research (Lum et al., 2012) because academic literature is methodologically sophisticated and is not read by line officers or is written in a style that is not easily transferable to the police workforce (Weisburd & Neyroud, 2011). Therefore, a sizable proportion of the population adopts an innovation based on the subjective assessment of others (early adopters) who are similar to them and have already done so (Rogers, 2003). This demonstrates the critical nature of understanding the existing communication channels within law enforcement. Utilizing these existing systems may aid in the dissemination and reception of information (Lum et al., 2012).

Another reason could be the nature of police organizations and the process of conducting "research" within them. While some larger organizations may have formal planning units and highly trained nonsworn employees skilled in research methods, these units are more likely to be staffed by sworn police officers without a background in research (Weiss, 1997b). Indeed, while we frequently learn about innovations through impersonal

media, we eventually adapt them after consulting with or observing someone we know, trust, or are regarded as an expert (Singhal & Dearing, 2006). Before acting independently, agencies should seek information and precedent from their peers, as using an established department with proven results saves time and money (ManTech, 2012). Thus, interpersonal channels are critical for developing or changing deeply entrenched attitudes like resistance or apathy, and the reason that peer communication is vital for later adopters who have more localite communication channels (Rogers, 2003).

The adoption process often follows a grapevine-like pattern from initial to potential adopters (Strang & Soule, 1998). To further illustrate police communication networks, DeGarmo (2012) applied Social Network Analysis (SNA) to Weiss' Communication of Innovation in Policing in the United States Study data (Weiss, 1997a). SNA allows researchers to examine relationships between individuals in social networks. The complexity and relationship of the social networks of 416 police agencies were illustrated using an Organization Risk Analyzer, leading to the conclusion that information spreads from one agency to another. The SNA diagrams show a clearly defined network between agencies that DeGarmo calls 'in-the-know' and 'out-of-the-know' or outliers in the communication network (DeGarmo, 2012, p. 458). These findings were consistent with those of Weiss (1998), who discovered that 89.7% of interagency communication occurs over the phone. DeGarmo argued that policing researchers should view police communication networks as highly complex systems rather than "fragmented or concerted" based on the SNA findings (DeGarmo, 2012, p. 461).

To better understand the role of police networks, Young and Ready (2015) examined whether officer communication within a department influenced officers' shared perceptions

of an innovation and whether this shared perception influenced implementation. They

suggest that framing BWCs as a legitimate tool for achieving departmental or personal goals

such as officer safety or reduced complaints will impact implementation. On the other hand,

if officers perceive the cameras as a managerial attempt to limit discretion and punish

officers for misconduct, they may resist using the technology, thereby undermining

departmental goals. The researchers create models of officer networks based on shared

incidents and then examine whether officer perceptions of BWCs as legitimate are related to

the other officers with whom they shared incidents. Their results showed a small correlation

of officers' legitimacy frames influencing other officers' views within their network.

Additionally, the findings indicate that officer perceptions may not be contingent on

hands-on experience with the devices and that exposure to shared events with other officers

equipped with cameras can influence attitudes. Finally, Young and Ready argue that

innovation champions may be advantageous at the start of implementation because they can

influence others' perceptions and translate departmental goals and potential costs and

benefits. However, the authors caution that negative experiences with the cameras may have

a detrimental "ripple effect" on other officers in the network (Young & Ready, 2015, p. 258).

The spread of innovations among police departments is aided by police managers'

communication networks, their tolerance for risk and liability concerns, peer emulation and

imitation, and the tendency of a department to adopt innovations. Information is shared as

officers interact within police workgroups while assigned to the same squad, work schedule,

shift, or precinct. Within these workgroups, officers are exposed to standard features of the

broader occupational and organizational environments, such as types of citizenries, crime

levels, and frontline supervision (Ingram et al., 2013). Officers communicate their

experiences as they interact and complete joint tasks, resulting in a shared understanding of various aspects of the job (Young & Ready, 2015), including how to cope with problems associated with their environments. Using interpersonal networks is efficient since information is received promptly, it does not have to be repeated, it is communicated at the appropriate level of sophistication, and peers endorse it. Police leaders will spread the innovation in and across agencies based on the assessment that the innovation worked and not because research confirmed the outcomes (Weisburd & Neyroud, 2011). Police often do not look to outside experts and prefer to receive information from their professional peers (Mastrofski & Willis, 2010; Weiss, 1997b). For instance, word-of-mouth support from other law enforcement organizations was almost certainly a significant factor in the spread of LPRs (Lum et al., 2016). However, police organizations freely share in-house information and allow outsiders to observe routine operations (Skogan et al., 2004).

Some partnerships are informal and based on good faith, while others are more formal (Maguire & King, 2004). As an example, task forces are frequently made up of people with varying levels of training, differing perspectives on how to approach a problem, and who come from a variety of organizational cultures (Maguire & King, 2004). The primary purpose of task forces is to address a pressing issue that extends beyond the traditional jurisdictions of agencies and takes the form of a new organization comprised of officers from other agencies. It has been suggested that the degree to which these units are connected through information exchanges within their networks positively affects their innovative capacity (Rogers, 2003). Therefore, it is natural for individuals and organizations to develop relationships with others who share similar social characteristics in their immediate vicinity.

The isomorphic change perspective complements connectedness for later adopters in diffusion theory. The reliance on network partner communication for adoption experiences suggests that modeling and imitation are central to diffusion (Rogers, 2003). For law enforcement, the later adopters rely on the subjective evaluations of innovations from the earlier adopters within their communication channels. Police motivation may stem from peer pressure to conform or simply because a recommendation from another police department lends credibility to the innovation (Weiss, 1997b). Others see a form of competition or requirement to "keep up with the Joneses" because they cannot afford to fall behind (Strang & Soule, 1998).

Weiss (1998) identified peer emulation as an indirect effect of cosmopolitanism, owing to the proclivity of networked organizations to actively gather information about and emulate the success of other police departments. If the best players are doing it, it must be the best strategy; hence the actions of larger or more prestigious organizations are emulated to appear modern (Byrne & Marx, 2011). In other words, agencies model themselves after other organizations they view as successful or to court legitimacy and enhance standing among peers (M. H. Moore, 2003). Over time, organizations begin to resemble one another as external pressures compel them to perform specific actions to maintain legitimacy, and they choose from the available options as seen by their peers (DiMaggio & Powell, 1983). Except for the most daring and cautious, prospective adopters reflect the attitudes and values associated with the networks or systems they belong to (Dearing & Meyer, 2006).

This section discussed the characteristics of the individual leader, professionalism, and organizational communication behaviors from a diffusion theory perspective. Earlier adopters are more interconnected within their networks. As highly respected role models

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they influence innovation diffusion with their assessments of innovations. The next section examines environmental variables identified in the diffusion, organizational, and social disorganization literature.

**Environmental Context**

Diffusion theory divides known external influences on innovation into two categories. The first is the degree to which members of the organization interact, as previously described, and the second is the organization's environment. External contextual elements pertain to the adoption environment, which encompasses both the organization and its immediate surroundings. Weak control over external constituents is a consequence of the adversarial nature of many police interactions with other entities (Klinger, 2004). As a result, the tasks that police perform and the entities with which they interact all have the potential to influence police actions, policies, and innovation. Although contextual factors are beyond the adopter's immediate control, they significantly impact the innovation adoption process (Damanpour & Schneider, 2006; Klinger, 2003).

Examples of external characteristics from innovations research include geographical settings, socioeconomic factors, political conditions, and cultural context (Damanpour & Schneider, 2006; Wejnert, 2002), and are listed below in Table 1. Neighborhood characteristics like socioeconomic status, racial heterogeneity, and residential instability indicate areas where residents are unable to form the important social relationships required to informally regulate crime and disorder. In turn, a lack of social control contributes to the emergence of community crime.

These contextual factors influence the innovation's feasibility and benefits and the adopter's willingness and ability to adopt it (James, 1993). Langworthy (1986) and Maguire

(2003) used the term "environmental complexity" to describe how police organizations adapt

their structures to meet the varying needs of a diverse client base in highly complex social

environments. Environmental complexity is a theoretical construct that is difficult to

measure but can be estimated using a combination of quantifiable community characteristics

such as racial diversity, education, and economy within a given area.

**Table 1: Environmental Conditions for Analysis**

| Geographical Settings | Socioeconomic Factors | Political Conditions | Cultural Demands & Constraints |
|---|---|---|---|
| Region | Representation<br>Residential Stability<br>Income Inequality<br>Unemployment<br>Poverty | Political Affiliation<br>Collective Bargaining | Crime Rate<br>Citizen Complaints<br>Officer Assaults<br>Use of force Incidents |

External institutions such as insurance companies, health and welfare organizations,

schools, vendors, courts, and local governments gradually shape law enforcement agencies.

Thus, external forces can either enhance or limit an organization's capacity for innovation.

Increased external control, for example, has a detrimental effect on the delegation of

authority in public institutions. As a result, bureaucratic control tightens and stifles

innovation (Damanpour, 1991). Thus, police innovation is influenced by the cultural

characteristics of their environments, which also affect decision-making, organizational goal

prioritization, and an organization's capacity to adapt (Willis et al., 2007). Consequently,

criminal justice scholars have begun to incorporate environmental variables such as crime

rates, political ideologies, and citizen complaints into their analyses of innovation diffusion.

As formal organizations tasked with cultivating relationships with external stakeholders, the

theoretical framework used to evaluate police innovation should involve a sociological

perspective (Klinger, 2004).

*Socioeconomic Factors*

Quantitative studies on police innovation frequently refer to Langworthy (1986),

Maguire (2003), and social disorganization theory to develop measures of environmental

complexity. Social disorganization concerns the relationship between a community's

socioeconomic structure, social control, and crime. According to research, crime is dispersed

across neighborhoods and is concentrated in areas afflicted by adverse conditions such as

residential instability, income inequality, unemployment, and poverty (Lowenkamp et al.,

2003; Sampson, 1985; Sampson & Groves, 1989; Shaw & McKay, 1972). These

characteristics are generally reliable indicators of a weakened community infrastructure over

time.

Individuals and institutions within communities, including family, peers, religious

organizations, schools, and workplaces, exercise social control to maintain conformity with

society's established norms and rules (Sampson & Groves, 1989). Social ties and informal

control are thought to mitigate the effects of external sources of social disorganization (e.g.,

poverty, residential mobility, and racial heterogeneity) on neighborhood crime (Kubrin &

Weitzer, 2003). According to Hirchi's (2002) description of control theory, individuals do

not commit crimes when they are attached to, committed to, involved in, and subscribed to

society's beliefs. Keeping everything else constant, a person who lacks work, family, or other

responsibilities is more likely to run afoul of the law (Black, 1976). Without attachment

(Hirschi, 2002), "the truant, migrant, or friendless, and the product of a broken home" all

have a greater motivation to engage in deviant behavior (Black, 1976, p. 54). These factors

weaken a neighborhood's ability to regulate public behavior, thereby increasing the probability of crime.

Considering these theories, numerous studies have attempted to measure social disorganization to assess the theory's validity (Sampson & Groves, 1993). Furthermore, these studies show that social disorder in communities, which is caused by a set of underlying socioeconomic conditions, can lead to a perception of a need for more supervision, thereby influencing the adoption of innovations as solutions to this problem (Morabito, 2010; Kubrin & Weitzer, 2003; Schuck, 2017; Skogan & Hartnett, 2005; Zhao, 1996). Therefore, the general assumption is that because innovations are adopted in response to local problems caused by socioeconomic conditions, the police innovation adoption rate in communities with more problems should be higher (Zhao, 1996).

Damanpour and Schneider (2006) measured urbanization, community wealth, population growth, and the unemployment rate to determine the adoption of administrative innovations in public organizations. The authors proposed that urbanization has a beneficial effect on innovation adoption. Generally, urban areas are larger and have more resources. Additionally, urban areas face more complex problems than rural areas, and increased environmental complexity results in more specialized and interconnected organizational structures, stimulating more significant innovation and change.

Community context can interact with innovation unpredictably. On the one hand, more heterogenous environments can stimulate innovation, with large organizations being more responsive to environmental pressures and changes (Rogers, 2003). On the other hand, complex environments can hamper the ability of organizations to focus on innovation, hinder communication between organizations and constrain the adoption of innovations.

Studies have also focused on the relationship between racial heterogeneity in communities and the racial composition of local police departments. In theory, groups that do not have access to the political process may resort to violence to achieve their objectives and protest injustice (Barrick et al., 2014). Instead, if the composition of the local police department reflects the racial makeup of the community it serves, there may be a greater level of understanding between the police and the community. This is known as representation.

Hendrix et al. (2018) examined whether police-community racial asymmetry increased the use of surveillance technology (unmanned aerial vehicles [UAVs] and CCTV) to monitor what the police perceived to be problem segments in the community. They discovered that, on average, those sample agencies underrepresented minority groups in their communities and that Black asymmetry (defined as the ratio of full-time Black officers to Black residents in the population served) was a negative statistically significant predictor of CCTV and UAV use. The odds of using CCTVs decreased by 51% with each incremental increase in the scale, while the odds of using UAVs decreased by 41%. This indicates that agencies with officers who more closely reflect the community's racial composition were less likely to use CCTV or UAV surveillance technology.

### Political Conditions

Police departments adopt innovations in response to external political pressures (Zhao, 1996; Zhao et al., 2010). The political climate is the general or collective view of the populace regarding a particular issue or problem (Schuck, 2017). In general, liberal political ideologies are correlated with greater concern for privacy and civil liberties, whereas conservative ideologies are correlated with support for law enforcement (Schuck, 2017).

Political conditions include national policies, government structure, political character, political-corporate-social groups, and forms of government such as city manager or mayor (Morabito, 2008). The presence of set districts and the type of government were significant predictors of community policing adoption, indicating that police have complex relationships with their government officials (Morabito, 2008). Greater intelligence-led policing adoption was associated with a healthy relationship between the local government and the police (Darroch & Mazerolle, 2015).

Localization is an essential aspect of U.S. policing; as a result, local political culture can influence police agencies (Zhao, 1996). Specifically, sheriffs are elected officials who must contend with a different political environment than police chiefs (Morabito, 2008). In this sense, sheriffs likely have a greater awareness of community sovereigns, particularly when seeking re-election.

In their study of agencies of all sizes that received a COPS grant between 1993 and 2012, Gayadeen and Phillips (2014) discovered, among other things, that federal politics can also play a critical role in the diffusion of innovation. These grants stemmed from Clinton's 1992 presidential campaign's efforts to combat crime in the United States. Motivated by political promises, the COPS Office established monetary incentive programs and streamlined the federal grant application process, thereby increasing access to grants. These financial incentives accelerated the spread of community policing initiatives throughout the country.

Unions have an important role in policing, and especially the larger agencies because they engage in collective bargaining to negotiate conditions such as salary, benefits, promotions, and disciplinary procedures (Morabito, 2008). According to Morabito (2014),

police unions should be considered in a dual role as internal and external actors. They are internal entities because they represent the local constituency of the officers within the police agency, but they are often tied to national networks and gather information from national outlets. Therefore, they could recognize the value of new innovations and could affect adoption. Investigations have found that unionization affects the ability of municipal employees to wield influence over local politicians regarding wages, job security, and general employment issues (Morabito, 2008). Unions are found nationwide in 41% of local police departments that employ 71% of all officers (BJS, 2006).

Relatively few innovation studies examine the influence of police unions on innovation adoption. The most innovation occurs within large departments which are also more likely to be unionized. Almost all published articles express the opinion that police unions negatively impact innovation, accountability, and police-community relations (Walker, 2008). Studies indicate that police employee associations are obstacles to police management and policy, limit the ability of police chiefs to implement widespread organizational reforms (Maguire, 2003), are barriers to innovation and change (Walker, 2008), and oppose the adoption of technologies that limit officers' discretion (Schuck, 2017). Indeed, police unions have negotiated generous pay packages for their members and have proven to be formidable opponents in often contentious and confrontational relationships with police administrators (Nolan, 2018). "Because of union contracts, civil service requirements, state and federal regulatory bodies, courts, governing charters, and special police boards (to name a few), police chiefs are quite constrained in altering fundamental aspects of their organization" (Mastrofski, 1994, p. 247).

Measuring the relationship between union presence and the adoption of community policing, Morabito (2014) concluded that union presence does affect implementation. Surprisingly, her results showed a positive correlation that held when controlling for regional differences. This finding contradicts previous research that suggested police officers are resistant to changes in their traditional work. Morabito suggests that a possible explanation for this result might be that a perceived crisis created the need for innovation to "battle poor public image" and this could have influenced the police unions too (p. 779). It is possible, therefore, that unions "could act as a stabilizing force in an environment of frequent leadership changes in both the organization and local politics" (p. 779). Morabito points out that unions could also be gathering information from national sources and therefore have a dual role in providing local and national influence on the police.

### *Community Demands and Constraints*

For police organizations as public service organizations, the different stakeholders in their environment (political, civic, third-party) all shape police organizations in different ways (Maguire, 2003). As previously discussed, the interaction between police, courts, citizens, and special interest groups may have a strong effect on the adoption process. Community demands and pressures such as police-community contacts, crime rates, and citizen complaints are also characteristics of the environments in which police organizations operate (Archbold & Maguire, 2002). For example, agencies that are under pressure to reduce crime, improve officer conduct, or ensure officer safety, will be more likely to adopt innovations. As postulated by structural contingency theory, these pressures can influence police innovation as a means of performing more effectively or for enhancing their institutional legitimacy in the eyes of the communities they serve per institutional theory.

The character of police-community contact is an important force shaping public behavior toward law enforcement. Renewed societal interest in more transparency and accountability should matter to law enforcement agencies, especially if they want the public to perceive their organizations and actions are legitimate. Perceived legitimacy is central to the exercise of authority, and it stems from a perception that police actions are fair and just according to local values, which in turn, enhances police-community relations (Tyler, 2004; Tyler, Callahan, & Frost, 2007). It is difficult and unsustainable to gain compliance just by threat or use of force; therefore, police need citizens to choose to be compliant. Voluntary public support affords police the ability to focus limited resources on tougher problems (Tyler, 2004). This happens because of perceived legitimacy in the rules and those holding the power not just because they have the power.

Through personal experiences with police, citizens make judgments as to how police exercise their authority. As a social transaction, the police-citizen encounter is affected by a citizen's social status (e.g., gender, age, race, class) and role (e.g., as a complainant, suspect, witness, etc.) (Worden et al., 2021). Citizens are more willing to cooperate with police they deem use fair procedures, make unbiased decisions, allow citizens a voice, and respectful treatment (Tyler, 2004).

Keeping a positive image of the police has never been easy. Due to the nature of the work, individual officers are frequently placed in dangerous situations that necessitate the use of force. This distinguishing feature of law enforcement enables increased public scrutiny of how individual officers carry out their responsibilities (Archbold & Maguire, 2002). Citizen perceptions of police are a critical indicator of the institution's support in the community (Gallagher et al., 2001), and in the eyes of the public, perception is reality. There is evidence

that public confidence in law enforcement has waned since 1996. Confidence increased in 2001 following 9/11, but then declined in 2007, 2014, and 2020. (James et al., 2020). This is concerning because police require public acceptance of their authority and public confidence to maintain order (Maxson et al., 2003). External pressures such as public opinion can influence police practices and the adoption of new technologies.

Previous research indicates that citizen characteristics, neighborhood characteristics, the nature of recent police contact, and mass media coverage of police and crime all influence individual and public perceptions of police. Individuals' confidence in the police varies according to their age, education level, gender, political ideology, and race. For example, whites are more likely than non-whites to express a "great deal" or "quite a lot" of confidence in the police (McCarthy, 2019). The level of confidence in the police also varies significantly among conservative, moderate, and liberal constituents. Conservatives were more confident in the police than moderates or liberals (75% versus 46% versus 33%) (McCarthy, 2019).

According to one theory, because individuals with varying characteristics have varying experiences with police, their opinions are grounded in the objective reality of those experiences. Another theory is that people from various backgrounds have varying expectations or standards for law enforcement (Gallagher et al., 2001). Over time, the variability of these characteristics is generally constant. An earlier meta-analysis of publicly available national and international police image surveys revealed that older, white, and wealthier citizens are more satisfied with the police than younger, black, and poorer citizens (Gallagher et al., 2001).

Along with the frequency and nature of police contact with the community, citizens' perceptions of law enforcement are shaped by the outcomes produced by police and the processes that result in these outcomes (Lerman & Weaver, 2014). Public support for police officers appears to wane because of citizens' perceptions of unjust practices such as racial discrimination or excessive force (Fagan & Davies, 2000; Gould & Mastrofski, 2004). This has the potential to incentivize political disengagement (Lerman & Weaver, 2014). For example, speed cameras are widely used to capture images of drivers who exceed the posted speed limit to maintain traffic safety (Kearon, 2013). These relatively common instances of "ordinary," self-described "law-abiding" citizens being increasingly subjected to police surveillance have a greater negative effect on public confidence than images of disorder and violence, because citizens perceive this treatment as unjust or excessive (Kearon, 2013).

Citizen perception studies indicate that negative contact carries more weight than positive contact in the court of public opinion, because citizens are more focused on the negative aspects of police behavior, such as disrespect, rudeness, or harassment (Lerman & Weaver, 2014; Skogan, 2006). However, findings from a randomized controlled field test indicate that police officers can overcome negative perceptions. According to Mazerolle et al. (2013), positive encounters with officers increased respondents' positive attitudes toward police in general, resulting in increased satisfaction with police and a greater likelihood of cooperation. Informal interactions with police can mitigate the negative impact of formal interactions, such as being questioned or arrested (Maxon et al., 2003). Similarly, Maxson et al. (2003) concluded that informal contacts such as attendance at community meetings and neighborhood visibility can help improve public opinion, even when residents perceive their neighborhoods as crime-ridden, dangerous, and disorderly. Thus, in the face of public

criticism, law enforcement can foster positive public perceptions through increased informal contacts and procedurally just and unbiased practices.

Environmental factors such as high demand can spur innovation but can also result in avoidance and efforts to harden organizational boundaries to meet demand (Rogers, 2003). Demand for public services has a significant impact on the behavior of police officers. Increased demands might make police officers defensive, leading in the formation of more complicated and formalized institutions (Maguire, 2003; Wells et al., 2003). Officers may perceive themselves to be overloaded because of the increased demand for police services. This sense of pressure may cause officers to act defensively, determining the types of simplifications and shortcuts they employ (Lipsky, 1980, Wells et al., 2003). Officers' perceptions of an excessive workload may prompt them to reject innovation merely because it looks to add too much work to their already-heavy plate (Darroch & Mazerolle, 2015).

One of the police's key responsibilities is that of a crime fighter. Throughout the 1960s, the government, research, and media concentrated on the inability of traditional enforcement to handle the problems posed by crime, which was one of the motivators for the early attempts of community policing (IACP, 2004; Wilson, 2005; Zhao, 1996). Even while community policing programs propose that several social service duties should also be considered key police functions, crime control and prevention remain a primary police role. Crime-related measures such as reported offenses, total arrests, clearance rates, and response times continue to be the primary criteria used to evaluate police effectiveness. Police departments serving jurisdictions with higher crime rates are more likely to feel compelled to improve crime control and prevention methods than other departments without higher crime rates.

Perhaps organizations respond rationally to environmental pressures such as crime by inventing and adopting innovative approaches of reducing crime (Burruss & Giblin, 2014). In theory, organizations under public or internal pressure to solve or reduce crime, hold officers accountable for misconduct, or address concerns about officer safety are more inclined to implement innovations ostensibly designed to assist in accomplishing these objectives (Bingham, 1976; Schuck, 2017). Recent research has examined whether these variables correlate with BWC adoption, as higher rates may suggest increased pressure to adopt the innovation. However, organizational study evidence is contradictory, at least in terms of any relationship between external characteristics and police safety or use of force (Nix, Campbell, Byers, & Alpert, 2017).

Burruss and Giblin (2014) postulated that an increased perception of crime would enhance community policing uptake. They quantified police perceptions of rising crime by categorizing survey responses as extremely influential, somewhat influential, or not at all influential. They found a positive and significant effect, but it was the model's weakest predictor when compared to institutional pressures such as familiarity with innovation, publications, and professionalism.

The adoption of new technologies is generally predicted by prior technological experience. Thus, prior camera adoptions could provide insight into future BWC adoption. This next section discusses police use of advanced surveillance camera technology, including Closed-Circuit Television (CCTV), License Plate Readers (LPRs), dashboard cameras, handheld cameras, and mobile cameras. As we come to the end of the chapter, we examine the emergence of BWCs and evaluations of their diffusion.

# CHAPTER THREE

Law enforcement has a long history of innovation adoption. Research indicates that the telephone, two-way radio, and automobile contributed to the first technological revolution in law enforcement, and these technological advancements shifted police work from beat officers localized in neighborhoods toward a reactive strategy of patrol policing (Brantingham & Uchida, 2021; C. J. Harris, 2007; Manning, 1992; Reiss, 1992). For example, motorized patrols increased coverage in the city, and two-way radios promoted communication between officers and sergeants (Uchida, 2021). In addition, telephones allowed citizens to make direct contact with police officers. As a result, police officers became more responsive to calls for service. These advancements provided law enforcement with numerous new capabilities, and the goal of rapid response to citizen calls for service became the service model. The decentralized command structure of walking beats and station houses was phased out in favor of area commands, resulting in dramatic changes to the internal structures of police organizations (Maguire, 2003). Consequently, these technological advancements primarily resulted in the territorial centralization of U.S. law enforcement agencies (Maguire, 1997; Reiss, 1992).

Organizational and population changes typically occur incrementally, whereas new organizations and industries emerge during periods of rapid and discontinuous change (Scott & Davis, 2007). Joseph Schumpeter, an institutional economist, coined the term "creative destruction" in 1961 to refer to how new technologies result in significant change. For example, in traditional policing, officers walked beats or rode horses; however, the invention of automobiles displaced these methods, as the patrol car with a single officer could handle

several walking beats (Reiss, 1992). The theory of creative destruction implies that more advanced technology will eventually supplant and render obsolete what we currently consider to be cutting-edge technology. According to Schumpeter's ideas, researchers have distinguished two types of technological innovations: those that enhance an organization's competence and those that destroy it, in the sense that traditional ways of doing work are not improved but replaced by new technologies (Scott & Davis, 2007).

This chapter examines police use of advanced surveillance cameras, such as CCTV and LPRs, as well as dashboard, handheld, and weapon-mounted cameras, all of which may have influenced early BWC adoption. To begin, these prior camera technology adoptions are analyzed to assess adoption trends. It delves into the factors that influence technology adoption, implementation challenges, diffusion, and limitations of each of the camera technologies. Second, the early BWC trials are examined to gain a better understanding of the interests and experiences of early BWC adopters. Thirdly, a review of the few studies that have looked at some of the internal and environmental factors predicted to influence BWC adoption and diffusion. The chapter concludes by identifying gaps in the current state of research, as well as the research questions and hypotheses for this study.

## Police and Camera Technology

Is this new technology going to be transformative and displace previous innovations such as the dashboard camera, or will it be a more gradual evolution that supplements police work? Numerous stakeholder groups believe BWCs have the potential to transform policing. In 2013, Judge Scheindlin of the U.S. District Court for the District of Manhattan became a prominent supporter of BWCs. Judge Scheindlin determined that the New York City Police Department's stop-and-frisk policies constituted racial profiling and violated the rights of

minorities and ordered the department to conduct a pilot program in select precincts to evaluate the cameras' use (*Floyd v. City of New York*, 2013). Judge Scheindlin (2015) later explains that witness credibility is a critical deciding factor in every case of police misconduct and excessive force. She believes that officers will become less aggressive, respectful, and hesitant to use force unless necessary. While Scheindlin acknowledges concerns about privacy and accuracy, she argues that these concerns will be outweighed by the reduction in civilian complaints and officer use of force, as well as the "unbiased account of events" provided by a camera with "no motive to lie and no stake in the outcome" (p. 26).

Some have argued that despite the fact that citizen footage has increasingly demonstrated police misconduct, it has not resulted in the convictions of the involved officers. Concerning BWCs, the question is whether the footage will serve the purposes for which citizens advocate them. Some have asserted that police footage from other sources has not always fulfilled its intended purpose, as there have been examples of police withholding dashboard camera evidence from the prosecution. Also, that other reforms have been beneficial to police in lieu of discouraging misconduct.

On the other hand, Manning (2003) argues that there is limited evidence that over thirty years of funding technological innovation has resulted in significant changes in police practice or effectiveness. Moreover, agencies often reinvent past innovations for new purposes (Willis et al., 2018), stop replacing outdated or inoperable technology (Schuck, 2017), or discontinue programs when innovations fail to meet expectations (Koen et al., 2021).

Law enforcement has a long history of interest in technical innovations, as indicated by their desire to integrate technologies that enable them to accomplish their tasks more

efficiently and effectively (Harris, 2007; Maguire & King, 2004). As a result, numerous surveillance technologies, including CCTV (Hier, 2004), LPRs (Lum et al., 2016), tasers (White, 2014b), and BWCs, have been rapidly adopted (Nix et al., 2020). In 2003, 60% of state and local police departments and 66% of sheriff's offices routinely used video cameras, most frequently in patrol cars (55% and 58%), followed by fixed-site (14% and 19%), traffic enforcement (11% and 10%), and mobile surveillance (8% and 11%) (Hickman & Reaves, 2006a, 2006b). Additionally, some agencies equipped officers' uniforms with cameras (Koper et al., 2009). However, surprisingly little is known about how and why particular innovations are adopted. Thus, before evaluating BWC adoption, it is crucial to evaluate earlier surveillance camera adoption, as well as the contexts for adoption, implementation challenges, and diffusion throughout U.S. police.

**Closed-Circuit Televisions**

CCTV systems were the first surveillance technology with a documented impact on reducing crime. As a type of formal surveillance, CCTVs supplement or replace security personnel's efforts to monitor public places to deter crime and promote public safety (Clarke, 1997) and are used by law enforcement as a force multiplier (Welsh & Farrington, 2008). Drawing from deterrence theory, this surveillance method is often used as a situational crime prevention tool. By increasing the perception that criminals will inevitably be caught, criminal activity becomes less appealing to offenders to reduce crime (Clarke, 1997).

CCTV has proven more effective at reducing property crimes, such as car theft and vandalism, when combined with street lighting as a form of natural surveillance (Welsh & Farrington, 2004, 2008) or directed patrol (Piza et al., 2015). These results were initially

limited to parking lots or garages and were more effective in the United Kingdom than in the United States at reducing crime (Welsh & Farrington, 2008). Researchers have suggested this may be due to more concern over privacy rights in the US and acceptance of surveillance by British citizens. Although early results were limited, proponents of the advancement championed the camera systems as a panacea for all crime problems (Piza et al., 2015).

As a result of this unwavering faith in the power of technology, CCTVs were initially accepted and quickly spread across the country (Hier, 2004). According to an IACP survey of 200 law enforcement agencies conducted in 2000, 80% of agencies used CCTV, and another 10% planned to use it in the future (IACP, 2001). Among the top three applications of CCTV, the results showed that police vehicles, interrogation rooms, and government facilities were the most common. Additional applications of CCTV included investigative assistance (63%), evidence gathering (54%), and crime reduction (20%).

Despite CCTV's widespread adoption, evidence of the innovation's effectiveness is rarely a significant factor in the adoption decision (Byrne & Marx, 2011). Indeed, the IACP survey found that 96% of respondents did not use any measurement system to determine the effectiveness of CCTV in reducing crime. Nonetheless, when asked about the effectiveness of CCTV, respondents indicated a reduction in frivolous lawsuits, a reduction in the number of officers required to conduct surveillance in public areas, protection against allegations of abuse or coercion during interrogation procedures, and decreased court time for officers.

Several agencies reported that officers were hesitant to use CCTV while performing their duties and that evaluating recorded materials took an inordinate amount of time.

Initially, CCTV and handheld video applications were quite limited, discouraging a more widespread use of video evidence (Goodall, 2007). For instance, the image quality was frequently insufficient to identify suspects and witnesses positively, rendering the images ineffective as evidence in court proceedings (La Vigne et al., 2011). Additionally, the tension on the tape causes damage with each play, and when digital images are exported from surveillance systems, critical details are lost (Lewis, 2004). Furthermore, costs were a significant impediment to future acquisition and use (Schwabe et al., 2001). Due to the limitations of these cameras, which include their static nature, poor image quality, and lack of audio capabilities, new forms of video technology have emerged, forcing some agencies to choose between upgrading and innovating.

**License Plate Readers**

LPRs are another example of a police surveillance technology that gained widespread acceptance. Between 2007 and 2014, the adoption of LPR increased threefold to 59% (Lum et al., 2016). LPRs can be fixed while secured to a utility pole or mobilized while attached to a patrol car (Willis et al., 2018) and operate as single-purpose CCTV cameras (Skogan, 2019) that scan license plates and compare them to databases of vehicles associated with specific crimes and offenders (Lum et al., 2010). Among the plates of interest are those associated with moving violations, parking violations, theft, and those whose registered owners have outstanding warrants or are wanted by police (Lum et al., 2016). Police can scan up to 1,000 license plates per minute using these small, high-speed cameras (Skogan, 2019), thereby automating routine tasks such as identifying stolen vehicles and monitoring vehicle movements (Koper et al., 2013).

Given these characteristics, LPRs can improve police efficiency, and they have been considered a force multiplier by many law enforcement agencies engaged in crime prevention and homeland security initiatives (Lum et al., 2016). For example, in Mesa, Arizona, Koper et al. (2013) observed that LPRs increased the number of plates scanned compared to manual checking and increased the number of hits, arrests, and recoveries for stolen vehicles. In addition, LPRs may also assist criminal investigators by providing information about the vehicles present at the scene of a crime (Koper et al., 2013). Furthermore, LPRs minimize the reliance on individual officer discretion to identify suspicious vehicles. Therefore, vehicle tracking systems may assist law enforcement in increasing vehicle recovery, apprehending vehicle thieves, and resolving criminal investigations (Taylor et al., 2011).

Like CCTV units, LPRs can assist in reducing crime by serving as a deterrent and aiding in the apprehension of offenders; however, there is little evidence that use results in reduced crime. Crime reduction in auto theft hot spots was not observed during the measurement periods in the first two randomized controlled trials (RCTs) to examine LPR effectiveness. Lum et al. (2010) assessed the effects of general and specific deterrence on auto-related crimes in two jurisdictions in Northern Virginia. Similarly, Taylor et al. (2011) examined the impact of LPRs on vehicle theft in Mesa, Arizona. The results from both studies did not indicate that crime rates or auto thefts were reduced during the experiment measurement period. These two studies have concluded that automatic LPR scanning is significantly more efficient than manual plate recording and information retrieval from patrol cars but not statistically more effective. Both studies, however, ascribed these findings to a lack of intervention intensity or ineffectiveness. Nonetheless, results from a 2007 survey

of Police Executive Research Forum (PERF) members indicated that 38% of the agencies

had LPRs, and 62.5% found the technology very effective (Koper et a., 2009).[7]

Each device costs between $20,000 and $25,000 (Koper et al., 2013; Taylor et al.,

2011b, 2011a), which may inhibit technology adoption, mainly if the technology is used

exclusively to detect stolen vehicles. In fact, according to a national survey on the use of

LPRs, officers cited the high cost and the need to prioritize other technologies as the main

reasons they did not implement LPRs (Lum et al., 2016). Interestingly, Lum et al., 2016

found that having fewer marked cars per officer was associated with having LPRs. Thus,

agencies with fewer patrol cars to outfit may find that the initial purchase of the LPRs is

more economically feasible.

**Dashboard Cameras**

Police dashboard cameras also referred to as in-car cameras or in-car video systems,

have spread slowly and gradually. These analog systems (videotapes) evolved from security

systems for buildings, which were then adapted for vehicle use (Kuboviak, 2004). Although

police began experimenting with cameras in the 1960s (Westphal, 2004), the perception of a

widespread drunk driving problem in the 1980s prompted increased use of vehicle cameras

by law enforcement. As a result, dashboard cameras were increasingly used to record

interactions with suspected drunk drivers, from the initial encounter to the field sobriety test,

to provide supporting evidence for a conviction (IACP, 2004, 2019). The initial success of

the cameras led Mothers Against Drunk Driving (MADD) and a few insurance companies to

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[7] Koper et al. (2009) qualify their findings by stating that because the survey format did not specify the definition of efficacy, replies indicating that technology was effective could have meant that it performed as planned, significantly enhanced operations, or a combination of the two.

invest in camera systems for police departments (Depalma, 2016; IACP, 2004). Over time, agencies realized those dashboard cameras also offered additional advantages, including reduced court time, enhanced evidence collection, fewer frivolous lawsuits, and a higher likelihood of successful prosecution (IACP, 2004).

Officers' initial reactions were negative, fearful that the cameras were being used to spy on them. A long-standing resentment against external scrutiny is a cultural value in policing, and this frequently results in resistance to innovation. However, after the untimely death of a Texas police officer was captured on video by a camera in his patrol car, the systems came to be recognized as an essential tool in policing. During the early hours of January 1991, Constable Darrell Lunsford stopped a suspicious vehicle while on patrol (Depalma, 2016; IACP, 2004). He activated his dashboard camera and approached the vehicle, only to be overtaken by three male passengers (Depalma, 2016; SeaSkate, Inc, 1998). The three men stabbed and beat Lunsford before fatally shooting him in the neck. The video footage obtained by the camera in his patrol car provided the only evidence of the murder, which resulted in the arrest of the three perpetrators later that night and their subsequent convictions (IACP, 2004; SeaSkate, Inc, 1998). As a result, police officers throughout the country began to view cameras as integral components of their safety (IACP, 2004).

Vehicle cameras were recognized as a valuable tool for increasing officer safety on the highways, enhancing written evidence, and resolving public concerns about racial profiling (IACP, 2004). According to the IACP (2004), officer perception of safety is one of the most significant benefits of the vehicle camera. Through written surveys and in-person interviews with 3,585 officers, the impacts study determined that one-third (33%) of officers perceived an increased sense of safety when using the cameras. This metric was significantly

associated with officers who had received in-car camera training, as they were more likely to report that the cameras increased their sense of security on the job. Notably, 77% of officers reported receiving no training or receiving less than four hours of training.

In the late 1990s, officer safety and racial profiling became serious law enforcement issues, as officers were increasingly assaulted or became victims on the highway and public outrage grew over perceived racial profiling (IACP, 2004). The Office of Community-Oriented Policing (COPS) believed that installing vehicle cameras would deter assaults and improve officer safety and recording audio and video of interactions between police and community members would aid in the investigation of complaints about police racial profiling (IACP, 2004). Therefore, the federal and state governments enacted legislation requiring police officers to record traffic stops in response.

Dashboard cameras were initially envisioned as a silent partner for individual officers on patrol (Atkinson et al., 1999) and a silent witness that recounts the story without forgetting any details (Lewis, 2004). However, the cameras were prohibitively expensive, at least $5,900 per unit. As a result, the COPS Office established the In-Car Initiative Program in 2000 to assist law enforcement agencies in acquiring vehicle cameras. Between 2000 and 2005, the program invested over $21 million in grants to help with the acquisition of over 5,000 cameras (IACP, 2004), and by 2004, approximately 72% of state police and highway patrol vehicles were equipped with in-car cameras (IACP, 2004). In 2003, 54% of local police departments in counties with a population of at least 250,000 used them, up from 34% in 2000 (Hickman & Reaves, 2006a, 2006b).

The dashboard camera offered more mobility at a less expensive cost than stationary video surveillance systems. However, cameras became smaller and lighter as technology

progressed, allowing for the ability to record public interactions such as service calls, foot or

bicycle patrols, and emergency responses. Administrators face difficult choices regarding

purchasing new systems or replacing existing systems (Kuboviak, 2004). Analog tapes have

been phased out in favor of digital cameras, and most agencies had no plans to upgrade their

video technology (Kuboviak, 2004). Additionally, the vehicle cameras were susceptible to

vibration, resulting in system failure frequently; and low-quality recording media resulted in

insufficient recordings (IACP, 2004). These limitations almost certainly influenced agencies'

interest in and willingness to implement up and coming video technologies.

**Handheld Cameras and Police Weapons**

As video cameras shrunk in size and costs, it became possible to mount them on

new objects, allowing for increased mobility with handheld camcorders and cameras

mounted on weapons. The proliferation of handheld video cameras and the broadcasting of

police-citizen encounters contributed significantly to policing's negative image in the 1990s

(Fox et al., 2007; Lorusso, 2012). The news media's coverage of the criminal justice system,

which some refer to as "tabloid justice" (Fox et al., 2007) , has shifted away from education

and toward "sensationalist, personal, and lurid details of unusual and high-profile trials and

investigations" for entertainment purposes (p. 6). This highly critical reporting style

characteristic of tabloid publications has permeated mainstream news coverage (Fox et al.,

2007).

Additionally, consumer mobile media technologies enabled the distribution of raw

footage devoid of corporate media narratives (Brucato, 2015). The public was largely

unaware of police use of force before video technology. This is because police work in the

shadows (Skogan & Meares, 2004), which means they frequently work alone and rely on

their discretion to determine the best course of action, making most of their work difficult to monitor or control. Stakeholders desired a check on police power abuse. Since then, the public's lack of trust has been intensified by increased informal surveillance conducted by community members.

The Holliday tape is one of the most infamous examples of the impact of media coverage of police misconduct. In 1991, George Holliday used his newly acquired handheld video recorder to capture footage of Los Angeles police officers assaulting a civilian motorist. Rodney King, the intoxicated civilian motorist, led police on a nearly eight-mile high-speed pursuit that involved at least 21 officers and a police helicopter (Christopher Commission, 1991).

Holliday recorded the beating from his apartment across the street and later sold it to a local television station, where it was edited and repeatedly aired on media outlets worldwide (Manning, 2000). Continuous coverage of police brutality was broadcast 24 hours a day on news channels, and other protests occurred across the country (Skolnick & Fyfe, 1993). This audiovisual evidence of police officers punching, kicking, and tasing King was prominently displayed during the criminal prosecution of Los Angeles police officers, demonstrating the importance of video evidence in court (IACP, 2005).

When a jury found the four officers not guilty of excessive force, the city descended into five days of violence, race riots, and civil unrest, resulting in 53 fatalities (including ten people shot and killed by LAPD officers and National Guardsmen), over 2000 injuries, and the arrest of over 6,000 looters and arsonists (Sastry & Bates, 2017). The Holliday video is significant because it was one of the earliest and most widely viewed demonstrations of the

potential of the mobile recorded image. The message of the Rodney King tape was that no individual, institution, or organization was immune from surveillance (Yesil, 2011).

In response to the Rodney King case, the Los Angeles Mayor formed the Christopher Commission to review the LAPD's use of force. The Commission found that excessive force was used repeatedly, that police often disregarded force rules, and that "brazen and lengthy references to beatings" were made (Christopher Commission, 1991). These instances of police misbehavior were worsened by the agency's racism and bias and management's inability to regulate the officers under their command. Among the recommendations of the Commission was the installation of video cameras in police vehicles as a means of recording police actions and accounting for police procedures (Maghan et al., 2002).

In 2003, Time magazine named camera phones one of the greatest inventions of the year. By 2006, according to Pew Research Center (2007), 73% of adults surveyed owned a cell phone. As a result, activists and everyday citizens increasingly document and disseminate encounters with new technologies (Kearon, 2013). Specifically, personal camera phones to record police activity and coverage in social and news media have increased public awareness of officer misconduct (Erpenbach, 2008; Harris, 2010). Officers caught doing something decent or lawful do not receive the most replay; officers caught doing something wrong capture the public's attention (Erpenbach, 2008). Websites for social networking and video sharing, such as Facebook, Twitter, and YouTube, have expanded the reach of imagery to a broader audience (Kearon, 2012). For example, a tourist's camera phone video of a police officer knocking a bicyclist off his bike and then arresting him garnered over 400,000 views

on YouTube in less than four days (Dwyer, 2008). Within three days of the video's upload to YouTube, the officer was required to surrender his badge and gun (Barron, 2008).

The widespread availability of affordable digital technology such as video cameras, digital cameras, and cellphone cameras has effectively ended the monopoly on official narratives of public gatherings as "[t]he digital age has brought in free-range history" (Dwyer, 2008). Therefore, it is in the officer's best interest to create video from their perspective (Fiumara, 2012), as this can counterbalance the increasing popularity of citizen recording of police-citizen encounters (Wasserman, 2015). Photographs taken from the officer's perspective can be used to counter dramatic video that does not tell the entire story.

Thomas A. Swift's Electric Rifles (TASERs) are electronic control devices, more commonly referred to as stun guns and tasers. They were reintroduced in 1998 and quickly adopted by law enforcement (Lum et al., 2016; SeaSkate, Inc, 1998). Tasers are non-lethal weapons that enable an officer to immobilize a target by delivering an electric current of up to 50,000 volts via two darts fired from the gun (Hummer, 2007). However, tasers have a high level of effectiveness and relatively low risk of injury, which has caused some officers to become over-reliant on them, resulting in excessive force through their use of the taser in situations where de-escalation was the better option (Sierra-Arevalo, 2019). The media likely played a role by increasing publications on police use of the taser and disproportionate focus on high-profile incidents in particular (White, 2014b). Accordingly, Axon International, the market leader, introduced a taser-mounted camera in 2006 to demonstrate when stun guns are useful and add a layer of accountability for officers who may abuse the weapon (Brucato, 2015; DeFalco, 2005). By 2013, 81% of agencies had adopted tasers or stun guns, while 6% of agencies employing 9% of all officers had cameras attached to weapons (Reaves, 2015a).

The taser camera is an audio and video recorder that attaches to the weapon's buttstock and begins recording immediately upon weapon activation. Taser cameras are aimed in the same direction as the weapon (DeFalco, 2005), in contrast to dashboard cameras, which have a limited field of view and are less effective for officers conducting investigations on foot or outside their vehicles' transmission range (IACP, 2019). Axon Chief Executive Rick Smith stated during a demonstration at the company's headquarters in Phoenix, Arizona, "It's going to give real accountability," before adding, "[n]ow you'll have proof" (DeFalco, 2005). Smith (2019) asserts that the taser camera is the "beginning of body camera technology," but the taser camera has developed a reputation for being impractical because it records only when the weapon is drawn and pointed (Draisin, 2011). Nonetheless, technological advancements and a growing awareness of the need for police accountability enabled the taser device to evolve into something more than a stun gun but also a tool for influencing police accountability.

These isolated incidents and media trends bring attention to police-citizen interactions and influence police reform movements such as Black Lives Matter (Adegbile, 2016). As a result, the Justice Department, politicians, police experts, and police departments have emphasized the use of force, aggressive stop-and-frisk policies, and high-speed chases. The videotaping of Rodney King's beating and subsequent incidents demonstrated that technology would play a role in holding law enforcement accountable (Ariel et al., 2015); and media coverage contributed to the belief that cameras can reform 'flawed' police practices from the ground up (Schwabe, 2001).

Turning on to the emergence and diffusion of BWCs, the following section discusses the characteristics of the innovation, followed by case studies of BWC adoption and

diffusion. Then, an examination of what we currently know about cameras and early adopters, as well as the remaining gaps in our knowledge. Following that, a chapter summary, research questions, and hypotheses are presented.

## **Emergence of Body-Worn Cameras**

The most recent innovation with the potential to transform law enforcement is the BWC. These cameras are small enough to be worn on an officer's uniform, fitted to a pair of glasses, or attached to the end of a weapon. The officer-mounted camera is a breakthrough in policing because it enables video documentation of the officer's perspective from the scene. From this position, we gain insight into officers' interactions with citizens, including traffic stops, arrests, searches, and critical incidents such as officer-involved shootings (Miller et al., 2014). Based on prior experiences with camera technologies described herein, the vantage point from the officer has the potential to mitigate the explosion of citizen footage, improve police-citizen interactions, reduce police complaints, enhance evidence collection, and assist agencies in identifying and correcting departmental problems.

The first published tests of body camera systems took place in the United Kingdom in 2005, followed by Canada in 2009, and the United States in 2012. The United Kingdom started the first deployment of modern wearable cameras, with the Devon and Cornwall Police Departments conducting small-scale trials of the technology (Goodall, 2007). Following initial success, a more extensive study dubbed the Plymouth BCU Head Camera Project began in October 2006 and lasted until March 2007, involving a team of 300 officers and staff trained to use the equipment.

One of the project's primary objectives was to demonstrate that this technical solution could reduce court challenges to camera evidence reduce malicious complaints

against police officers, and increase early guilty pleas, thereby saving officers time in court. The Plymouth Camera Project reported several positive outcomes, including increased officer awareness and professionalism in their interactions with the public, success in domestic violence cases by establishing the defendant's violent history, and improved citizen behavior. In addition, following a more widespread deployment during a domestic violence enforcement campaign, the camera's ability to significantly improve the quality of video evidence demonstrated the technology's potential utility. Although the officers were volunteers and no control group was used, these findings establish a baseline for future body camera testing.

A small trial with three head-mounted cameras was conducted in Renfrewshire, Scotland, in 2006, followed by a larger trial with 38 cameras in June 2009 (ODS Consulting, 2011). In June 2010, Aberdeen began a three-month pilot program with 18 cameras. Both studies found increased public confidence, a significant decrease in the number and resolution of officer complaints, and a decrease in officer assaults. Additionally, the studies reported significant declines in crime, including a 19% decline in breach of peace offenses, a 29% decline in vandalism, a 27% decline in minor assaults, and a 60% decline in serious crimes, for a total crime decline of 26%. Furthermore, body camera-related cases were resolved more quickly, either through an earlier guilty plea or a significantly smaller number of cases proceeding to trial. Finally, the study noted a decrease in officer assaults in Aberdeen, as one officer was assaulted while wearing a camera compared to 61 officers assaulted while not wearing cameras. Due to the success of these initial pilots, other programs throughout the United Kingdom quickly adopted BWCs (Goodall, 2007), and by 2010, over 40 police departments had implemented the camera systems (ODS, 2011).

Between July and October 2009, the Victoria Police Department conducted the first Canadian feasibility study on BWCs in British Columbia. Its objective was to evaluate new field equipment and compare camera performance to results from the trials in the United Kingdom (see Lauer and al., 2010). The voluntary use of four head-mounted cameras resulted in no citizen complaints against the officers who wore them, and many officers believed the videos improved the quality of evidence. However, officers in Victoria discovered an unintended consequence of using video evidence—they spent more time on paperwork. Additionally, the use of the videos in court added time for officers attending proceedings.

In 2011, Canada's second camera evaluation began as part of a more extensive pilot program evaluating the technical performance, legal implications, and practical utility of cameras used in routine police work (Edmonton Police Service [EPS], 2015). Before field testing two body camera systems, the team evaluated sixteen different models and concluded that none of the cameras met the overall operational needs, particularly secure and efficient video management. Furthermore, and in stark contrast to the earlier studies, the EPS discovered no statistically significant evidence that cameras influenced citizen complaints, officer use of force, or professionalism. Instead, officers indicated that any perceived increase in professionalism might be counterbalanced by hesitation and fear of judgment. Additionally, officers may develop increased patience and caution but also become more robotic, impairing their ability to establish rapport with citizens. Finally, the report recommended deferring additional investment in BWCs and monitoring ongoing Canadian studies due to the following impediments: increased hardware and data management

requirements, concerns about evidentiary value, a lack of a clear recording policy, and a scarcity of cost-benefit analyses.

The development of BWCs in the United States has largely gone undocumented because the initial introductions were primarily reported on departmental websites, news articles, and professional magazines, rather than by academics. Police departments routinely conduct experiments intended for publication internally or within professional associations, conferences, and publications. Further, the dispersed nature of U.S. law enforcement may also have contributed to the disparity in adoption between the United Kingdom and the United States (Lum et al., 2019). U.S. law enforcement is highly fragmented and decentralized such that policing is unique in almost every jurisdiction. Indeed, according to the Census of State and Local Law Enforcement Agencies (CSLLEA), in 2008, there were 17,985 agencies in the United States that employed at least one full-time officer or the equivalent in part-time officers (Reaves, 2011).[8] This total included 12,501 local police departments, 3,063 sheriffs' offices, 50 primary state law enforcement agencies, 1,733 special jurisdiction agencies, and 638 other agencies, each with its own legal and geographic jurisdiction, ranging from single-officer police departments up to departments with over 30,000 officers (Banks et al., 2016).

Nonetheless, professional policing sources indicate that U.S. police agencies began testing BWC technology as early as 2001. For example, the Los Angeles Sheriff's Department equipped 14 deputies with vest-mounted video cameras that transmitted images

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[8] The Bureau of Justice Statistics administers the Census of State and Local Law Enforcement Agencies (CSLLEA) every four years to all state and local agencies to collect agency employment data. The statistics discussed here refer to the 2008 CSLLEA, which covers the period when BWCS began testing in the United States.

to a police cruiser (Nunn, 2001). Additionally, a 2007 survey of 298 PERF members indicated that police were increasingly using various surveillance cameras, including individual cameras on officers' uniforms (Koper et al., 2009).[9] Additional references to police adoption include the following: the Burnsville Police Department adopted in 2008 (Brucato, 2015); Albuquerque and Oakland, New Mexico adopted in 2010 (Goodison et al., 2018; Guerin et al., 2016); and the San Jose, California Police Department tested 18 BWCs in 2010 (Draisin, 2011).

According to Coppola (2010), BWCs were gaining popularity as a supplement to or replacement for dashboard-mounted cameras, particularly among agencies looking to cut costs. In 2010, affordable BWCs with long-lasting batteries became available (Sherman, 2013). Several agencies, including the Erlanger Police Department in Kentucky and the Lafayette Police Department in Colorado, conducted their own evaluations of BWC technology prior to deciding to implement the cameras. (Coppola, 2010). Erlanger had 41 officers and a population of 23,000 and began a six-month evaluation period, but the cameras had already been in use for a year by Coppola's 2010 publication. Captain Arens of the Erlanger Police Department stated that the department previously purchased in-car camera systems for each police cruiser, but had since discontinued the purchase in favor of BWCs as a more cost-effective solution to department needs (Coppola, 2010). For Erlanger, BWCs were more practical than dashboard cameras due to their recording limitations and the improved audio quality of BWCs.

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[9] PERF membership is open to agencies with 100 or more employees and/or a jurisdiction of at least 50,000 citizens; while this is not a representative sample, PERF members represent an influential group of police agencies known for their innovation adoption leadership (Koper et al., 2009).

With 40 sworn officers, the Lafayette Police Department serves a population of 25,000 citizens just north of Denver. Sergeant Sellers stated that the department evaluated three different types of BWCs for 30 days in 2009 before deciding on one to implement (Coppola, 2010). As with Erlanger, the dashboard cameras were prohibitively expensive at $5,000 when compared to BWC units, and they captured footage only in the direction the vehicle was pointed. As a result, the critical video was not captured, and Sellers stated that it was more important for officers to document anything they encounter (Coppola, 2010). Lafayette had also discontinued the purchase of dashboard cameras for new patrol cars, opting instead to adopt the most expensive of the three cameras they tested because it performed the best and was available at a 50% discount on four additional cameras when they purchased one at full price (Coppola, 2010). By the end of 2010, the department intended to equip each officer with a camera.

It is important to recognize that Erlanger and Lafayette were smaller agencies with fewer patrol vehicles and officers to equip with camera technology than the larger agencies analyzed later in this dissertation. Beginning in October 2008, the National Law Enforcement and Corrections Technology Center (NLECTC) had also distributed cameras to approximately 20 small, rural, tribal, and border regional agencies to determine the utility of officer-worn cameras were worthwhile to law enforcement. Discussion of these smaller evaluations was published in *TechBeat*, an NLECTC magazine devoted to brief overviews of emerging technologies.

For the first time in the United States, empirical evaluations of BWCs were conducted in Rialto, California and Mesa, Arizona from 2012 to 2013. The evaluations from these studies drew widespread national media attention, highlighting the potential of this

emerging technology for law enforcement. In February 2012, the Rialto Police Department

(RPD) evaluated 54 officers working shifts assigned at random with or without a camera

system (Ariel et al., 2015). The study tested the hypothesis that the presence of cameras and

awareness of being filmed influenced how citizens interacted with police (Ariel et al., 2015;

Scarberry & Nash, 2014). This is referred to as a *civilizing effect*, which means that increased

self-awareness improves citizens' and law enforcement officers' behavior when they are

being watched (Ariel et al., 2015). For police officers, it has been suggested that using a

camera increases officer professionalism (Farrar, 2013), which results in increased Fourth

Amendment compliance (Harris, 2010). In addition, it decreases the likelihood of using

force, resulting in a decrease in citizen complaints (Miller et al., 2014). The intent of use may

be to discourage officers from acting inappropriately, unprofessionally, or illegally. "When

you put a camera on a police officer," William Farrar, Rialto Chief of Police, explained, "they

tend to behave a little better, follow the rules a little better. And if a citizen knows the officer

is wearing a camera, chances are the citizen will behave a little better" (Lovett, 2013).

Rialto's findings indicated that police use of force and citizen complaints against

officers had decreased significantly, suggesting that cameras have a calming effect, whereas

officers who did not have cameras experienced twice as many use of force incidents as those

who did (Ariel et al., 2015). Complaints decreased by 87.5% while officer use of force was

reduced by 59%. However, it is unknown whether the declines were caused by changes in

officer or citizen behavior or by combining the two. One theory suggests that police

departments may find cameras more effective if their culture lacks accountability evidenced

by recent troubles with police misconduct (Ripley, 2017). The Rialto Dept was at a low point

from several scandals involving corruption, misconduct, use of force, and an attempt by the

Rialto City Council to disband the police department (Gaub & White, 2020; cited to Arizona State University, 2018; Kelly & Reston, 2007). If a police department has recently completed a collaborative reform agreement or a federally monitored consent decree, fostering a more accountable culture may have aided in the reduction of police misconduct.

Nonetheless, the Rialto study drew considerable attention from national news organizations, including The *New York Times*, which published an article summarizing the study's initial findings (Brucato, 2015). "I think we've opened some eyes in the law enforcement world. We've shown the potential," Farrar explained (Carrol, 2013). Given these encouraging results and widespread dissemination of Farrar's testimonial, BWCs were immediately regarded as a technological innovation capable of supporting law enforcement in addressing current challenges.

Critics of the study's methodology raised concerns about Farrar's independence as he was the head of the Rialto PD when the study was conducted (Brucato, 2015; White, 2014). Farrar directed the department's study and fulfilled his master's degree thesis requirement with Cambridge University in the United Kingdom. As a result, he was "doubly committed" (Brucato, 2015, p. 463) to proving his hypothesis true to complete his master's thesis and to reform the department for which he was hired.

From a diffusion of innovation perspective, Farrar's personal network included police professionals and academics as a student of the Cambridge Police Executive Program (Sherman, 2013). Additionally, the program included over 100 international mid-career police professionals (Garner, 2018). Farrar studied police strategies, programs, and results in the United Kingdom, and hence, would have been aware of the 2005 Devon, Cornwall, and Plymouth trials. Then, as chief of the Rialto Police Department, he developed the test to

reform the department, which had a reputation for officer misconduct. By using the test as his master's thesis, he would have received advice or guidance from Cambridge faculty in developing Rialto's BWC test. Farrar and the RPD study garnered national media attention, as well as in law enforcement publications, conferences, and academic journals. These events, which were communicated through local and national communication channels served as assessments of BWC's capabilities, mitigating the risk associated with this innovation for later adopters. The police chief's publication of empirical research marks a significant shift in the way law enforcement technology evaluations are conducted and communicated.

The Mesa Police Department began testing 50 on-officer cameras in October 2012, citing an increase in civil litigation, associated rising costs, and advancements in civilian smartphone capabilities. The 12-month evaluation assessed the camera's effect on civil liability, criminal prosecution, and operational transparency by randomly assigning half of the cameras to officers and half to volunteers (Mesa Police Department, 2013). Results showed that complaints against Mesa officers decreased significantly within a short time after video was implemented. Additionally, officers equipped with camera systems received 40% fewer departmental complaints, and those received were resolved within days. Furthermore, the findings indicated a 75% reduction in complaints about use of force during the evaluation period compared to the previous year. These findings bolstering proponents of the BWC, combined with Rialto's similarly positive results, almost certainly influenced future law enforcement adoptions in other jurisdictions.

As with Rialto, the Mesa research was done by the organization responsible for the deployment of the cameras, raising doubt on its independence (White, 2014); however, the

MPD collaborated with Arizona State University to evaluate officer survey research and field contact reports (MPD, 2013). Officer perceptions were surveyed quarterly throughout the evaluation, and by the end of the trial, only 23% of respondents believed the MPD should implement on-officer BWCs.

All the early body camera studies that examined citizen complaints reported some complaint reduction and several identified instances of reduced use of force. Additionally, citizens were less likely to file complaints about reasons we can only speculate on, including that the video clarified the interaction (ODS Consulting, 2011), the evidence established that their claim was unfounded (Goodall, 2007), or the civilizing theory and calming effects are real. The results of these early studies suggest that any agency that receives a high volume of citizen contact and self-initiated calls should strongly consider equipping officers assigned to these units with BWCS as standard equipment (ManTech, 2012, p. 11). In other words, increased citizen interaction creates an opportunity for more complaints.

These early studies evaluated the emerging technology's potential and established that the cameras were capable of providing some of the anticipated benefits. These earlier adopting agencies, however, made adoption decisions based on anecdotal evidence from prior camera adoptions, such as in-car cameras, and conducted their own experiments with BWCs. These evaluations were then used by supporters of BWCs to influence continued adoptions. Collectively, the timing of these adoptions and communication of evaluations follows the traditional innovation S-curve.

According to the Bureau of Justice Statistics' (BJS) 2013 LEMAS survey, 32% of local police departments reported using BWCs by January 1, 2013 (Reaves, 2015), as illustrated in Figure 3 below. Also shown, are findings from the 2016 LEMAS Body-Worn

Camera Supplement (LEMAS-BWCS) indicating that 47% of the general-purpose law enforcement agencies reported BWC adoption.

Despite the limited available evidence, BWCs promise significant benefits for improving behaviors, increasing officer safety, reducing police misconduct and citizen complaints, and enhancing evidence for prosecution. The early adopters did not have much evidence to ponder, only that from other camera technologies. However, the subjective evaluations and formal trials conducted by a few police departments greatly influenced diffusion.
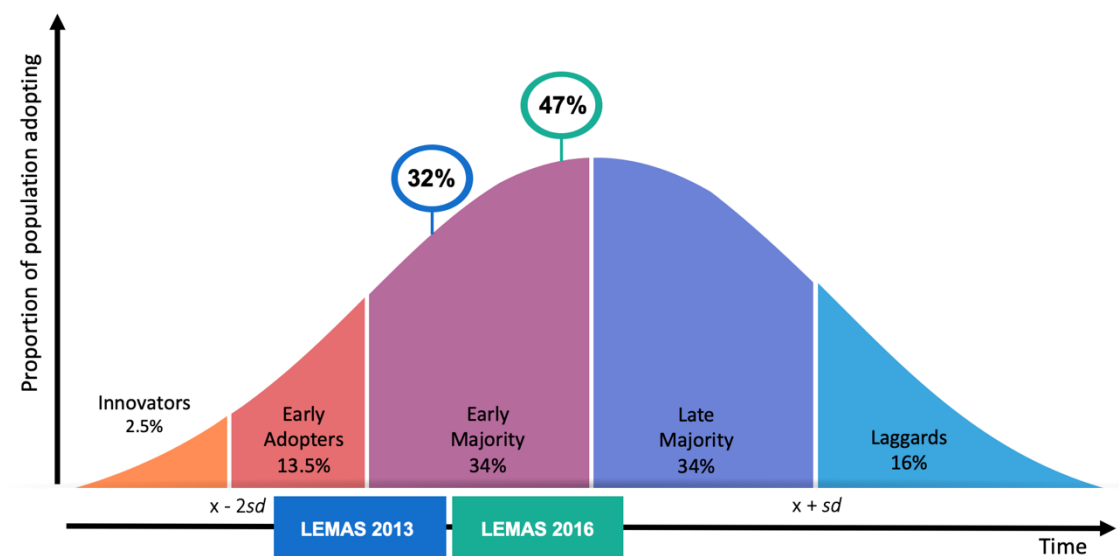


**Figure 3: Early Body-Worn Camera Adoption**

Increasing scrutiny of police use of force against unarmed Black citizens in 2014 led to a crisis of legitimacy for law enforcement, as evidenced by court judgments, federal investigations, and the Presidential Task Force (Civil Rights Division, 2015; *Floyd v. City of*

*New York*, 2013; President's Task Force on 21st Century Policing, 2015). These circumstances led many to believe that BWCs would benefit both citizens and police by increasing police legitimacy and accountability. The National Institute of Justice funded a study on the impact of technology on 21st-century policing strategies, which included an executive panel, nationally representative survey, and in-depth site visits (Strom et al., 2017). BWCs were one of the most frequently discussed technologies by police agencies during 2014 site visits.[10] Several agencies discussed wanting to resolve legal or policy concerns regarding BWC use before they were willing to deploy the systems on a large scale. Most agencies indicated that they were under internal or external pressure to investigate the use of the technology. Numerous agencies prioritized at least exploring this relatively new and expensive technology in response to public demand for law enforcement transparency and accountability.

According to Strom et al. (2017), while many police departments prioritized the acquisition of BWCs, there appeared to be a high level of awareness about the political, policy, technological, and personnel challenges associated with these devices. Agencies appeared to approach BWCs adoption more cautiously and deliberately than other types of adoption. During the site visits, agencies considering BWCs almost uniformly perceived the technology as new and unfamiliar, which warranted a more thorough and structured implementation plan. They reported that the chiefs' concerns were data storage issues, public privacy questions, officer buy-in, and a lack of specific policies for their use. Strom and colleagues argue that police departments typically adopt technology to enhance the way they

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[10] The survey was administered before the national focus on the use of BWCs technology after the summer of 2014. Therefore, the expectation is that findings related to BWCs would have likely changed after 2014.

conduct traditionally performed activities and that few technologies have resulted in fundamental shifts in policing work or strategy. Thus, law enforcement may perceive BWCs as having a more profound impact on their policing activities, and this perceived impact may be one of the factors influencing a more cautious approach.

Following is a discussion of the characteristics of BWCs using the innovation attributes identified by Rogers (2003). A notable deficiency in the literature is the failure to analyze the characteristics of innovations, resulting in comparisons between innovations with similar and dissimilar characteristics. When the relative advantage, compatibility, complexity, observability, and trialability of the innovations are determined, the context for differentiating and comparing their outcomes is established.

**Characteristics of Body-Worn Cameras**

Police innovations are new ideas that the field of police practitioners currently recognizes as new, whether they are technologies, processes, services, tools, products, tactics, policies, programs, or practices (Matusiak & King, 2021). Thus, when BWCs were introduced to law enforcement, they were unmistakably innovative, and they have rapidly diffused from agency to agency (Hyland, 2018; Nix et al., 2020; Reaves, 2015; White & Malm, 2020).

Successful innovations in policing are adaptable and reversible, outperform current and previous methods, are cost-effective, simple to learn, quickly upgraded, and do not cause significant uncertainty (Chan et al., 2001). These innovation characteristics explain between 49% and 87% of the variation in adoption rates (Rogers, 2003). The assumptions inherent in the new technology and their alignment with those held by organizational users are additional cultural factors to consider (Chan et al., 2001).

Structured organizations, like police departments, operate within an authority innovation-decision framework (Rogers, 2003). Within this framework, the command staff determines whether to accept or reject an innovation. This top-down approach to equipment acquisition assures that most equipment purchasing choices are made without input from line officers. While this approach may be appropriate for flashlights or batons, according to Kelliher (2014), it is not appropriate for "radically different systems," and BWCs represent changes in almost every aspect of their job, including evidence collection, use-of-force reviews, officer-involved shooting investigations, personnel complaints, critical incident debriefing, and training.

### *Relative Advantage*

BWCs are expected to influence officer and citizen behavior during encounters, as the mere presence of a camera and the knowledge that their interactions are being recorded should encourage both parties to act appropriately. In the presence of a camera-wearing officer, citizens are expected to be more respectful and compliant, or at the very least less aggressive. Citizens who act in a socially acceptable manner are presumed to be less likely to misbehave or become combative (Yokum et al., 2017). As one officer said, "When I tell them the camera is running, it kind of deflates them. It stops them from blowing up and taking their anger out on me" (SeaSkate, 1998, p.71). This view is supported by the IACP's (2004) report on the impact of video evidence, which found that 26% of officers who reported citizens were less aggressive when dashboard cameras were present also reported being more courteous.

However, police officers and the public engage in various other daily interactions. The dashboard camera offered more mobility at a less expensive cost than stationary video

surveillance systems. Nevertheless, a traffic stop is one application for video evidence, and dashboard cameras capture only the view from inside the vehicle and not the entire scene from the officer's perspective. Furthermore, attorneys with experience defending police officers assert that dashboard cameras have limited utility since only about 10% of police activity occurs in front of a vehicle camera, and measurable benefits are only associated with those circumstances (Scarberry & Nash, 2014).

Camera footage from the officer's point of view is a new source of information about what happened on the scene. As a result, it is presumed that BWCs will de-escalate inter-party tensions and reduce the likelihood of violence (Katz et al., 2014). Cameras can be helpful tools for reducing complaints and capturing evidence for use in court or internal investigations (Miller et al., 2014). Videotapes can be used with police reports to help paint a complete picture of an incident. Compared to the CCTV or the dashboard camera's fixed view, BWCs capture data as they travel around the scene with the officer, which is an advancement over previous innovations. Following an incident, the videos can assist officers in writing accurate reports about what occurred. Videotapes may be submitted in addition to incident reports to supplement the officer's paperwork and provide a complete picture. Video aids officers in report writing after the fact for anyone who truly wants to know what occurred.

The early findings from the United Kingdom's 2005 body camera testing provided limited support to the anticipated outcomes of BWCs. These studies suggested that camera footage enhanced evidence collection, strengthened cases against defendants, and increased guilty pleas at earlier points in prosecution (Goodall, 2007). Preliminary findings also indicated that the cameras could improve officer safety outcomes (Ariel et al., 2015; Goodall,

2007; Katz et al., 2014; Mesa Police Department, 2013; ODS Consulting, 2011; White, 2014a). Video proved especially helpful in domestic violence cases where the victim was reluctant to press charges or provide a statement (Goodall, 2007). With the victim's consent, BWCs allow officers to record statements, and then the video evidence paints a clear picture of the victim's emotions, injuries, and immediate reactions (Miller et al., 2014). The statements provide prosecutors with enough evidence to prosecute even when the victim does not agree to participate. Video is powerful because it is lasting documentation, can be widely disseminated, and brings awareness to a situation that the public would not otherwise have (Yesil, 2011).

Another reportedly advantageous feature of BWC footage is its potential use as a training tool (Harris, 2010). These applications maintain a detailed record of faces, license plates, weapons, and interactions that occurred prior to and during dangerous situations, which can be highly beneficial when training new officers to ensure proper procedure and caution are exercised in various circumstances (Atkinson et al., 1999). While evaluating BWC technology in 2012, the Miami Police Department's academy began using video footage of actual incidents as training scenarios (White, 2014a). According to the UK Home Office guide, officers' ability to review their actions has enabled them to assess their behavior and improve their performance (Goodall, 2007). When the IACP (2004) evaluated dashboard cameras, they discovered that most officers lacked proper training and recommended that all users, managers, and court affiliates have a thorough understanding of how the equipment works to have a successful camera program.

However, cameras have many limitations. They can be switched off or capture too limited a view to understanding what happened entirely. They do not provide any contextual

information that may be important to understanding an interaction. The initial costs to implement a BWC program may cost less than fixed-site cameras or vehicle cameras; however, long-term costs can grow exponentially as archived footage accumulates.

### *Compatibility*

Like its advanced surveillance predecessors, BWCs were hailed as the panacea for all current challenges. If they prove to be effective tools for improving professionalism, reducing citizen complaints, or reducing liability, then most practitioners would deem them to be compatible with law enforcement's values, needs, and prior experiences. However, some speculate that as police begin to use more advanced surveillance technologies, society's concerns may also increase about the use or abuse of technology and individual privacy rights (Schwabe et al., 2001). For example, the American Civil Liberties Union (ACLU) expressed concern about law enforcement's use of surveillance equipment as an intrusive, warrantless search without probable cause or individualized suspicion. The ACLU has also questioned the validity of statistical claims of the camera's effectiveness and the possibility of crime displacement, not a reduction.

Additionally, the growing use of formal surveillance footage to prosecute police misconduct was an unintended consequence of CCTV footage, as is how the context of its use contributes to a loss of public confidence in police (Kearon, 2013). Moreover, the IACP (IACP, 2004) recognizes that widespread surveillance can have a chilling effect on individuals and may cause them to alter their behavior when they are aware they are being watched. Thus, an unintended consequence is over-deterrence. More specifically, in the policing context, officers forego the type of educated risk-taking and problem-solving that is frequently required to save lives, abstain from potentially beneficial policing strategies out of

fear of personal liability (*Filarsky v. Delia*, 2012), or exercise less discretion (Byrne & Marx, 2011).

In the second Canadian study, officers expressed concern that any perceived increase in professionalism would be offset by hesitation and fear of judgment. Additionally, officers may develop increased patience and caution but become more robotic, impairing their ability to form relationships with citizens. An ethnographic study of a large urban police department in England revealed that officers complained about turning into robots when using BWCs (Rowe et al., 2018). While officers recognized the value of cameras for complaint protection, their interactions with people they stop have changed because of camera use. They feel "constrained and scripted" instead of having a natural conversation (Rowe et al., 2018, p. 6).

Literature suggests that police are resistant to externally focused change (Manning, 2008; Randol, 2014). In adopting and using technology, police managers play an instrumental role; however, line-level staff reactions are also significant, as negative perceptions can cripple an initiative (Koper et al., 2015). Historically, police have been resistant to change until managers and line officers perceive the innovation as beneficial to their interests (Lum et al., 2017; Young & Ready, 2015). For example, Young and Ready (2015) claim that global positioning systems (GPS) patrol monitoring systems, dashboard cameras, and Tasers were met with resistance until their utility was demonstrated.

Officers initially regarded dashboard cameras (IACP, 2004), BWCs, and telephone call boxes (Maghan et al., 2002) as supervisory tools to monitor their performance. Officers were hesitant to use the new technology so to avoid being watched by their superiors; call box wires were cut, antennas for dashboard cameras went missing, and BWCs were turned

off. For instance, line officers with the LAPD initially resisted dashboard cameras, having adopted the attitude that the cameras were installed to spy on them and showed a lack of faith in them (Maghan et al., 2002). Some officers that did not want to use the cameras would destroy or disable the systems (IACP, 2004). A thorough inspection of the LAPD revealed half of the 80 cars were lacking antennas; thus, they were unable to transmit what officers said in the field (Kelliher, 2014).

The negative attitude officers had towards using the cameras was a hurdle that agencies had to overcome. Implementation plans had to incorporate officers' concerns. For the LAPD, a training program that focused on the cameras' value to the officers reduced resistance. Overall, police will tend to adapt, manipulate, or somehow bend technologies to fit their traditional operations, not because they desire to be subversive, but because the pressure to respond quickly and effectively to calls for service demands as much (Harris, 2007).

### *Complexity*

Mesa's experience as one of the earliest BWC studies provided a foundation for understanding officer reactions to use the cameras. During the first six months of the Mesa research, officers were instructed to use their cameras whenever possible during public interactions but were allowed to utilize them at their discretion during the second six months. The study revealed that officers were less likely to activate their cameras without instructions. As a result, camera activations decreased by 42% during the first and second halves of the Mesa trial. These results highlighted a need to have policies or guidelines instructing officers on following procedures.

A survey of BWC users and administrators indicated that users were worried about the ease of use, durability, and functionality and anxious about the time it would take to don their BWCs, the technology response times, and the user interface (Koen et al., 2021). In addition, administrators had considerable worry over the upfront and long-term costs. Many discovered that the long-term costs of storing footage were more than they anticipated. Additionally, retrieving stored footage gradually took longer to complete as the video storage increased.

However, the cameras averaged a seven on a 1 (very difficult) to 10 (very easy) scale measuring ease of use. The cameras were often deemed straightforward to use (Koen et al., 2021); however, battery life weakened over time and would not last the entire shift. Administrators grew concerned over increased time spent retrieving footage. In interviews, 69 out of 91 users expressed disenchantment with the degenerating battery life, and many began carrying backup battery packs, charging batteries in their patrol cars, requesting larger battery packs, and even surreptitiously switching out older batteries with an unsuspecting officer's newer battery (Koen et al., 2021). In addition, the user interface was not user-friendly regarding video playback as it would not permit the user to skip to different parts of the video, the video would automatically restart, and video uploading or retrieval grew slower. All 91 users reported growing frustration with the server. This led to officers viewing prior footage less frequently when writing reports. Over time, users grew frustrated with the technical shortcomings and malfunctions related to the system. As a result, users became reluctant to interact with the systems unless dictated by program policy, and the agency ultimately discontinued their BWC (Koen et al., 2021).

*Observability*

An innovation's observability determines whether potential adopters can observe its effects. In contrast, innovators wish to be the first to test an innovation; thus, very little is required to appeal to this small group. Additionally, early adopters are accustomed to changing and are comfortable adopting new ideas. Outside of a how-to manual or information sheet, they need very little information to convince them to make a change. Early adopters are the opinion leaders. Their shared subjective assessment is what the two largest groups of adopters, the early majority and the late majority, require. Before the early majority is comfortable adopting the innovation, they must see that it works. Stories of success and evidence of an innovation's effectiveness or advantages will appeal to these groups.

Furthermore, the late majority is interested in knowing how many people have already adopted the innovation. Lastly, the laggards will likely be aware of the outcomes but remain skeptical of change. The pressure of other adopter groups often influences their adoption decisions. Therefore, observable outcomes are more relevant to later adopters than to the earlier adopters who are the focus of the present study.

*Trialability*

Innovations that can be evaluated before full implementation have a greater chance of success. The limited evaluations and trials of early adopters help encourage later adopters to seek additional information. Starting a smaller roll-out to test effectiveness often stems from cost concerns. Administrators are initially concerned with the upfront costs and quality of new technology. Koen et al. (2021) reported that administrators' concerns over the expense of starting a BWC program were eventually allayed by a vendor's offer of a four-

year beta test in which they would receive some equipment, maintenance, and replacements at no additional cost. During interviews, the administrators admitted this was an offer they "could not refuse" (Koen et al., 2021, p. 7).

However, the earlier adopters are known to have enough resources to mitigate or absorb possible losses from failed innovations. These groups would likely be more inclined to start trials to test out capabilities before a complete implementation. For example, several police departments tested out multiple camera models and features to find the right fit (Reinhardt, 2015; Washburn, 2016). The following section summarizes existing studies on BWC adoption and diffusion to provide insight into what we currently know and what gaps in our knowledge exist.

**Body-Worn Camera Innovation Research**

A handful of new studies have been published that examine organizational features and environmental factors that may influence BWC adoption or diffusion. This section reviews the research on BWCs as an innovation in detail, including data, variables, and theoretical frameworks about adoption, implementation, and diffusion. These studies confirm that several types of law enforcement agencies are increasing their use of cameras. Despite the new competition, dashboard cameras remain a popular technology, particularly among larger agencies, and those who have used them are more likely to have adopted BWCs. As a result, this section also reviews empirical studies that have examined the adoption of alternative camera systems. Additionally, BWCs may represent the fastest diffusion of an innovation within law enforcement.

*Adoption of Dashboard and Mobile Video Recorders*

Drawing from structural contingency theory and social disorganization, Schuck (2017) explores factors leading to dashboard and mobile video recorders (MVRs) diffusion. Using LEMAS data from three iterations of LEMAS surveys, Schuck (2017) created two data sets. One data set enabled a longitudinal analysis of large agencies with 100 or more sworn officers matched across LEMAS surveys from 2000, 2003, and 2007 (*n*= 437). The other was a cross-sectional stratified random sample of small and medium-sized agencies drawn from all three LEMAS data sets (*n*= 2,543).

The agency types included in the two data sets were not specified in her research and are a limitation to generalization. Although the self-reporting LEMAS sample of large agencies includes state, municipal, sheriff, and tribal agencies, state and tribal agencies would not have matched meaningfully to at least two of her data sources for Census and county-level voting data. As a result, it is assumed that state and tribal agencies were excluded.

For these three survey iterations, the LEMAS survey questions asked whether the agency used the following video cameras: patrol cars, fixed-site surveillance, mobile surveillance, or traffic enforcement. However, there is some uncertainty regarding the definition of mobile surveillance, and the LEMAS survey instruments do not provide instructions or definitions to clarify the meaning of mobile surveillance. According to the IACP's (2005) Mobile Video Recording Model Policy, mobile video recorders, or MVRs, and in-car camera systems refer to any system that captures audio and video signals and can be installed in a vehicle. Therefore, this policy views the two words as being interchangeable. The MVR also seemed interchangeable in Kuboviak's (2004) article discussing digital mobile

in-car videos, where he discusses issues of analog tapes versus the new digital video systems, and in the IACP's (2004) report on the impact of video evidence in policing.

Conversely, a 2000 RAND Law Enforcement Technology Survey (LETS) defined *mobile video surveillance cameras* as those that might be used in a stakeout or hostage negotiation situation. Specifically, the category did not include video cameras in patrol cars (Schwabe et al., 2001). While some ambiguity remains as to what the MVR category included, the language of the 2007 LEMAS survey suggests that these systems are distinct from video cameras on patrol officers. This means that agencies that may have adopted BWCs before 2007 were not directly measured in the 2007 LEMAS data due to the ambiguity surrounding the definition of MVR. Some agencies may have included officer BWCs in their response to mobile video surveillance, but it seems less likely given the definitions by RAND and the IACP. Thus, the 2013 survey was the first time that LEMAS clearly recorded BWCs use.

According to Schuck (2017), technology adoption can be understood as an interaction between technology characteristics, organizational culture, and features of the larger social-structural and political environment. Therefore, she operationalized variables for the innovators drawing from Langworthy's (1986) and Maguire's (2003) structural contingency models for organizational context, complexity, and control. In addition, social disorganization theory guided the conceptualization of environmental variables to determine whether communities with higher levels of disadvantage demonstrate a perceived need for increased supervision. Schuck hypothesized that the presence of disadvantage would influence police adoption of advanced surveillance technologies to enable increased supervision. Finally, to assess the police-community power balance and political climate, she

developed additional variables, including crime rates, assaults on officers, collective bargaining, and political affiliation.

For large agencies, spatial differentiation, formalization, community policing, homeownership, poverty, collective bargaining, and Republican voter percentage predicted dashboard camera adoption. On the other hand, the adoption of MVRs was predicted only by information technology use, crime rates, and the youth population. These results indicate that political and community factors were more predictive of dashboard cameras and MVRs than organizational attributes.

Smaller agencies used MVRs to expand surveillance to cover broader geographical areas, while larger agencies used them to combat crime. The strongest predictor of MVR use in large law enforcement agencies was crime; therefore, Schuck argues that the widespread adoption of advanced surveillance technology is the consequence of complex interactions between a technology's properties and organizational cultures because technology impacts how people interact with their surroundings, individuals and the broader social-structural context influence how technology is framed within an organization and how it works.

In Schuck's study, law enforcement's use of dashboard cameras and MVRs increased from 2000 to 2007 across all agency sizes. During that period, the percentage of small- to medium-sized agencies using at least one dashboard camera went from 18% in 2000 to 47% in 2007, while the percentage of agencies using at least one MVR increased by 3%. Large agency use of dashboard cameras increased fourfold by 2007. MVR usage increased as well, but at a slower rate, with the total number of cameras in use more than doubling between 2000 and 2007. The most probable explanation for these increases was an influx of federal

grants. Beginning in 2000, the COPS Office provided over $21 million in grants to assist law enforcement agencies in acquiring over 5,000 cameras (IACP, 2004).

Interestingly, Schuck's findings indicated that many small- and medium-sized agencies were not operating either camera type, as 44% did not operate dashboard cameras, and nearly 88% did not use MVRs. Similarly, 38% of large agencies did not use dashboard cameras, and 71% did not use MVRs. Additionally, by 2007, 12% of agencies had reduced the number of dashboard cameras, and of those, 54% discontinued their use. Thus, while camera use increased overall, many agencies operated without cameras, while others reduced or discontinued their use. The end of federal grant programs may have contributed to agencies' failure to replace obsolete or inoperable equipment. These findings, according to Schuck, imply that agency officials' adoption of modern surveillance technology is neither consistent nor complete but rather an ongoing and evolutionary process in which officials adopt and abandon technologies over time.

These outcomes do not adequately reflect the early use of BWCs; instead, her study provides insight into the diffusion of dashboard cameras and MVRs in law enforcement. Additionally, her approach illustrates the diffusion of dashboard cameras at a period when BWCs were becoming available in the United States. Finally, this dissertation analyzes the 2013 LEMAS data to extend Schuck's research and further investigate dashboard cameras' continuous adoption or rejection alongside the next emergent surveillance technology.

### *Early Adopters of Body-Worn Cameras and Organizations of all Sizes*

By 2012, BJS had expanded a section of questions in the 2013 LEMAS survey instrument to examine how law enforcement agencies use social media and other technologies. A total of 2,826 state, municipal, tribal, and sheriff's offices were included in

the sample. According to the findings, 76% of law enforcement agencies used in-car, body-worn, or weapon-attached cameras in 2013 (Reaves, 2015a). Additionally, this survey also indicated that 32% of agencies had adopted BWCs, but the extent to which they were used was not recorded (Reaves, 2015a).

Nowacki and Willits (2016) used this data to examine the relationship between organizational characteristics and BWC adoption. The authors created a sample that included all sizes and types of police agencies ($n= 823$). They identified a substantial correlation between the number of full-time sworn officers and the operational budget. As a result, they substituted a proxy measure of the natural log of the operating budget for the officer count. However, they did not provide descriptive statistics of the population sample; thus, the distribution of the agencies in the size and type categories is unknown.

Nowacki and Willits examined context, complexity, and organizational control variables using a structural contingency framework. To measure technology use, Nowacki and Willits created an additive index of these social media questions and advanced technology (e.g., gunshot detection systems, LPRs, smartphones, and types of video cameras). They used the social media questions to examine how an agency shares data with and engages with the community. Their findings indicate that a 1-unit increase in the technology index increased the odds that an agency uses BWCs by 14.2%. These results support the research showing that agencies already using technological innovations are more likely to adopt new technologies. Further, they argue that because BWCs are tools that could externally monitor police activities, agencies already sharing data and engaging with the community through social media will be more likely to invest in BWCs.

Nowacki and Willits conceptualized dashboard cameras as an improved tool for supervision and measuring organizational control. Although the evidence from a few studies that measured officer perceptions of BWCs supports this hypothesis, the deployment of dashboard cameras may also indicate past technological use. In that regard, the estimated chance of an agency using dashboard cameras and BWCs is 89.2 % greater than the expected probability of an agency not using BWCs. Nowacki and Willits utilized the presence of a single policy, a policy governing foot patrol, as a second measure for formal control. Results showed that agencies with a formal foot patrol policy governing officer behavior were 50.7% more likely to adopt BWCs. They suggested that more restrictions on patrol officers with written policies would relate to adopting BWCs for supervisory control.

The total number of specialized units served as their measure of functional differentiation, and it was significant and positively related to BWC adoption. Functional differentiation is typically a measure of organizational complexity in the contingency framework. However, there is also precedent in policing literature that specialized units are an innovation (Giblin, 2006; Katz, 2001). These results indicate that earlier acceptance of special units influences subsequent adoptions.

Additionally, as measured by budget, larger departments and agencies with collective bargaining units were less likely to adopt. The researchers argued that larger budgets or additional resources insulate departments from external pressures. At the same time, those with greater bargaining power have the leverage to resist pressure for technology that limits police discretion. An alternative explanation is that acquisition and implementation costs were still prohibitively high for larger agencies that would generally have higher operational costs.

The authors acknowledge that their study concentrated almost exclusively on organizational characteristics and suggest that future research should include an examination of external factors. In addition, Schuck's (2017) finding that external context factors were more predictive of the adoption of dashboard and mobile cameras than organizational characteristics provides additional justification for future research to include both categories in the same model.

Institutional perviousness is an organization's capacity for innovation based on susceptibility to environmental influence and internal alignment with the innovation. In a test of institutional perviousness and BWC adoption, Lawshe (2022) included all agencies ($n= 2,826$) from the LEMAS 2013 data set of local police (73%), sheriff's offices (25%), and state agencies (2%). Approximately 25% of the sample was missing data on at least one variable. Lawshe addressed this using multiple imputations with chained equations (MICE), which works by making multiple imputations to account for statistical uncertainty.

Perviousness was conceptualized as an agency's openness to change and experience with change. The variable was measured as the sum of 15 dichotomous variables, including survey questions about the agency's use of social media to share information with the public and advanced technology. Incidentally, this variable is operationalized the same as Nowacki and Willits' technology index. According to Lawshe, Nowacki and Willits (2017) were actually assessing perviousness through their technology use index variable of social media use. In this respect, institutional measures of perviousness are viewed similarly to the conceptualization of the innovativeness variable in diffusion theory, which measures prior technology experience. However, situations such as this add to the methodological problems

with innovation theory. Here, perviousness added a new conceptualization to the same measures used for innovativeness by Nowacki and Willits (2016).

Perviousness was significant and increased the odds of BWC adoption by 13% with a one-unit change. This result is consistent with Nowacki and Willits' who reported odds of 14.2% for a smaller portion of the LEMAS 2013 sample population. Lawshe included internal contingency variables for organizational context and found that size and budget per capita had negative relationships with the odds of adopting BWCs. Additionally, collective bargaining agreements were present in 85% of organizations and were associated with decreased odds of BWC adoption. Again, these findings echo those from Nowacki & Willits (2017). Thus, Lawshe's results further support those from Nowacki and Willits but with the total sample of agencies in the LEMAS 2013 data set.

Lawshe constructed three variables for examining the race or ethnicity ratios of officers per city resident for Black, White, and Hispanic populations. Results indicated that the odds of BWC adoption were 2.53 times higher for agencies with Hispanic representation. However, White and Black representation were not statistically significant.

Interestingly, community policing activities were not associated with BWC adoption when examined using an additive index of survey items. Lawshe hypothesizes that this result is due to the pervasiveness of community policing efforts, citing Gill et al. (2014) as evidence that these tactics have become ubiquitous in policing. Furthermore, only 1% of agencies in this sample did not engage in some form of community policing. Schuck (2017) found a positive relationship between community policing and dashboard cameras and MVRs using the LEMAS 2000, 2003, and 2007 survey data. Perhaps these circumstances exemplify the

terminus of the S-curve for community policing, the point at which an innovation runs out of system adopters.

Lawshe states that BWCs was "an innovation brought on by a cultural shift rather than an institutional response to a legal change" (p. 12). The critical problem with this explanation is that the sample was drawn from LEMAS 2013 data, which included agencies that adopted BWCs as of January 1, 2013. The President's Task Force on 21st Century Policing did not make the recommendation for BWC adoption until 2015, well after these early BWC adoptions. The President's Task Force and highly publicized incidents involving lethal use of force likely encouraged the late majority and laggards to seriously consider using BWCs, but not the early adopters because 32% of agencies had already adopted them. Another limitation of this explanation is that institutional pressures to maintain legitimacy include more than legal changes. Institutional logic also includes values and normative assumptions about how things should be, such as how a good police department should act. Thus, an institutionalist would counter that a cultural shift is an institutional pressure (but institutional pressures from the cultural change did not apply to the early adopters, at least not in the examples Lawshe provides).

### *Body-Worn Cameras and Strategy*

In a collaborative study conducted by the Policing, Security, and Investigative Science Program at RTI International and the PERF, a questionnaire was developed and, in February 2014, administered to a nationally representative sample using the National Directory of Law Enforcement Administrators (NDLEA). Aspects of the results from this project were reported in at least two different studies. Strom et al. (2017) used a modified organizational choice theoretical framework to examine whether organizations adopted

innovations in line with a broader organizational strategy. According to Strom et al., an organizational choice theory is an overarching framework of four perspectives: rational, contingency, institutional, and entropic. This study focuses on two perspectives. First, the rational approach implies that organizations rationally define their objectives, design strategies, and use technologies to support those plans. Second, the entropic perspective portrays organizations as anarchies that seek answers before encountering specific problems that must be resolved.

Their sample included a stratified random sample across U.S. census regions and agency size (including tribal and state agencies) ($n= 749$) and a subsample of all agencies with 250 or more sworn officers ($n= 302$). In these studies, dependent variables were coded for whether the respondents reported using crime mapping, social media, data mining, car cameras, LPRs, and BWCs in the past two years. The independent variables measured the importance of policing strategies (professional, community, problem-oriented, zero-tolerance, hot spot, offender targeting, intelligence-led, and predictive policing) toward supporting the agency's core mission.

Citing reductions in citizen complaints from the Rialto (Ariel et al., 2015) and Phoenix studies (Katz et al., 2014), the authors anticipated a relationship between BWCs and community policing as reducing the number of complaints filed against local law enforcement might ultimately increase police trust in the communities they serve. Unlike Braga and Weisburd (2007), who concluded that police are more likely to adopt innovations that align with their traditional strategies, Strom et al. (2017) found little evidence that agencies select technology innovations concerning their strategic goals and reported no statistically significant relationships between strategy and dashboard or BWCs. They noted,

however, that when the analysis was restricted to the subsample of agencies with 250 or more sworn officers, more robust relationships between strategy and technology emerged. Specifically, agencies that emphasized hot spot policing were more likely to have used BWCs. Taken at face value, the results suggest that BWC use as of 2014 was not related to organizational strategy. Based on their findings, Strom et al. (2017) suggest future studies expand examination to include organizational and environmental variables previously identified in diffusion literature.

Strom et al. (2017) found that the number of sworn officers was consistently related to greater GIS, data mining, social media, and LPR use from 2012 to 2014; however, not for BWCs. The large agencies were less likely to have used BWCs in the preceding two years. Additionally, the type of agency was statistically significant as municipal agencies were less likely to use GIS or data mining than the reference group (e.g., county, sheriff, state, highway patrol, and tribal agencies). Strom and colleagues concluded that the organizational environment affects how technology is handled and integrated into the department. Additionally, technology will be more successful if it is more closely aligned with existing successful technology. Each agency placed a premium on its prior performance regarding technology selection, purchase, and implementation.

Interestingly, agencies that did not have dashboard cameras indicated little interest in deploying such systems in the next two years. These results corroborate Schuck's (2017) findings that 37.4% of large agencies in her sample (100 or more sworn) were not using dashboard cameras, 24% of agencies had reduced their number of dashboard cameras, and 54% of those were discontinuing use. This further supports Schuck's argument that larger agencies were discontinuing use. Moreover, Strom et al.'s sample of large agencies with 250

or more sworn officers was less likely to have used BWCs in the last two years. They suggested this may be due to the cost issue, or these agencies had already begun discontinuing use after initial trials.

According to the executive panel, Strom et al. surveyed, BWCs were prioritized due to recent public and policymaker emphasis on the innovation's application. However, these comments were made before the 2014 events in Ferguson. As a result, numerous agencies expressed plans to upgrade or increase their use of BWCs during the site visits. However, they frequently cited a shortage of financing for not reaching full deployment. In addition, these agencies viewed BWCs as very resource-intensive, necessitating the appointment of more staff to handle the increased workload (Strom et al., 2017).

### *Diffusion of Body-Worn Cameras*

BJS changed the format of the LEMAS survey in 2016 to incorporate a supplemental survey to conduct a more comprehensive examination of a key topic in law enforcement. The 2016 LEMAS-BWCS collected data from 2015 to 2016 from a sample of general-purpose state, local police, and sheriffs' offices of all sizes ($n= 3,928$) (United States Department of Justice. Office of Justice Programs. Bureau of Justice Statistics, 2019). The reported date of adoption illustrated in Figure 4 below shows the typical slow start of adoption consistent with diffusion research. Then, we can see the spike of adoptions beginning in 2014 as the majority and later adopters begin adopting.
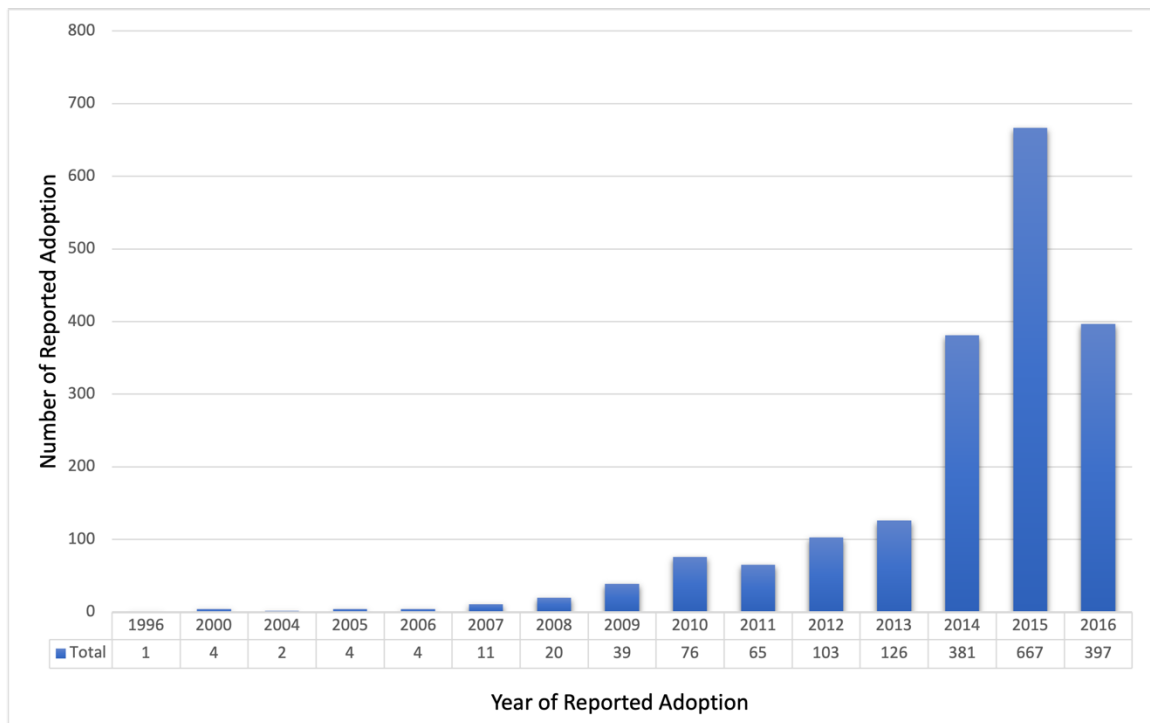
**Figure 4: Diffusion of Body-Worn Cameras by 2016**

These results showed that 80% of larger (100+ officers) general-purpose agencies had adopted BWCs (Hyland, 2018). The results from Goodison et al.'s (2018) and Nix et al.'s (2020) research, discussed below, also indicate that larger agencies had the highest adoption rates at this point on the adoption S-curve.

A PERF study of the cost and benefits of BWC deployments surveyed municipal agencies to assess the costs of BWC programs, agency goals for implementation, realized benefits, and the effect on civil litigation claims and awards (Goodison et al., 2018). The survey was administered in 2015 to all municipal agencies with 250 full-time sworn officers and a random stratified sample of all other sizes in a manner proportionate in each region (*n*= 893). The results showed that BWC adoption was related to size but not strongly. More than one-third of the smallest agencies with fewer than ten officers had adopted it. This was

a slightly higher rate than agencies at 11-99 and 100-499. The largest agencies of 500 or more had the highest adoption rate with just under half (46%).

The motivation to use only municipal agencies was to keep financial costs and budgets comparable because state agencies and sheriff's offices would have different responsibilities resulting in various cost concerns. Goodison et al. attempted to gather civil lawsuit information from the agencies, but most did not keep those records. Then, they tried to submit Freedom of Information Act (FOIA) requests to obtain the information from government sources. They could only get documentation for eight departments, and only three had enough information for analysis. Ultimately, they concluded that civil litigation information would continue to be challenging to test unless there were changes to recording processes.

Using Wejnert's (2002) diffusion framework, Nix et al. (2020) examined BWC adoption as of 2018 about innovator characteristics (size and region), cultural factors (racial composition, fatal force on officers, and violent crime), and political variables (support from sovereigns; percentage Trump supporters). The researchers developed their sample (*n*= 624) from the 2018 National NDLEA that included municipal agencies of all sizes and excluded sheriff's offices. They grouped agencies by size, measured as the number of sworn officers, into four strata: 0 to 24 (145 agencies), 25 to 49 (162), 50 to 99 (160), and 100 or more officers (167).

Nix et al.'s findings indicated that large agencies of 100 or more sworn officers were more likely to have adopted BWCs than agencies in the other three strata (0-24, 25-49, and 50-99). Their findings indicated support for BWC adoption by region, as southern agencies were significantly more likely than northeastern agencies to be using BWCs across all four

size strata. They suggest that the lower reported adoptions may be due to the pervasiveness of unions in the northeast, but they omitted a variable for collective bargaining. They provide anecdotal evidence that police unions have opposed BWCs implementation in some agencies, most notably in Boston, where the police union filed an injunction to prevent a department from requiring officers to wear cameras. Nowacki and Willits (2016) measured collective bargaining and reported that departments with collective bargaining units were less likely to have BWCs. However, because most innovation occurs within large police departments (Walker, 2008), some departments may have managed innovation more effectively than others or employed different strategies for interacting with the local union.

Nix et al. (2020) also found support that racial composition was important for diffusion. Their continuous variable measuring the percentage of Black residents was statistically significant in all four strata: positively with the three larger and negatively in jurisdictions with 24 or fewer officers. Still, the percentage of Hispanic residents was not statistically significant. The authors suggest that the perceived need to record police-citizen interactions in these agencies and communities may be more critical. This study traces the diffusion of BWCs after the 2016 LEMAS survey to 2018; for that reason, the findings shed light on BWCs diffusion but are not specific to early adopters of the technology. Nonetheless, regional variables were not tested in the prior BWCs studies and thus warranted inclusion in the assessment of early adopters.

In summary, the studies discussed in this section each used different theories and frameworks (contingency, institutional perviousness, organizational choice, cost & benefit analysis, and diffusion of innovation) to study the innovativeness of law enforcement agencies or the diffusion of BWCs in different years depicted in Table 2 below. Nowacki and

Willits (2016) and Lawshe (2022) analyzed agencies in the 2013 LEMAS survey when 32% of agencies had adopted. The findings from both studies suggested that larger size was negatively associated with earlier BWC adoption. Strom et al. (2017) discovered that size was not significant for the sample of 250+ officers, implying that there may be a point beyond which the number of sworn officers is no longer a predictor of technology adoption. Their sample was collected prior to the events of 2014 and thus includes earlier adopters. Goodison et al. (2018) and Nix et al. (2020) found that a greater percentage of the larger agencies had adopted BWCs in their size categories compared to the smaller sized agencies, but these studies occurred after 2014 and indicate 47% adoption overall.

**Table 2: Comparison of Key Body-Worn Camera Diffusion Findings**

| Study | Nowacki & Willits (2016) | Lawshe (2022) | Strom et al. (2017) | Goodison et al. (2018) | Nix et al. (2020) |
|---|---|---|---|---|---|
| Sample size | $n$= 823 from LEMAS 2013 | $n$= 2,826 from LEMAS 2013 | 1) $n$= 302<br>2) $n$= 749<br>Collected 2012-14 | $n$= 893<br><br>Collected 2015 | $n$= 624<br><br>Collected 2018 |
| Agency Type | Municipal, county, and state | 73% local, 25% sheriff, 2% state | Municipal, local, sheriff, state, & tribal | Municipal only | Municipal only |
| Agency Size | All sizes; operating budget | All sizes; logged No. sworn officers; slack | 1) 250+ officers<br>2) All sizes | All agencies 250+ and a sample of all other sizes | All sizes, No. sworn officers |
| **Results** | | | | | |
| Size | Negative | Negative for number of officers and slack | Not Significant for 250+ | Depts with 500+ officers had highest rate of adoption (46%) | Positive; larger agencies 100+ highest rate of adoption (64%) |
| Specialized Units | Positive | Not significant | N/a | N/a | N/a |
| Foot Patrol Policy | Positive | Positive | N/a | N/a | |
| Region | N/a | N/a | Not significant for BWCs | N/a | All 4 strata, agencies in S significantly more likely than NE have BWCs. |
| Unions | Negative | Negative | N/a | N/a | N/a |
| Racial Composition | N/a | Black officer/pop representation not significant; Hispanic was positive | N/a | N/a | % Black population positive in 3 larger strata; negative in jurisdictions less that 24 officers |

Strom et al. (2017) and Nix et al. (2020) conducted studies on the regional effects of BWC adoption. Strom et al. collected data between 2012 and 2014, which means it includes early adopters similar to Nowacki and Willits (2016) and Lawshe (2022). According to Strom et al.' findings, region was not a factor in the earlier municipal, local, sheriff, state, and tribal agency adopters. In comparison, Nix et al. (2020) discovered that municipal agencies in the south and west were significantly more likely than those in the northeast to have BWCs. Overall, these findings suggest that the region has an effect on adoption but varies for adopter category and type of agency.

The following section discusses the limitations and gaps in the literature, as well as the lessons learned from research that revealed critical characteristics of police innovation and organizations.

**Patterns in Police Innovation**

*Adoption Without Evaluation*

There are several discernable patterns in law enforcement's adoption of video surveillance technology, from CCTVs to BWCs. First, technologies were implemented and widely disseminated before research could establish that they worked for the hypothesized reasons, such as efficiency and effectiveness. In fact, despite their staggering costs, most police practices remain untested (Sherman, 2013). Research has shown that police agencies often adopt technologies without being aware of the evaluation research that supports adoption (Lum, Koper, et al., 2019; Lum & Koper, 2017; Willis et al., 2007) or in a "black box" fashion without having conducted a comprehensive assessment (Weisburd & Neyroud, 2011, p. 7). For example, LPRs were rapidly adopted in a "low-information environment" without regard for the outcomes or consequences of their use (Lum et al., 2016, p. 9), and

police departments frequently lack knowledge about what works best and under what conditions (Lum, Stoltz, et al., 2019; Weisburd & Neyroud, 2011). According to diffusion theory, earlier adopters are the groups that create the evaluations of innovations that subsequent adopters learn about and consider when making their adoption decisions. Thus, the majority of innovators adopt innovations based on the subjective evaluations of earlier innovators. Identifying which agencies are more likely to be early adopters, in this case, can aid in the spread of new technologies, policies, or processes throughout law enforcement.

Except in a few instances, such as hot spot policing (Braga & Weisburd, 2007; Weisburd & Braga, 2006) and computerized crime mapping (Weisburd & Lum, 2005), the adoption of police innovation has had little to do with science, as the majority of police agencies are uninterested in evaluating programs and practices using scientific methods. Scholars have argued that for law enforcement officers, science is simply not a high priority (Weisburd & Neyroud, 2011). One theory is that academic literature is methodologically sophisticated and not read by line officers or is "in a style that is not readily transferrable to the police workforce" (Weisburd & Neyroud, 2011). However, in recent years there has been an increase in police-led evaluations such as those in Rialto and Mesa (Farrar, 2013; Mesa Police Department, 2013).

Another theory proposes a division of labor between those engaged in policing and those engaged in research (Skogan et al., 2004). Another possibility is the nature of police organizations and the process of conducting "research" within them. For instance, some larger organizations may have formal planning units and highly trained non-sworn employees who are proficient in research methods. Nonetheless, it is more likely that these units will be staffed by sworn police officers without a research background (Weiss, 1997b).

Rather than conducting rigorous scientific testing or reviewing the research literature, employees who lack research skills are more likely to contact colleagues in other departments (Weiss, 1997b).

According to innovation theory, earlier adopters understand more complicated concepts, conduct experiments, have more years of formal education, have more favorable attitudes towards science, and are more intelligent and literate (Rogers, 2003). These are the organizations that the majority contact for information on new ideas. In that sense, the generalization that most law enforcement is uninterested in science seems true as the majority of agencies in the system look to the earlier adopters. However, where do the science-loving earlier adopters get their information? Research has suggested that professional police organizations (Burruss & Giblin, 2014), vendors (Lum, Stoltz, et al., 2019), listservs, and conferences (Weisburd & Lum, 2005) have positively influenced prior innovation adoptions. However, it is unknown whether these methods are universally applicable to all policing innovations or are associated with early adopters. The available evidence from the 2013 LEMAS does not include data for the majority of these channels of communication; however, LEMAS data were used to create measures for collaboration with external researchers and multijurisdictional task forces. Additionally, CALEA accreditation was obtained. Chapter 4 will discuss these measures in greater detail.

### Benefits, Consequences, and Shared Experiences

Adoption of these advanced surveillance technologies is likely to have comparable benefits and drawbacks. All of the advanced surveillance technologies discussed in this section were implemented to help reduce crime as surveillance mechanisms, improve police efficiency, protect officers from complaints, and improve evidence collection. This makes

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sense because, from a societal standpoint, the most effective and beneficial activity that law enforcement agencies can engage in is crime prevention (Schwabe et al., 2001). On the other hand, crime prevention is a contentious area of police work, as increased surveillance frequently raises concerns about civil liberties and is difficult to objectively evaluate. The early BWC evaluations assessed the technology's effectiveness in reducing liability, increasing officer professionalism, and improving evidence collection; as a result, these evaluations provide insight into their implementation motivations.

Many agencies were also looking for ways to boost public trust and confidence in the legitimacy of law enforcement. Both agency leadership and the public expect law enforcement to be accountable. One of the perceived benefits is the ability to expedite the resolution of citizen complaints (IACP, 2004). Dashboard cameras have been used by agencies to ensure accountability. A videotape can assist in resolving disagreements regarding contentious police-citizen interactions, such as whether the citizen resisted arrest or the officer used excessive force. Maghan et al. (2002) also discovered evidence that car cameras assisted in deterring police abuse of power, reducing false complaints, and regulating citizen and police behavior. So it is evident that BWCs impact not only how police do business but also the work of attorneys, judges, and others in the community and their interaction with police (Todak et al., 2018). Police innovation studies frequently examine organizational innovation through the lens of the contingency and institutional theories discussed in Chapter 2. Variables to quantify organizational context, complexity, and control were developed for this dissertation using LEMAS 2013 data and will be discussed in greater detail in Chapter 4.

Considering these similarities, much of the information gathered from previous camera use can be extrapolated to the use of BWCs (ManTech, 2012). For example, videos of traffic stops generated by dashboard cameras are used throughout the country to resolve officer-involved complaints and bolster evidence (ManTech, 2012). In addition, as part of a study of dashboard cameras and BWCs for the Orlando Police Department, Draisin (2011) concluded that BWCs offer many of the same benefits as dashboard cameras at a lower cost. Dashboard cameras have also shown to be positively related to earlier adopting agencies of BWCs (Nowacki & Willits, 2016). Essentially, BWCs are miniature vehicle cameras that can now be mounted on police officers rather than their dashboards. BWCs have a significant overlap with more established technologies such as CCTV and LPRs (Strom et al., 2017); thus, many of the concerns agencies had regarding data storage, public privacy concerns, and a lack of specific policies to use may have been addressed in some form in the past, either by their agencies or another of similar composition.

Despite limited and mixed results from the first five evaluations of BWCs regarding these factors, the technology's adoption was perhaps not surprising given these anticipated benefits from prior camera technologies. However, BWCs can pose numerous obstacles and cause unintended consequences in officer training, data preservation and access procedures, and privacy concerns. Several of these issues have already been investigated concerning prior surveillance cameras, and there is much to consider from prior experiences.

These innovations shared similar disadvantages and unintended consequences. General drawbacks included high acquisition costs, image quality problems, and a limited field of view. In addition, implementation challenges and functional issues may have adversely impacted the technology's acceptance, use, and impact (Koper et al., 2014). Indeed,

several of these technologies initially met with opposition from officers and experienced various operational difficulties.

A 2007 national survey of large agencies associated with PERF asked agencies to characterize the condition of specific technologies as either "obsolete," "old but serviceable," or "up to date" (Koper et al., 2009). The results showed that many of the widely used technologies were also likely to be outdated. For surveillance technologies, 60% to 65% of the respondents used video surveillance networks and patrol car cameras, and 31% to 37% were rated as old or obsolete. Notably, 26% of agencies reported using audio/video equipment worn by officers, and 36% were old or obsolete. Koper and colleagues predicted that these technologies might require widespread replacement in the coming years. Ineffective, poorly managed, or rapidly outdated technology is less likely to be adopted (Schuck & Rosenbaum, 2008). It is unclear whether agencies implemented upgraded versions of their currently adopted technology, moved on to the newest related technology, or rejected innovations because of their experiences with prior technology they now consider old or obsolete. Innovation research often measures the degree of past innovativeness by assessing the organization's past adoptions. Measures for prior and current technology use were created for the currently study, in addition to the extent of community policing adoption and the number of specialized units. These three measures are discussed further in Chapter 4.

### Innovation to Reform

Finally, a third common thread in police innovation is technology adoption in response to controversies, as it seems that innovation is inextricably linked to crises in policing (White & Malm, 2020). For example, police departments installed video cameras in

their patrol cars following large-scale riots in Los Angeles in the wake of the Rodney King riots (Maghan et al., 2002), the Ferguson Police Department began using BWCs after the police shooting of Michael Brown, and taser cameras were developed in response to misuse and excessive force. Following each event, diverse groups of stakeholders actively supported adoptions, including police leadership organizations (IACP), activists (MADD), civil rights groups (American Civil Liberties Union), police unions, research organizations (PERF), state and federal governments, and citizens.

The motives and decision-making processes for implementing innovations differ by agency, and the local constraints and demands can also influence the implementation of BWCs (Gaub & White, 2020). In scandal-plagued agencies, for example, excessive and unnecessary force may be employed, citizen complaints may arise, and police legitimacy may be undermined (Gaub & White, 2020; White, 2019). In other words, an agency that is deploying cameras as part of its ongoing professionalization efforts has a different starting point than one that is adopting BWCs in response to a misconduct scandal (White, 2019).

For troubled agencies that adopt BWCs, it may be feasible to achieve reductions in complaints and force that are comparable to Rialto. However, agencies with well-developed employee selection, training, policy, supervision, and accountability processes will not likely see the same declines (White, 2019). An increased culture of accountability could be attributable to a lower rate of police misconduct rather than the cameras. However, in some cases, BWC adoption involved a deliberate decision followed by meticulous planning. For this dissertation, measures of officer education and professionalism were developed and are discussed in greater detail in Chapter 4.

This chapter examined the emergence, characteristics, and diffusion research of BWCs. According to the 2016 LEMAS-BWCS, the first BWC adopters were small to medium-sized agencies until 2006, when the first agency with 100 or more sworn officers adopted, see Table 3 below (Local police [LP], sheriff's office [SO]). Innovation research suggests that larger size or larger available resources are correlated with early adoption. For BWCs, however, size was negatively associated with early adoptions. Studies have suggested that large size was a constraint for BWC adoption because of the costs to equip and train greater numbers of officers or that larger budgets insulated agencies from public pressures (Nowacki & Willits, 2016). Larger size does not become a positive predictor of BWC adoption until Goodison et al.'s (2018) and Nix et al.'s (2020) studies that included adoptions by 2015 and 2020, respectively. These findings suggest that size can have a positive or negative effect on adoption and appears to be associated with certain adopter categories. The sample for this study is comprised of large agencies with 100 or more sworn officers, which is discussed in greater detail in Chapter 4.

**Table 3: Body-Worn Camera Adoptions Reported in 2016 LEMAS**

| Agency type & size | 1996 | 2000 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LP: 100+ | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 4 | 12 | 15 | 24 | 15 |
| LP: 50-99 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 2 | 4 | 3 | 4 | 2 |
| LP: 25-49 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 5 | 6 | 11 | 9 | 9 |
| LP: 10-24 | 0 | 0 | 1 | 1 | 0 | 3 | 3 | 4 | 9 | 12 | 15 | 30 |
| LP: 5-9 | 0 | 0 | 0 | 0 | 1 | 3 | 7 | 8 | 11 | 10 | 15 | 22 |
| LP: 2-4 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 7 | 14 | 4 | 12 | 17 |
| LP: 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 1 | 1 | 3 |
| SO: 100+ | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 2 | 5 | 2 | 6 | 5 |
| SO: 50-99 | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 2 | 1 | 0 | 2 | 5 |
| SO: 25-49 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 2 | 4 | 2 | 2 | 3 |

| Agency type & size | 1996 | 2000 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SO: 10-24 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 6 | 4 | 7 | 9 |
| SO: 5-9 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 3 | 1 | 4 | 3 |
| SO: 2-4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| State | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 2 |
| TOTAL | 1 | 4 | 2 | 4 | 4 | 11 | 20 | 39 | 76 | 65 | 103 | 126 |

**Research Questions**

The questions explored in this study are:

1. What organizational factors predict early adoption of BWCs?

2. What are the relationships of internal complexity, professionalism, and control characteristics and early adoption of BWCs in large law enforcement agencies?

3. What is the relationship between prior innovativeness and early BWC adoption?

4. What is the relationship between interconnectedness variables and early BWC adoption?

5. What are the relationships between geographic settings and early adoption?

6. What are the relationships between socioeconomic factors and early adoption?

7. What are the relationships between political conditions and early BWC adoption?

8. What is the relationship between community demand and early BWC adoption?

This study examines a nationally representative sample of large police agencies using secondary data from LEMAS 2013, which is large enough to allow for analysis of the factors that may predict early innovation adoption. The research questions and hypotheses are designed to elucidate the internal and external characteristics of early BWC adoption. By incorporating several structural contingency and social disorganization variables into the

general diffusion of innovation model using LEMAS 2013, this study extends Schuck's (2017) analysis of dashboard cameras and MVRs. These variables will enable an in-depth examination of internal organizational characteristics, external community demands and constraints, cultural factors, and political circumstances surrounding early BWC adoptions.

The BWC innovation studies discussed in this chapter did not include measures of the communication channels through which law enforcement agencies learn about and share their experiences with innovations. Earlier adopters have more extensive interpersonal networks and are well-known for sharing their subjective experiences and opinions about innovations with other agencies in their networks. This study includes measures of CALEA membership, participation in multijurisdictional task forces, and openness to outside researchers. LEMAS 2013 contains data on these measures, which demonstrate how police can expand their interpersonal networks.

Nowacki & Willits (2016), Lawshe (2022), and Strom et al. (2017) examine samples containing earlier adopters like the current study, however, these studies examined adoption by drawing on contingency, perviousness, or organizational choice theories and did not assess many key factors identified in diffusion of innovation research such as complete measures for organizational differentiation, professionalism, innovativeness, and interconnectedness outlined in Chapter 2. Schuck (2016) found that external community socioeconomic factors and political conditions exhibited greater influence on dashboard camera and MVR use than internal organization factors by including measures created from Census and voting data.

Goodison et al. (2018) and Nix et al. (2020) examine the spread of BWCs in 2015 and 2018 samples of municipal agencies. Their findings indicated that greater size was a

predictor of adoption, that region had a beneficial effect, and that race composition was also associated with adoption. The current study developed measures for geography, socioeconomic factors, political conditions, and community constraints in order to extend these findings to earlier adopters.

While this research focuses on BWCs, the answers to these research questions will shed light on the early stages of law enforcement innovation adoption in general and will be broadly applicable to other policing innovations. The outcomes and analyses will support Rogers' (2003) adopter categories specific to law enforcement organizations. Additionally, these answers will provide insight into police organizational decision-making. A detailed analysis of the variables will answer these questions in Chapter 3.

# CHAPTER FOUR

The dissertation's central question, addressed through a review of theory and research, is "What factors contribute to the early adoption of BWCs in large police departments?" This research examines the relationship between organizational and environmental factors, both individually and in combination, for large law enforcement agencies and early innovation adoption decisions using logistic regression models. The factors influencing police innovation adoption have long been a point of contention in the policing research community. Disagreements about the causes and correlates of organizational innovation, both in general and in the realm of law enforcement, exemplify this. While a few studies have identified factors influencing law enforcements' adoption of BWCs or other police innovations in general, none have examined early adopters in detail and considered organizational and environmental factors within the same model. Organizational theories and literature indicate several factors that may be significant; however, the specific relationship between these factors and early BWC adoption is unknown.

A general diffusion of innovation model informed by policing organizational and innovations research was used to develop measures for context, complexity, control, innovativeness, and interconnectedness. After examining institutional, structural contingency, disadvantage theories, and existing policing research, environmental measures for quantifying geographic settings, cultural context, political conditions, and community demand were developed.

The following chapter is divided into four sections. The first section discusses the data sets culled from archival sources and the procedures used to combine them and generate a sample for analysis. This is followed by a discussion of how operational measures for variables used in analyses are constructed and described. The chapter concludes with an examination of the analysis strategy and, finally, the research design's limitations.

## Data and Methods

There are three national data resources that collect law enforcement employment statistics, crime data, and other information unique to each collection used in the current study. The FBI, U.S. Census Bureau, and the Bureau of Justice Statistics (BJS) data collections have different purposes, data definitions, respondent universes, and collection procedures. Data for this dissertation was collected from each of these collections and merged to create the sample for analyses. This section describes the process undertaken for merging these disparate data sets.

To begin, data from the BJS 2007 and 2013 Law Enforcement Management and Administrative Statistics (LEMAS) surveys provide measures of structural organizational variables and were used to identify the universe of large agencies during this timeframe (LEMAS, 2007, 2013). LEMAS 2013 was the primary source of agencies to build the sample. LEMAS 2007 was matched to the primary sample to provide prior camera use, formalization, and citizen complaints data.

Second, crime rates were calculated using Uniform Crime Report (UCR) data from the FBI's Offenses Known and Clearances by Arrest files from 2010 to 2012, as well as data on Law Enforcement Officers Killed or Assaulted (LEOKA) (UCR, 2010, 2011, 2012). LEMAS and UCR data sets are available through the National Archive of Criminal Justice

Data (NACJD), a part of the Interuniversity Consortium for Political and Social Research (ICPSR).[11] LEMAS data included the FBI's alphanumeric identification code, referred to as the Originating Agency Identifier (ORI), which connected the two sets of LEMAS data and matched to FBI UCR crime data for each agency.

Third, the American Communities Survey (ACS), conducted by the U.S. Census Bureau, provided estimates of the population's social and economic characteristics over a specified period. This data was obtained directly from the Census Bureau's website.[12] The Census Bureau uses Federal Information Processing Standards (FIPS) codes to identify cities, counties, and states geographically, providing a common identifier for merging the ACS data from the 2008 to 2012 five-year estimates to the sample. The NACJD-provided Law Enforcement Agency Identifiers Crosswalk (LEAIC) file "crosswalks" UCR and FIPS state and county codes.[13] As a result, a city-level analysis of crime and poverty could be conducted by merging UCR crime data with law enforcement agency records (both of which are contained in the UCR and LEAIC files) and then matching the result to Census data using FIPS state, place, and codes (contained in both LEAIC and Census data).

Fourth, the sample was supplemented with spatial differentiation data from the 2008 Census of State and Local Law Enforcement Agencies (CSLLEA) retrieved from the NACJD (*CSLLEA*, 2008). BJS administers the CSLLEA every four years to all state and local agencies to collect agency employment data (Reaves, 2011). The 2008 CSLLEA is closest in time to the early BWC adoptions.

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[11] https://www.icpsr.umich.edu/web/pages/NACJD/index.html
[12] https://www.census.gov/programs-surveys/acs/data/summary-file.2012.html
[13] https://www.icpsr.umich.edu/web/ICPSR/studies/35158

Fifth, data from the 2008 and 2012 presidential elections were gathered from the Atlas of U.S. Presidential Elections (Leip, n.d.) to determine the percentage of Republican votes cast in both election years. State and county data were exported directly from the Atlas and associated FIPS codes. Ultimately, 2008 and 2012 were highly correlated; therefore, the 2008 data set was excluded from analysis.

Sixth, the Commission on Accreditation for Law Enforcement Agencies (CALEA) Client Database provided the initial date of an agency's accreditation using the agency name which was matched with each agency in the sample.[14] Together, these six data sources offer a unique opportunity to examine several organizational and environmental predictor variables associated with early BWC adoption.

**Sample Characteristics**

To create a sample suitable for studying early BWC adoption, I sought to maximize the number of agencies that adopted BWCs while also maintaining the ability to match police agencies to environmental variables from Census data. The study's scope necessitated a sample of large agencies with at least 100 officers and focused on whether agencies reported using BWCs and not on their extent of use. Larger agencies, according to studies, are more likely to adopt early. Additionally, most of the prior research on police innovation has focused on large municipal police departments, ensuring that the findings of this study are comparable to the available literature. For this dissertation, "large police agencies" are defined as those with more than 100 sworn officers (see Figure 1); "municipal" or "local" police agencies are defined as those with primary jurisdiction over a city, town, or county

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[14] https://calea.org/calea-client-database

rather than a state, territory, or special district such as a school or airport; and "police agencies" are defined as those that respond to citizen calls for service as well as those that enforce a broad range of laws. Sworn officers carry a firearm and a badge, have full arrest authority, and are compensated with funds set aside for law enforcement personnel (Banks et al., 2016).

According to 2008 CSLLEA statistics, the United States had 12,501 local law enforcement agencies employing approximately 461,000 local police officers, with agencies employing 100 or more officers accounting for 64% of all full-time sworn officers (Reaves, 2011). BJS used the 2008 CSLLEA to build the sampling frame for the 2013 LEMAS. This provides a suitable sample size and enables the construction of police organizational structure variables. LEMAS data have been used in several other police innovation studies for this purpose (Burruss & Giblin, 2014; Hendrix et al., 2018; King, 2000; Lum, Koper, et al., 2019; Randol, 2014; Weisburd & Lum, 2005).

The current study conducts a cross-sectional investigation on a national sample of police agencies, using data from the 2013 LEMAS survey to create the data set for analysis and data from the 2007 LEMAS survey for some temporally lagged variables. LEMAS data are one of the most frequently of used data sets in peer-reviewed articles out of BJS data collections (Matusiak et al., 2014). The 2013 survey was conducted at an optimal time to analyze the early adoption of BWCs.

BJS has conducted the LEMAS survey every three to four years since 1987 and collected data from over 3,000 general-purpose state and local law enforcement agencies. This includes all those who employ 100 or more sworn officers, sheriffs' offices with primary law enforcement duties, state agencies, and a nationally representative sample of

small agencies using a stratified sample design based on the number of sworn personnel from the CSLLEA sampling frame. As a result, the survey is cross-sectional and multi-wave in duration, allowing researchers to conduct longitudinal studies of police organizations to understand their consistency and change better. The 2013 LEMAS survey, which was the latest survey data set available,[15] was mailed out to 3,272 agencies, including 2,327 local police departments, 895 sheriffs' offices, and 50 state agencies. Agencies employing 100 or more sworn officers make up 5% of local police departments that employ 63% of all full-time officers (Reaves, 2015b). Law enforcement agencies with fewer than 100 sworn, full-time officers were excluded from the study's sample because their data is less detailed, contains more missing data, and does not consistently allow for comparison to previous LEMAS surveys or to Census data at the city- or county-level for socioeconomic variables.

The core LEMAS questions cover various topics, including agency size, personnel data, budgets and expenditures, operations and management, and equipment use. However, each survey iteration is updated to reflect emerging issues. For example, the 2007 survey instrument asked respondents to provide the total number of required training hours, whereas the 2013 survey instrument asked only about the type of training required. In addition, questions regarding citizen complaint review boards were added to the 2007 survey but were not included in the 2013 survey. Finally, in 2013, the survey was expanded to

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[15] BJS conducted a LEMAS Body-worn Camera Supplement (LEMAS-BWCS) in 2016, with the results published in November 2018. This supplement collected detailed information on BWCs to supplement the LEMAS core survey's analysis. Unfortunately, this data was not available until after the dissertation's data collection period. However, the 2016 LEMAS-BWCS data collection period ran from May to October, well after the early adoption. Results estimated that 47% of general-purpose law enforcement agencies had adopted BWCs (Hyland, 2018).

include questions about their agency use of social media and patrol officers' use of body-worn and weapon-attached cameras.

I selected the 2013 LEMAS for three significant reasons. The first advantage of utilizing this data set is that the 2013 survey was the first to include questions about police departments' adoption of BWCs, allowing for the first opportunity to examine early adoptions. By 2013, 32% of agencies in the LEMAS sample reported use of BWCs by their patrol officers. Second, the 2013 LEMAS surveyed a nationally representative sample of general-purpose law enforcement agencies, including those with at least 100 full-time sworn officers, ensuring a sufficient sample size for evaluation. Third, the 2013 LEMAS survey received a high response rate of 91 percent from law enforcement agencies with 50 or more officers (Reaves, 2015). Finally, due to the consistently high response rate for BJS, the sampling plan was well-executed (Langworthy, 2002). The final database includes 2,059 local police departments, 717 sheriffs' officers, and 46 state law enforcement agencies.

Law enforcement officers assigned to local police departments are the closest to citizens and serve as the point of contact for law enforcement. The sample was limited to sheriffs' offices, county, and municipal agencies to enable matching LEMAS data to ACS place, (city-) and county-level social demographic and economic data. Agencies that lacked data in 2007 and 2013 were excluded from the sample in addition to state or federal law enforcement agencies and tribal police. Table 4 below displays the descriptive statistics of the original sample before case exclusion for missing data. The cases that provided data for each variable are noted in the second column, and the maximum chief pay, citizen complaints, and use of force variables account for most of the missing data. These questions were particularly sensitive and subjected to more missing data problems in prior studies

(Lawshe, 2022; Nowacki & Willits, 2016; Worrall, 1998). In the absence of complete data on all cases, the final sample was reduced by listwise deletion. Imputation was not attempted due to the sensitivity of these measures.

**Table 4: Descriptive Statistics of Sample (*n*= 644)**

| Variable | *n* | Min | Max | Mean | *SD* |
|---|---|---|---|---|---|
| Agency Size | 644 | 100 | 12,042 | 416.00 | 821.32 |
| Slack | 644 | 11.76 | 1,531.89 | 247.56 | 131.43 |
| Population served | 644 | 23,921 | 5,231,351.00 | 29,6769.69 | 468,236.55 |
| Functional Differentiation | 633 | 0.00 | 137 | 6.41 | 7.64 |
| Vertical Differentiation | 607 | 0.30 | 7.20 | 2.25 | .86 |
| Spatial Differentiation | 644 | 0.00 | 99.00 | 4.53 | 7.83 |
| Officer Education | 644 | 0.00 | 558 | 9.68 | 29.76 |
| Training Requirement | 644 | 64.00 | 11999.00 | 1,469.86 | 982.75 |
| Chief Max Pay | 609 | 62,000.00 | 453,627.00 | 144,043.04 | 41,541.80 |
| Use of Technology | 644 | 0.00 | 6.00 | 2.72 | 1.19 |
| Community Policing | 644 | 0.00 | 5.00 | 3.04 | 1.39 |
| Centralization | 644 | 0.00 | .288 | 0.08 | 0.04 |
| Formalization | 644 | 7.00 | 17.00 | 14.35 | 1.88 |
| Task Force Participation | 644 | 0.00 | 5.00 | 2.65 | 1.18 |
| Outside Researchers | 644 | 0.00 | 9.00 | 1.84 | 3.48 |
| Racial Asymmetry | 644 | 0.00 | 7.69 | 0.59 | 0.57 |
| Youth to Adults | 644 | 0.14 | .53 | 0.31 | 0.06 |
| Unemployment | 644 | 3.60 | 25.5 | 9.96 | 3.04 |
| Residential Stability | 644 | 6.24 | 203.41 | 28.51 | 22.28 |
| Poverty | 644 | 1.76 | 89.96 | 10.52 | 6.71 |
| Income Inequality | 644 | 0.34 | 0.62 | 0.45 | 0.04 |
| Republican % 2012 | 644 | 7.27 | 80.00 | 45.36 | 13.38 |
| Citizen Complaints | 580 | .00 | 188.46 | 6.54 | 15.34 |
| Average Crime | 643 | 0.00 | 20,286.04 | 4,857.61 | 2,605.96 |
| Officers killed/assaulted | 643 | 0.00 | 69.97 | 8.63 | 11.50 |
| Use of Force | 383 | 1.18 | 1,470.59 | 71.16 | 106.23 |

Non-response to surveys and items in one or more of the six data sets merged for these analyses resulted in only a subset of agencies providing sufficient analysis data. Missing data required agency exclusion if they failed to provide information for survey questions or sets of questions used in variable construction. A decision not to use imputation for missing data was made after careful consideration of the data, assumptions underlying the use of imputation measures, and explanations for nonresponse. Specifically, variables constructed to measure citizen complaints, crime rates, officers killed or assaulted, and use of force suffered from moderate to significant missing data. Studies have examined variation in the number of civil suits filed and found significant missing data that were not missing randomly as there were important differences in respondents and nonrespondents (Archbold & Maguire, 2002; Worrall, 1998). Archbold and Maguire (2002) argued that cases showing some sample selection bias should not be remedied with statistical techniques, but with more creative research methods to account for the sensitive nature of the topic.

After processing the data to the above specifications, the final study sample comprises 532 sheriffs' offices and local police agencies. Excluding the 112 cases did not change the proportions of size or agency type, but it did remove cases with missing data. The final sample's frequency distributions for agency sizes and types are shown in Table 5 below.

**Table 5: Frequencies of Agency Size and Type ($n$= 532)**

| Variable | $n$ | % |
|---|---|---|
| Agency size | | |
| 100-149 | 191 | 35.9 |
| 150-199 | 100 | 18.8 |
| 200-249 | 46 | 8.6 |

| Variable | $n$ | % |
|---|---|---|
| 250-299 | 36 | 6.8 |
| 300-499 | 72 | 13.5 |
| 500-749 | 33 | 6.2 |
| 750+ | 54 | 10.2 |
| Agency Type | | |
| Sheriff's Office | 138 | 28.0 |
| Local Police | 384 | 72.0 |

**Dependent Variable**

The dependent variable in this investigation is a dichotomous variable of whether a police department reported using video cameras on patrol officers in the 2013 LEMAS question (hereinafter Q) F1F, which was coded as 1 (adoption) or 0 (non-adoption). The 2013 survey was the first time that LEMAS clearly recorded BWC use. This data set reflects only whether an agency reported using BWCs, not the extent to which they were used. In Q35a of the 2007 LEMAS, the agency was asked whether it routinely used video cameras, and then in Q35b, the agency was asked to specify the number of cameras used in patrol cars, fixed-site surveillance in public areas, and mobile surveillance.

As of January 1, 2013, 112 (21%) of the sampled agencies reported having adopted BWCs. LEMAS 2007 and 2013 data were merged to enable an analysis of two prior camera use variables for dashboard and mobile cameras and measures for the number of citizen complaints, formal written policies, and training courses. Additionally, the 2007 survey was conducted when an increase in interest in BWC technology and a decline in or discontinuation of dashboard and other mobile camera use occurred. Thus, this survey may add context to the discussion above about police use of video surveillance cameras.

**Independent Organizational Variables**

The structural contingency theory explains that organizations alter their structures and activities to accomplish specific organizational goals more effectively and efficiently. According to proponents of the theory, organizations rationally adopt structures and practices most conducive to achieving their objectives (Mastrofski & Willis, 2010; Willis & Mastrofski, 2011). Previous research has indicated that these structural and historical differences in police organizations can affect their ability to implement change. (Katz et al., 2002). LEMAS is an excellent data source for this type of information on police organizations.

One criticism of survey-based studies emphasizes the need for researchers to agree on measuring organizational variables (Matusiak et al., 2014). LEMAS provides easily accessible data on various organizational variables and constructs, but there are differences in the operationalization and terminology used in the literature. Using consistent and accurate terminology is critical to ensure that everyone participating in this study has a common understanding of the variables under consideration (Matusiak et al., 2014). The following section discusses the organizational measures developed to analyze their association with early BWC adoption listed in Table 6 below.

**Table 6: Organizational Variables and Descriptions**

| Variable | Description |
| --- | --- |
| *Context* | |
| Size | The total number of full-time sworn personnel. |
| Slack | The operating budget per the population served. |
| Population | Census bureau population estimate for 2012. |

| Variable | Description |
|---|---|
| *Complexity* | |
| Functional Differentiation | Total number of specialized units created with full-time sworn officers assigned (range 0 – 137). |
| Vertical Differentiation | A standardized pay differential of the maximum chief salary and minimum entry-level officer salary. |
| Spatial Differentiation | The sum of all districts, precincts, substations, and fixed-site neighborhoods controlled for population size. |
| *Professionalism* | |
| Education | Number of employees hired for full-time sworn positions with a bachelor's degree or higher. |
| Training | A sum of the total number of additional training hours required for lateral or preservice hires. |
| Max chief salary | Maximum salary of the police chief controlled for population size. |
| *Organizational Control* | |
| Formalization | An additive index of the number of written policies the agencies reported on the 2007 LEMAS survey (range 0 – 17). |
| Centralization | The ratio of officers at the intermediate supervisor rank and above per total full-time sworn officers. |
| *Innovativeness* | |
| Technology Use | An additive index of adopted technologies (range 0 – 6). |
| Community Policing | An additive index of adopted community policing strategies (range 0 – 5). |
| Prior and concurrent camera use | Separate dichotomous measures for 2007 and 2013 dashboard camera and MVR use. |
| *Interconnectedness* | |
| Accreditation | Agency accreditation prior to 2013 reported in the CALEA Database coded 1 = yes and 0 = no. |
| Multijurisdictional Task Forces | Additive index of issues addressed with multijurisdictional task forces (range 0-5). |
| Outside Agencies Research | Additive index of outside organizations or individuals that conducted research or statistical analysis of the agency's computerized records of criminal incidents (range 0 – 5) |

### Organizational Context

*Size and Slack.* The size of an organization has consistently been shown to be positively related to innovativeness (Rogers, 2003; Walker, 2008). Organizational size is frequently used as a proxy or surrogate measure for several unknown variables that contribute to innovation, such as total resources, slack resources, employee technical expertise, or organizational structure, in most research designs (Rogers, 2003).

Throughout the diffusion literature, size is typically measured by the number of staff, total budget, or size of the population served (Rogers, 2003). The number of employees is an ideal size indicator for bureaucracies of human services and other organizations with a high personnel requirement, such as the police (Maguire, 2003). Size and slack have been operationalized in police innovation research in terms of available federal dollars or personnel (Morabito, 2008), budgets recoded to account for population size (Morabito, 2014), and the natural log of the operating budget (Nix et al., 2020; Nowacki & Willits, 2016). Additionally, some researchers used size or slack as control variables (Randol, 2014; Schuck, 2017; Zhao, 1996). The agency's size is frequently highly correlated with the population, as cities with a large population consistently have larger police departments (Maguire, 2003).

Generally, research indicates that slack has a positive relationship with innovation adoption; however, Nowacki & Willits (2016) found larger budgets negatively predicted BWC adoption in their sample of earlier adopter agencies counter to their hypothesis. They suggested that larger operating budgets or additional resources may insulate departments from external pressures, or it could indicate that the costs to test and implement the cameras was prohibitively higher for larger agencies.

Analyzing a sample of agencies of all sizes and all five adopter categories, Nix et al.'s (2020) findings indicated that large agencies were more likely to indicate having adopted BWCs than agencies in the other three strata (0-24, 25-49, and 50-99). For these agencies and communities, Nix et al. suggest that the perceived need to record police-citizen interactions may be greater.

Consistent with prior research, the size of each agency was measured for this dissertation by the number of full-time sworn officers employed gathered from LEMAS 2013 QA1c and controlled for the population served.[16] The agencies were then classified according to the size categories used in previous BWC diffusion research to allow for more accurate comparisons (e.g. 100-249, 250-499, 500-999, and 1000+). Additionally, these categories enable comparisons among the group of larger agencies. Each agency's operational budget per capita was used to determine the agency's resource availability in relation to the size of the community it serves.[17] LEMAS 2013 QD2 asks for the agency's total operating budget for the 12-month period, including January 1, 2013.

> **Hypothesis 1a:** Larger agencies, measured by the number of full-time sworn officers, are less likely to be early adopters of BWCs.

> **Hypothesis 1b:** Agencies with more resource availability are less likely to be early adopters.

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[16] LEMAS 2013 QA1 asks for the number of paid sworn male and female personnel with separate columns for full-time and part-time employees and totals summed in row "c".

[17] Population served, named POP12, is reported in LEMAS data sets based on the Census Bureau estimate.

*Complexity*

The organizational framework discussed in Chapter 2 denotes that structural complexity contains three elements: vertical differentiation (hierarchical levels), functional differentiation (division of organizational tasks), and spatial differentiation (geographic divisions such as precincts or patrol beats). To predict innovation adoption, prior research has used structural components as independent variables, offering various combinations of factors for assessing organizational structural variation. The existing literature on police innovations has taken a similar approach. For example, Nowacki and Willits (2016) examined functional and vertical differentiation in BWC diffusion. In addition, Randol used functional, vertical, and spatial differentiation to investigate their impacts on homeland security innovations (2012) and crime analysis technologies (2014). Finally, Schuck (2017) constructed vertical and spatial differentiation variables in her longitudinal analysis of dashboard and mobile video recorders.

Maguire (2003) argues, however, that structural complexity necessitates consideration of all three differentiation components, as bureaucracy is not a unidimensional variable. Furthermore, he notes that agencies can become more structurally complex by differentiating in any of these components or a combination of them. Moreover, many academics have argued that selecting appropriate measures for examination should be guided by theory. As a result, all three components of differentiation were used in this study.

While the structural framework of organization theory quantifies organizational complexity solely through levels of differentiation, the innovations framework defines complexity as the collective knowledge and expertise of an organization's members (Rogers, 2003). In the innovations model, professionalism refers to the members of an organization

possessing a relatively high level of knowledge and expertise. Members' occupational

specializations (functional differentiation) and levels of formal education, training, and

experience are frequently used to assess organizational complexity in innovation studies.

Professionalism encourages organizational members to value innovation, education, and

training, influencing adoption decisions (Rogers, 2003). Agencies that are more

professionally complex are more likely to innovate in general (Rogers, 2003). As a result,

professionalism measures for education, training, and a qualified chief, while taking both

innovation and traditional methods of police organizational complexity into account.

 *Functional Differentiation.* The degree to which an organization divides and assigns its

tasks to functionally distinct units may serve as a proxy for prior innovativeness, implying

that more differentiated agencies may be so because of prior program adoption resulting in

the formation of special units. Indeed, police departments are well-known for adapting to

new problems by establishing specialized units to deal with emerging technologies and social

problems (Maguire, 2003; Scott, 2015; Randol, 2014). Functional differentiation is quantified

in this study using the total number of specialized units reported in the 2013 LEMAS survey

QI2.[18] Question I2 asks how many total specialized units the agency created to address

issues, problems, or tasks listed in QI1a - n.[19] By design, Q1a-b measures how many *issues* are

handled by personnel assigned to specialized units, but it does not distinguish whether the

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[18] Question I2 further explains that the agency may have only two or three units covering all the issues listed instead of having individual specialized units.

[19] QI1a – b lists fourteen issues and asks whether the agency had 1) personnel assigned full-time to the unit; 2) assigned to this unit on a part-time basis; 3) dedicated personnel but had no specialized unit; 4) had specialized policies, procedures, or training but no specialized unit; or 5) the issue was not formally addressed. The list included: bias/hate crime, bomb/explosive disposal, child abuse/endangerment, cybercrime, domestic partner/intimate partner abuse, terrorism/homeland security, human trafficking, drug/alcohol-impaired driving, juvenile crime gangs, re-entry surveillance, fugitives/warrants, victim assistance, or special operations unit (e.g., SWAT, SRT).

agency has specialized units designed to multitask and handle more than one issue.

Developing two or three specialized units to cover all fourteen issues exemplifies less

differentiation than an agency that created individual specialized units for each issue. For

example, an agency with three specialized units devoted to all fourteen issues is less

differentiated than an agency with eight specialized units devoted to all fourteen issues.

Thus, QI2 provided a more accurate measure of functional differentiation as defined for this

study. Increased scores indicate a higher degree of functional differentiation (range $0 - 137$).

> **Hypothesis 2a**: Agencies more functionally differentiated are more likely to
>
> be early adopters of BWCs.

*Vertical Differentiation.* Segmentation, height, and concentration are the three

components of vertical differentiation representing the layers of an organization. The term

*segmentation* or stratification refers to the number of command levels, *concentration* refers to the

vertical distribution of staff throughout the command structure, and *height* refers to the social

distance or *social space* between the lowest and highest-ranking employees (Langworthy, 1986;

Maguire, 2003). Segmentation measures the number of command levels in an organization,

often by counting ranks. However, police departments employ a wide variety of differing

ranks that correspond to various levels of command, thus creating ambiguity for

operationalization. Police segmentation requires a researcher to gather more detailed

information, often using qualitative methods, than available from LEMAS surveys (Maguire,

2003). According to Maguire, segmentation is the most popular measure for vertical

differentiation, but only one study on the relationship between organizational measures and

innovations was located. Zhao (1996) used the number of ranks from officer to Chief to

conceptualize vertical differentiation but discovered no relationship between it and

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community policing innovations. Due to a lack of data for an appropriate measure, a variable measuring segmentation was omitted from this study.

Concentration focuses on the distribution of personnel within the hierarchical levels and concerns unequal distribution.[20] Referring back to the pyramid illustration, police departments typically have the highest percentage of employees at the bottom of the hierarchy and are typically led by a single chief executive (e.g., chief, sheriff, commissioner). Concentration is the least common method of determining vertical differentiation, and while it is related to vertical differentiation, it "cannot be used as a measure of overall dimension," according to Maguire (2003, p. 169). For this reason, a concentration measurement was not examined for this study.

To measure the social space (height) between the lowest and highest-ranking employees, many studies construct a standardized pay differential by subtracting the lowest-paid officer's salary from the highest-paid salary and dividing that difference by the lowest salary. According to Langworthy (1986), this income disparity metric is a more abstract component of height. While this is not ideal, it serves as a proxy for the social distance between patrol officers and chief executives (Maguire, 2003). The greater the salary disparity, the greater the department's social distance or height, increasing organizational complexity. Recent studies on police innovation have used social distance measures of height with all but one finding a non-significant relationship with innovation: negative, not significant for community policing (Morabito, 2010, 2014); and non-significant for BWC diffusion (Nowacki & Willits, 2016), homeland security innovations (Randol, 2012), and diffusion of

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[20] This variable construction for the concentration component that quantifies an organization's authority distribution has also been mislabeled as "centralization" in some research (e.g., Zhao, 1996).

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dashboard cameras or mobile video recorders (Schuck, 2017). Only Randol (2014) found a positive relationship between this proxy measure of hierarchical command structure and crime analysis techniques. Nevertheless, a standardized pay differential measure of salary disparity was constructed for this study using the available data from LEMAS QB1a (max chief executive salary) and B1c data (min entry-level officer salary). Nowacki and Willits (2016) examined agencies of all sizes and types and found a non-significant association for this variable and BWC adoption. However, larger organizations are more likely to have greater distances between the lower and higher ranks, thus there may be a need to implement BWCs as a measure of supervision of patrol officers.

       **Hypothesis 2b:** Agencies with more significant vertical differentiation

                  (greater salary disparity) are less likely to be early adopters

                  of BWCs.

*Spatial Differentiation.* In policing, spatial differentiation represents the organization's geographic distribution, and thus departments with more patrol beats and stations are more spatially differentiated (Maguire, 2003). Nix et al. (2020) argue that less populated jurisdictions frequently cover larger physical spaces with fewer officers per capita and may face less pressure from communities to explore innovations due to their unique responsibilities and priorities (see also Gaub et al., 2017). Additionally, becoming more geographically decentralized may allow the police to get closer to their communities (Skolnick & Bayley, 1986).

Schuck (2017) tested spatial differentiation using the logged sum of patrol beats, police stations, separate facilities, precincts, and community substations operated by each agency. She found that organizations with a greater geographic spread were more likely to

have dashboard cameras. Schuck's research analyzed data merged from LEMAS 2000, 2003, and 2007. To extend her results to a sample constructed from the LEMAS 2013 survey, this study operationalized spatial differentiation using the sum of all districts, precincts, substations, and fixed-site neighborhood and community substations operated by each agency controlled for size and population served. However, LEMAS 2013 did not ask respondents for numbers of precincts, districts, or stations. Instead, data from CSLLEA 2008 Q2A, Q2B, and Q2C provided the necessary information.[21] This required US Census Bureau FIPS codes to link CSLLEA 2008 data to the sample.

> **Hypothesis 2c:** Early adopters of BWCs will have higher levels of spatial differentiation.

### *Professionalism*

Professionalism is the degree to which the organization's members have high levels of knowledge and expertise, enabling them to understand the value of innovations (Rogers, 2003). This study operationalized variable measures for education, training, and qualified Chief with data culled from LEMAS 2013.

*Education.* To date, prior innovation studies have indicated that earlier adopters generally have higher aspirations for formal education, more years of formal education, greater rationality, and a more favorable attitude toward science than later adopters (Rogers, 2003). Police researchers operationalize education through a variety of measures, including the presence of academic books on the innovation or awareness of research (Weisburd &

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[21] CSLLEA Q2A, B, and C asked agencies to enter the number of districts, precincts, division stations; fixed-site neighborhood and community substations; and mobile neighborhood and community substations operated by the agencies as of September 30, 2008, that are separate from headquarters.

Lum, 2005),[22] the agency's requirement that new hires have some college education

(Nowacki & Willits, 2016), and the percentage of officers with college degrees (Skogan &

Hartnett, 2004). Professional review of how closely police practice adheres to professional

standards and the development and institutionalization of a professional body of police

knowledge are two more examples of professionalism indicators in law enforcement

organizations (Mastrofski & Willis, 2010).

The education variable for this dissertation measures new hires with a bachelor's

degree or higher for two reasons. First, research indicates that college degrees are more

prevalent now than years ago. Thus, there is likely a difference in officer education levels

now than 10-20 years ago, and the expectation that officers who had been there longer

would be different from new officers. Second, measuring the recently hired officers is more

likely to capture agency priorities from 2012 to 2013. Thus, education was operationalized

for this study by the number of newly hired full-time officers with a bachelor's degree or

higher from the LEMAS 2013 QC8.[23]

> **Hypothesis 2d:** Agencies with more new officers holding at least a four-year
>
> college degree are more likely to be early adopters of
>
> BWCs.

*Training.* Formal training is another way to demonstrate organizational

professionalism (Rogers, 2003). In addition, training can serve as a barometer of an agency's

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[22] Weisburd and Lum used a survey that asked respondents if their departments had scientific books on crime and crime mapping. The LEMAS surveys in 2007 and 2013 did not collect this information.

[23] LEMAS QC8 asks, "During the 12-month period ending December 31, 2012, how many employees hired for full-time sworn positions had a bachelor's degree or higher?" Question QC6 uses categorical variables to measure increasing levels of required education for sworn new officers, but was rejected for this study because Nowacki and Willits (2016) measured in this manner using a sample of agencies from LEMAS 2013. Thus, there was no reason to repeat the same measure again here.

commitment to innovation, as agencies must set aside time and rearrange schedules to accommodate officers' participation in training (Morabito, 2010). In general, this variable correlates positively with early adopters (Rogers, 2003). The measure for training in this study, which combines those two approaches, is the sum of the number of academy and field training hours required for new officer recruits plus the number of in-service training hours provided annually. This measure is captured from LEMAS 2007 Q10 and Q11.

**Hypothesis 2e:** Agencies requiring more hours of training are more likely to be early adopters.

*Maximum Chief Salary.* Finally, professionalism was examined in this study by creating a variable measure for the Chief's maximum salary from LEMAS 2017 QB1a.[24] This variable assumed that some large cities could afford to pay their chiefs a higher annual base salary (Reaves, 2015). Nix et al. (2020) suggested that large cities may be able to pay their chiefs higher base salaries enabling them to attract more qualified and experienced candidates or may have been selected for their reputation as an innovator. As a result, these seasoned leaders would better grasp emerging technologies and may serve as champions for early adoption. An innovation champion can boost a new idea in an organization (Rogers, 2003), plus a chief would have the authority and power to make adoption decisions. Alternately, a higher salary may be offered to attract chief candidates to reform a poorly performing department (Nix et al., 2020). A new chief hired to reform a department may be more likely to adopt innovations to solve the problem. To my knowledge, this conceptualization and

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[24] LEMAS QB1 asks, "As of January 1, 2013, what was your agency's annual salary schedule for full-time sworn positions? If. No fixed salary exists; list the lowest current pay as the minimum and the highest current pay as the maximum for each position. Subsection a specifies the chief executive (e.g., chief, sheriff, commissioner).

measure of professionalism have not been included in the research on policing innovation. The measure was constructed for this study using the available data from LEMAS QB1a (max chief executive salary) controlled by size and population served.

**Hypothesis 2f:** Agencies with higher-paid chiefs are more likely to be early adopters.

*Control*

Structured control and coordination mechanisms are used to manage and coordinate an organization's work and employees (Maguire, 2003). Centralization (the extent to which decision-making is concentrated) and formalization (the degree of emphasis on specific rules) are two organizational control mechanisms. These two control mechanisms may be compensatory as larger organizations may rely less on centralization and more on formalized rules and procedures as a mechanism for achieving control and coordination (Maguire, 2003). On the other hand, senior managers can easily control personnel by implementing additional written policies and formal rules to compensate for having delegated more authority to subordinate levels. The formalized rules and procedures serve as a blueprint help to achieve uniformity and to better coordinate efforts across to those with delegated authority.

Variables measuring organizational control are included because prior research indicates they influence police innovation decisions (Katz et al., 2002). This study developed measures of formalization and centralization.

*Centralization.* Centralization is the degree to which power and control in a system are concentrated in the hands of a single individual or select group (Maguire, 2003; Rogers, 2003). In a centralized structure, fewer leaders are at the top and the organization's ability to identify operational-level problems and propose innovative solutions is restricted when only

a few leaders dominate the system (Rogers, 2003). Conversely, a decentralized structure refers to the delegation of decision-making authority to subunits, such as a division station or community subunit, under the overall coordination of headquarters. Nowacki and Willits (2016) quantified centralization by calculating the percentage of officers with a sergeant rank or higher and discovered that centralization had no predictive value for body camera adoption. However, this operationalization does not account for power concentration at the top level of the agency's hierarchy, as implied by the innovation literature, which asserts that power concentration in a few strong leaders correlates with decreased innovation. While police sergeants are not considered entry-level officers, they are frequently referred to as front-line leaders because they are below the intermediate and chief executive managerial levels. By calculating the percentage of officers at the sergeant rank and above, Nowacki and Willits quantified power at the lowest level of leadership and above as the entire chain of command is represented, except for unranked officers.

Drawing from innovation theory, this study measures centralization based on the top levels of leadership and does not include officer ranks of sergeant and below. LEMAS 2013 QA4 requests information on the number of full-time sworn personnel who held supervisory positions classified as Chief Executive, intermediate supervisor, sergeant, or equivalent first-line supervisor. The measure used for this study was operationalized as a leadership ratio using the total intermediate and chief executive supervisors (QA4a and b) per total number of sworn full-time personnel reported in QA1c.

**Hypothesis 2g:** Centralization of power will negatively influence early BWC adoption.

*Formalization.* Formalization is an indicator of the degree to which an organization places a premium on its members adhering to rules and procedures (Rogers, 2003). Some organizations are highly informal, with a strong emphasis on verbal communication for control, while others are highly formalized, replete with mountains of rules, stacks of forms, and rigid standards of conduct. Less formal organizations are generally expected to be more innovative because their greater flexibility and less emphasis on rules and procedures are conducive to new ideas (Damapour, 1991; Randol, 2012). Generally, a higher degree of formalization inhibits the consideration of innovations by members but encourages implementation after a decision to adopt is made (Rogers, 2003). However, studies of police innovation have shown that the most innovative departments exhibited many characteristics of Weber's idealized bureaucracy. It is hypothesized here that formalization provides clear expectations and is better suited to adopt radical innovations like BWCs because dissent can be stifled. Innovation studies have measured formalization in a variety of ways, including the presence of a foot patrol policy (Nowacki & Willits, 2016), an additive index of written policies (Randol, 2012, 2014), and the number of written policies and procedures implemented as a percentage (Schuck, 2017). For example, regarding BWC adoption in 2013 by agencies of all sizes, Nowacki and Willits (2016) found that departments with formal foot patrol pursuit policies governing officer behavior were more likely to adopt BWCs than departments without such policies.

The 2013 LEMAS survey contained questions asking whether the agency had written pursuit policies for foot patrol and driving policing. However, LEMAS 2007 included 17 separate binary questions regarding the existence of formal written policies or procedural directives on various subjects, including officer conduct, dealing with special populations or

situations, and procedural functions. Given that Nowacki and Willits (2016) discovered a positive correlation between BWC adoption and agencies with foot patrol policies, there is no reason to replicate that finding here using the same LEMAS data. The 2007 LEMAS survey data on 17 distinct policies allow for the assessment of higher degrees of formalization. Furthermore, early BWC adoptions occurred between 2000 and 2012, which makes a 2007 measure of policy use timely within the range of early adoptions. This may reflect levels of formalization at or around the time when the adoption decision was made. Thus, formalization is measured in this study with an additive index composed of binary responses to LEMAS 2007 Q45a-q (range = 0 – 17).

> **Hypothesis 2h:** Higher formalization will positively influence early BWC adoption.

### *Innovativeness*

Numerous studies examining an agency's proclivity to adopt have dubbed it "innovativeness" and defined it as the degree to which an organization adopts new ideas relatively earlier than other members in the system. As mentioned in Chapter 2, adopter categories were developed to categorize system members according to their innovativeness (e.g., innovators, early adopters, early majority, late majority, and laggards). Innovativeness is a measure of an organization's openness to change and risk tolerance, and it reflects the level of receptivity to innovations. Early adopters tend to have a more positive attitude toward change as compared to later adopters (Rogers, 2003).

Prior technology adoptions can indicate a department's receptivity to new tools or practices, which is frequently quantified in terms of the number of innovations previously adopted by an organization. In the research on policing innovation, attitudes toward

innovation have been conceptualized in a variety of ways, including openness to research (Weisburd & Lum, 2005), reputation for innovativeness among peers (Weiss, 1997), the number of IT systems adopted (Schuck, 2017), NIBRS compliance (Skogan & Hartnett, 2005), and social media use (Nowacki & Willits, 2016). However, the most consistent measures of adoption styles have been scales or additive indices that quantify discrete binary questions about prior innovation adoption. To assess the effects of prior adoptions on early BWC adoption, two variables measuring prior technology and community policing innovations were created, indicating the degree to which each organization had adopted new ideas in policing.

*Technology Use.* An additive index was constructed using answers to binary questions of specific technologies to measure prior adoptions of technological innovations. Question F1 asked, "As of January 1, 2013, did your agency use any of the following technologies to collect information?" The list included a) gunshot detection system, b) license plate readers, c) smartphones, d) video surveillance of public areas, e) video cameras in patrol vehicles, f) video cameras on patrol officers, g) video cameras on weapons, and h) other types of video cameras. F1f was omitted from the index because the dependent variable is BWC adoption. Additionally, the index created for this research excluded reported use of patrol vehicle cameras because they are used as a prior camera use variable (discussed below). The result is an index with a value between 0 and 6.

**Hypothesis 3a.** Agencies that adopt more technologies are more likely to be
early adopters of BWCs.

*Community Policing.* Community oriented policing (COP) strategies have been described as a paradigm shift in policing (Crank, 2003) and a radical innovation (Morabito,

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2010), as they represented a significant shift away from the reactive professional model that

limited community input (Morabito, 2014) and toward a proactive approach that addresses

the unique needs of their community (Morabito 2010). Researchers in policing have used the

innovation framework to examine why some police departments adopted elements of

community policing but not others. Generally, these studies constructed variables measuring

community policing implementation with archival data from LEMAS surveys to include the

number of community policing activities, training hours received, and having formal COP

policies. Schuck (2017) used the degree of COP implementation with a scale constructed

from LEMAS surveys, including giving officers specific beats, encouraging SARA use, and

maintaining a COP plan. LEMAS 2013 asks these in E3-9. Thus, an additive index of

community policing activities was created for determining prior innovativeness using

LEMAS 2013 binary answer values, including:

- QE3 – agency actively encouraged patrol officers to engage in SARA-type problem-solving projects;

- QE5 – included collaborative problem-solving projects as evaluation criteria of patrol officers;

- QE6 – had a problem-solving partnership or written agreement with any local civic, business, or governmental organization;

- QE7 – whether in the prior 12-months ending December 31, 2012, agency regularly assigned the same patrol officers primary responsibility for a particular area or beat within the agency's jurisdiction; and

- QE9 – whether the agency utilized survey information from local residents about crime, fear of crime, or satisfaction of local law enforcement in the prior 12 months.

The result is an index ranging from 0 to 5, with higher numbers representing more significant implementation of community policing strategies and a higher degree of innovativeness.

**Hypothesis 3b.** Agencies that adopt more community policing strategies are more likely to be early adopters of BWCs.

*Prior and Concurrent Camera Use Variables.* The value of BWC adoption in 2013 may depend on past values of camera adoptions such as dashboard and mobile video cameras reported in the 2007 LEMAS survey. According to Draisin (2011), while many agencies were testing BWCs in 2011, she could not locate any formal studies, and no large agency had fully implemented them. On the other hand, dashboard cameras have been criticized for being costly to implement and have proven to be a barrier for some larger agencies as costs increased exponentially as the number of police vehicles increased (IACP, 2004).

As a result of the ongoing use or recent purchase of dashboard cameras, we might see those agencies resist early BWC adoption. Furthermore, according to Schuck (2017), large police departments decreased their ownership of dashboard cameras (by 12.4%) and mobile cameras between 2000 and 2007 (by 24%). Departments may have reduced or discontinued use due to their focus shifting to newer technology.

As previously discussed, the 2007 definition of a mobile video camera is ambiguous as to whether MVR was synonymous with dashboard cameras or included vehicles explicitly used for stakeouts and hostage situations. As a result of the ambiguity, some agencies may have included information on the use of BWCs in response to the 2007 survey, but the quantity is unknown. The LEMAS 2016 BWC Supplement included an open question for agencies to write in any other specific event-recording equipment. Additional camera types

included covert surveillance cameras, utility pole cameras, and handheld/mobile cameras, e.g., tasers, phones, and camcorders (LEMAS, 2019). Thus, the 2007 LEMAS survey question on the number of mobile video recorders potentially captured these additionally available camera options.

It is expected that the experiences gained with video cameras in 2007 will influence BWC adoption by 2013 because prior technology use generally positively influences additional adoptions. On the other hand, this variable may account for some agencies that already had BWCs in 2007 although that cannot be accurately measured. Variables were created for reported regular use of video cameras in 2007 LEMAS Q35b to allow assessment of any relationship with LEMAS 2013 responses. LEMAS 2007 survey questions required respondents to enter the number of video cameras the agency operated as of September 30, 2007, and the options listed were "in patrol cars," "fixed-site surveillance in public areas," and "mobile surveillance." A binary variable was created to represent having the specific camera type as 1 and not having it as 0, as entered in Q35b. The LEMAS 2013 survey asks for a binary response of using the technologies, therefore QF1 e) "video cameras in patrol vehicles" and was recoded for 1 to equal yes, and 0 equal no. This permitted analysis of whether prior (2007) or current (2013) dashboard camera use was associated with BWC adoption.

> **Hypothesis 3c:** Police departments that were using cameras in patrol cars in 2007 or 2013 are more likely to be early adopters of BWCs.

**Hypothesis 3d:** Police departments that were using mobile video

surveillance cameras in 2007 are more likely to be early

adopters of BWCs.

*Interconnectedness*

Previous research has revealed several significant differences in communication behavior between early and later adopters of innovations. Interconnectedness refers to the degree to which interpersonal networks link the units in a social system, and innovation research generally shows a positive relationship between interconnectedness and innovativeness (Rogers, 2003). The police innovation body of literature found the predominate factors explaining the adoption decision for an IT Data Warehouse was involvement in cosmopolitan professional networks and accreditation associations (Skogan & Hartnett, 2005); community policing with attendance at meetings and conferences (Burruss & Giblin, 2014); crime mapping technology with participation in listservs and conference attendance (Weisburd & Lum, 2005); and LPRs with social networks and word-of-mouth (Lum et al., 2019).

Independent variables such as individual leader characteristics, professional networks, and system openness are linked to organizational interconnectedness. Accreditation, participation in a multijurisdictional task force, and contact with outside researchers are the criteria used in this study. It is expected, based on innovation literature, that network and communication variables positively influence innovation adoption because innovations are primarily adopted based on the subjective evaluations of peers. Additionally, early adopters are said to be more social and connected than the other groups. However, later adopters often look to the early adopters for their evaluations of innovations.

*Accreditation.* Early adopters are more highly connected and have more robust interpersonal networks. The Commission on Accreditation for Law Enforcement Agencies (CALEA) promotes innovative practices in general, and accreditation has been demonstrated to assist organizations in overcoming barriers to innovation implementation (Mastrofski et al., 2007). The professional network is determined by the agency's accreditation status with CALEA, which can be accessed directly through CALEA's online membership database. This study examined a subset of innovators and early adopters who had adopted BWCs before January 1, 2013. A binary variable with the value 1 was created for agencies that had completed the accreditation process by December 31, 2012. The database only contains accredited agencies; therefore, any agency not on the list has not been accredited and coded as 0.

**Hypothesis 4a:** Agencies accredited with CALEA by 2012 are more likely to be early adopters of BWCs.

*Multijurisdictional Task Forces.* Early adopters engage in more social activities and have a more robust network of interpersonal connections located outside their organization than later adopters (Rogers, 2003). Multijurisdictional task forces are comprised of state and local law enforcement officers who pool resources and personnel to combat crimes such as child exploitation, organized crime, and gangs that originate in and between participating jurisdictions. Participation in multijurisdictional task forces is likely to expand participants' communication networks and opportunities to encounter new ideas. LEMAS 2013 QI4 asks agencies to report which issues are addressed with multijurisdictional task forces (SWAT, Drugs, Gangs, Human Trafficking, other). An additive index of these five binary responses to issues addressed by multijurisdictional task forces was created (range 0 – 5).

**Hypothesis 4b:** Agencies with higher degrees of participation in

multijurisdictional task forces are more likely to be early

adopters.

*Outside Research Participants.* Working with outside researchers can help police departments expand their interpersonal networks and thus increase their exposure to new ideas. Furthermore, involvement with more research is a characteristic of early adopters. Indeed, Nowacki and Willits (2016) discovered that data-sharing agencies were more likely to adopt BWCs when measured against a scale of social media use for crime data sharing. As such, LEMAS 2013 QF9 inquired about the types of external organizations or individuals that conducted research or statistical analysis on the agency's computerized records of criminal incidents (another law enforcement agency, a government agency, a college/university/non-profit organization, a commercial vendor, or another). To quantify police openness to outside researchers, an additive index of binary responses to this question was created (range $0 - 5$).

**Hypothesis 4c:** Agencies with more connections to outside researchers are

more likely to be early adopters.

**Independent Community Variables**

Institutional theory is concerned with the cultural forces or pressures within an organization's environment that may influence the organization to change in response. Each organization operates in a distinct economic, cultural, political, and social environment and must adapt accordingly (Scott & Davis, 2007). Drawing from social disorganization and general strain theories, innovation studies have operationalized environmental variables to assess their influence on the adoption and diffusion of innovations. Geographical location,

socioeconomic conditions, and community strain are all indicators of the environment in which agencies adopt innovations.

Several empirical studies of police structure and environment found that organizational structure is primarily determined by socioeconomic factors (Zhao & Ren, 2010). Police agencies work within the communities they serve, gathering feedback, responding to demands, and providing services to citizens, and as a result, they may respond to community demands with innovation. For these reasons, environmental variables evaluated in this study include geographic region, socioeconomic characteristics (racial asymmetry, racial heterogeneity, youth-to-adult ratio, unemployment, residential stability, poverty, concentrated poverty, income inequality), political conditions (political conservatism, unionization), and community demand (crime rate, citizen complaints, officer safety, and use of force incidents).

The following section discusses the community measures developed to analyze their association with early BWC adoption listed in Table 7 below.

**Table 7: External Variables and Descriptions**

| Variable | Description |
|---|---|
| *Geographic Settings* | |
| Region | Dummy variables for South, Midwest, and West using Northeast as the reference category. |
| *Socioeconomic Factors* | |
| Representation | Ratio of the percentage of full-time sworn Black officers per the percentage of Black residents in the population. |
| Youth-to-Adult ratio | The number of youths 17 and under per adults 18 and over. |
| Unemployment | Percentage of residents unemployed. |
| Residential Stability | Percentage of owner-occupied housing. |
| Poverty | Percentage of residents living in poverty. |

| Variable | Description |
|---|---|
| Income Inequality | The Gini coefficient of household income inequality and ranges from 0 (perfect equality) to 1 (total inequality). |
| *Political Conditions* | |
| Political Conservatism | Percentage of votes for the Republican candidate in 1) 2008 (McCain) and 2) and 2012 (Romney). |
| Unionization | The interests of sworn personnel were represented by an active collective bargaining agreement. (yes = 1; no or expired = 0) |
| *Community Demands & Constraints* | |
| Crime Rate | Average number of index crimes from 2010 to 2012 per population served multiplied by 100,000. |
| Citizen Complaints | Total citizen complaints reported in 2007 LEMAS per 100 officers. |
| Officer Safety | Average rate of assaulted or killed officers from 2010 to 2012 per 100 officers. |
| Use of Force Incidents | Total use of force incidents recorded per 100 officers. |

The American Communities Survey (ACS) five-year estimates for 2008 to 2012 were used in this study for several community variables in Table 5, which means that data were collected between January 1, 2008, and December 31, 2012.

Historically, the U.S. Census Bureau's decennial census has been the primary source of data for describing the socioeconomic conditions of U.S. communities. As part of the 2010 Decennial Census Program, the American Communities Survey replaced the traditional decennial census long-form and now provides up-to-date information in 1-year, 3-year, and 5-year estimates (Bishaw & Semega, 2008). The ACS is a continuous survey and the largest in the United States, with an annual sample size of nearly three million addresses in every county. The ACS collects detailed social, economic, housing, and demographic data in the same way that the decennial census long-form does, but on an annual basis rather than every

ten years. The ACS issues three- and five-year forecasts covering geographic areas down to the tract and block group level along with annual reports. Five-year estimates are published for areas of all sizes and are the most reliable and precise period estimates available. They are also the most comprehensive. Each release of the five-year estimates is based on data gathered over five years ending December 31 of the reference year.

The ACS uses FIPS codes, assigned alphabetically by geographic name for states, counties, voting districts, places, and several more. State and place FIPS codes were used to match to the data sample instead of other administrative boundaries, such as counties or metropolitan areas, because they allowed for more precise estimates of smaller jurisdictions. However, county codes were used to match when place data was not available.

### Geographic Settings

The United States' regions reflect a diversity of political conditions, attitudes, and beliefs, and organizations respond to these cultural characteristics. For example, numerous studies have discovered that law enforcement agencies' propensity for innovation varies by region and consistently find regional effects (Burrus & Giblin, 2014; Morabito, 2014; Nix et al., 2020; Randol, 2012). Additionally, organizations are less likely to adopt innovations that contradict local customs, norms, and traditions out of fear of societal rejection (Wejnert, 2002). Several studies have used the region as a control variable (Zhao, 1996) or independent variable (Burruss & Giblin, 2014; Morabito, 2014; Nix et al., 2020; Randol, 2012). A variable for the region of the country was created using the FBI and Census Bureau's four primary regions and creating three dummy variables for South, Midwest, and West (using Northeast as the reference category).

**Hypothesis 5:** Agencies in the South and West are more likely to be early

adopters of BWCs.

*Environmental Complexity*

According to diffusion theory, innovations occur within a specific ecological and cultural context in consideration of geographical settings, societal culture, political conditions, and globalization and uniformity (Wejnert, 2002). Environmental factors including low economic status, racial heterogeneity, and residential mobility, lead to the disruption of community social control, which can result in higher crime rates and social disorder (Sampson & Groves, 1989; Shaw & McKay, 1969). Crime is unevenly distributed across neighborhoods which tends to cluster in those communities with adverse socioeconomic conditions. Additionally, if tensions are high between law enforcement and the community, then there could be a higher likelihood of excessive use of force incidents and citizen complaints.

Communities characterized by juvenile delinquency, poverty, unemployment, and inequality would create more opportunities for officers and citizens to interact. For one, simply by increasing the number of opportunities for interactions increases the opportunities for officers and citizens to run afoul of professional or civilized behavior. Drawing from contingency theory, police leadership would be aware of the problem stemming from a community with rising crime rates and rising tensions between their officers and the community; therefore, the chief would rationally decide to adopt BWCs to improve officer performance effectively and efficiently. Furthermore, if the chief was hired to reform a department with a history of unruly officer behavior, then a rational decision to adopt BWCs could be a solution for controlling the officer behavior.

Seven socioeconomic measures were created to evaluate the impact of environmental factors in accordance with contingency and institutional perspectives and extend Schuck's (2017) study by adding data analysis from the most recent LEMAS survey. The variables used to reflect disorganization are racial asymmetry, percentage of owner-occupied housing, youth-to-adult ratio, unemployment, poverty, concentrated poverty, and the Gini coefficient to measure income inequality. The operationalization of these variables is explained in this section.

*Representation.* Theoretically, groups who do not have access to the political process may use violent means to achieve their goals and protest injustice (Barrick et al., 2014). Police officers are visible symbols of the justice system and may adopt advanced technologies as methods of social control. On the other hand, if the local police department's composition is more representative of the racial makeup of the community it serves, there may be a greater level of understanding between the police and the community. Hendrix et al. (2018) investigated whether the asymmetry in representation between the police and the community increased surveillance technology (UAVs and CCTV) to monitor what the police perceived to be problem segments in the community. Their results indicated that agencies with officers who more closely reflect the community's racial composition were less likely to use CCTV or UAV surveillance technology. A measure for representation was operationalized similarly to Hendrix et al. to examine its relationship with early BWC adoption.

**Hypothesis 6a:** Police departments that underrepresent Blacks in their
community would be more likely to adopt BWCs.

*Youth-to-Adult Ratio.* Juvenile delinquency tends to increase in socially disorganized neighborhoods characterized by a lack of control mechanisms and collective efficacy (Sampson et al., 1997). As a result, these communities provide opportunities for increased crime and delinquency (Shaw & McKay, 1942) and opportunities for antagonistic altercations between the officers and citizens. This variable is operationalized as the number of youths 17 and under per adults 18 and older.

**Hypothesis 6b:** Greater quantities of youths in the community will increase

the likelihood of early adoption of BWCs.

*Unemployment.* The unemployment rate is typically a lagging indicator following economic conditions, and low economic status is often linked with variations in crime and delinquency (Sampson & Groves, 1989). Research examining the relationship between unemployment and police innovations have measured the percent of unemployed residents (Schuck, 2017) or a set of combined measures for social disadvantage using receipt of public assistance, unemployment, single woman head of household, and percentage of residents below the poverty line (Morabito, 2010). The operationalization for this research uses the standard unemployment rate, which is the number of unemployed residents divided by the available resident labor force (older than 16 and able to work full-time).

**Hypothesis 6c:** Greater unemployment in the community will increase the

likelihood of police early adoption of BWCs.

*Residential Stability.* High rates of citizen turnover may increase anonymity, decrease the strength of community ties or collective efficacy, and enhance perceptions that surveillance is needed. Studies have created a variety of variables and combinations that measure this concept to include the proportion of residents living in the same house as they

were five years ago (Morabito, 2008) and homeownership (Schuck, 2016). Research has

shown that homeownership is positively correlated with residential stability (see South &

Dane, 1993). If this is true, a lower percentage of owner-occupied housing will increase

BWC adoption. Residential stability was measured as the percentage of owner-occupied

housing from ACS 5-year estimates.

>**Hypothesis 6d:** Higher rates of owner-occupied housing in the community
>
>>will decrease the likelihood of police early adoption of
>>
>>BWCs.

*Poverty.* Poverty is when a person or community lacks the financial resources and

essentials for a minimum standard of living. The poverty rate is determined by the percent of

residents living below the poverty level that in 2012 was approximately $23,000 per year for

a family of four.[25]

To test whether high economic inequality influenced police adoption of dashboard

and mobile video cameras, Schuck (2017) measured the percent of residents living in poverty

and matched the census data using county and place codes. The results showed that high

poverty was associated with more dashboard cameras. Therefore, a measure for poverty was

calculated for this study in the same manner as Schuck's operationalization as the percent of

residents living in poverty for each community represented in the sample.

>**Hypothesis 6e:** Higher rates of poverty in the community will increase the
>
>>likelihood of police early adoption of BWCs.

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[25] https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-poverty-thresholds.html

*Income Inequality.* The Gini index (Gini coefficient) is a summary measure of household income inequality that indicates how much the income distribution deviates from a proportionate distribution. Since 1947, the Census Bureau has used this widely used measure, also known as the index of income concentration (Jones, Jr. & Weinberg, 2000). The index ranges from 0, indicating perfect equality, in which all households have equal income shares, to 1, indicating perfect inequality, in which one household has all income and the others have none. The Gini coefficient was retrieved from the American Communities Survey to measure income inequality in this study.

   **Hypothesis 6f:**  Greater community inequality will increase the likelihood of

        police early adoption of BWCs.

*Political Conditions*

  Prior innovations research has examined political systems, regulations, and legal norms that can influence organizational behaviors (Wejnert, 2002). Institutional theory suggests that organizations like police departments cultivate and maintain practices and procedures based on prevailing ideas for institutions within the society to increase their legitimacy (Meyer & Rowan, 1977). For example, with fewer top-level leaders relying on delegation of authority, police departments require surveillance (Tyler et al., 2007). As a result, BWCs could improve police legitimacy by increasing transparency and reviewability mechanisms. On the other hand, line officers and the unions representing them may resist increased managerial control and complicate an adoption.

  For these reasons and consistent with prior police innovation research, variables were constructed to measure the political conservatism and unionization of each community in the sample.

*Political Conservatism.* Police adopt innovations in response to political pressures (Chan et al., 2001; Zhao, 1996). State and federal governments, ongoing national discourse, and other third-party entities exert pressure on organizations to innovate. Morabito (2008) discovered that the type of local government and the presence of defined districts were significant predictors of community policing adoption, arguing that this demonstrates the complexities of police-government relations.

In general, a more liberal political climate is more concerned with privacy issues, whereas more conservative political views support police and thus the use of surveillance technology by police (Nix et al., 2020). Nix et al. (2020) used the percentage of each county that voted for Donald Trump in 2016 to assess this generalization on BWC footage legislation. According to their findings, in agencies with 0 to 24 officers, the percentage of Trump voters was significantly related to support for releasing BWC footage. They claimed that as political conservatism grows in a county, so does support for the legislation. Schuck (2017) also calculated the percentage of votes cast for Republican presidential candidates George Bush in 2000, George Bush in 2004, and John McCain in 2008. According to the findings, increased conservatism predicted the adoption of dashboard cameras and mobile video recorders. Based on these findings, Schuck argued that political and community factors are generally better predictors than organizational characteristics.

Presidential election results for 2008 and 2012 were collected from *David Leip's Atlas of US Presidential Elections* (Leip, n.d.). FIPS codes were used to match to the sample the county-level percentages of votes for the Republican candidate John McCain in 2008 and Mitt Romney in 2012. The 2008 and 2012 variables were highly correlated; therefore, the 2008 variable was dropped.

**Hypothesis 7a:** Higher percentages of votes for the Republican candidates

(more politically conservative) in the community will

increase the likelihood of police early adoption of BWCs.

*Unionization.* Where collective bargaining organizations with active agreements represent members' interests, these associations may significantly influence how the department makes innovation decisions. On the other hand, where a collective bargaining association does not represent personnel interests, the police department faces little constraint. Similarly, police departments are likely to face few constraints when sworn personnel's interests are represented, but an expired agreement exists. Nowacki and Willits (2016) and Schuck (2017) found that unionization was associated with fewer dashboard, mobile, and BWCs in large police departments. Thus, it is likely that a higher presence of unions may reduce the early adoption of innovations.

However, police unions started to see the benefits for officer safety and liability protection from complaints and lawsuits from past experiences with dashboard cameras. At the point in time when earlier adopters began testing (e.g., Rialto, Mesa, and Phoenix) the sentiment was supportive of cameras for controlling officer behavior, calming citizens, reducing false complaints, and reducing use of force. Additionally, Morabito (2014) found a positive relationship between unionization and community policing adoption and suggested that police unions may see the need for innovation to combat a negative public image. Therefore, unions would not have presented as a constraint.

Unionization is measured by the presence of collective bargaining representation and a collective bargaining agreement, as indicated by LEMAS 2013 questions B5 and B6. The two questions inquired whether a collective bargaining organization represented the interests

of sworn personnel and the status of the agreement (active, expired, or no agreement). The data were converted to a binary measure coded as 1 for active collective bargaining rights for sworn personnel and 0 for expired or no collective bargaining rights.

**Hypothesis 7b:** Agencies with active bargaining agreements are less likely to be early adopters of BWCs.

*Community Demands & Constraints*

This section discusses the impact on the police organization of external or third-party constraints. Prior research demonstrates that the interaction of police, courts, citizens, and special interest groups can significantly impact the adoption process (Maguire, 2003; Morabito, 2014; White & Malm, 2020). Community demands and pressures, such as crime rates and interactions between police and citizens, are characteristics of the environments in which police organizations operate, not of the police themselves (Archbold & Maguire, 2002). Additionally, dashboard cameras were shown to improve officer professionalism, safety, and the liability of the agencies they represent (IACP, 2004). These findings could have ramifications for how BWCs are used. As a result, the crime rate, officer safety, citizen complaints, and use of force all factor into how this study conceptualizes community demand.

*Crime.* Issued each year by the FBI, the Uniform Crime Reports are a statistical summary of crimes reported to the police. Like LEMAS, the UCR data sets are accessible from the ICPSR website. The FBI data sets only include officer who perform primary law enforcement functions and are paid out of police funds. Officers who primarily serve the civil justice system, provide courtroom security, provide staffing at jail facilities, and federal

agencies are excluded (Banks et al., 2016).[26] The UCR uses standard definitions to ensure consistent data on 29 types of crimes (FBI, 2004). In addition, the data show factors such as age, race, and the number of reported crimes solved for eight major crimes referred to as Part I (Index Offenses). The data for the remaining 21 crimes classified as Part II (Other Offenses) is less complete. The UCR Index Offenses contains information on violent crimes such as murder and non-negligent manslaughter, forcible rape, robbery, and aggravated assault, as well as property crimes such as burglary, larceny, and motor vehicle theft.[27]

Prior research on police innovation has discovered that crime significantly affects innovation adoption. For example, Schuck (2017) determined community demand for in-car and mobile surveillance cameras by analyzing UCR reports on crime rates per 100,000 residents. The findings indicated that increased crime rates were associated with camera adoption. This finding was consistent with that of Randol (2014) who reported violent crime rates were significant at the 90% confidence level for crime analysis techniques. Burruss and Giblin (2014) identified a related finding that a perception of rising crime rates was influential in the decision to adopt community policing strategies.

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[26] One criticism leveled at the UCR is whether it is a valid indicator of crime in the United States. The UCR Program compiles data from monthly law enforcement reports and individual crime incident records transmitted directly to the FBI or to centralized agencies that report to the FBI. This nationwide program is based on statistical data that has been voluntarily submitted by over 18,000 city, university and college, county, state, tribal, and federal law enforcement agencies (Crime in the United States, 2010, 2011). Significant variations in crime levels may result from modified records procedures, incomplete reporting, or changes in a jurisdiction's boundaries. The Program compares monthly reports to previous submissions from the agency and those with similar agencies to identify and correct any unusual fluctuations in an agency's crime counts (Planty et al., 2014). Another issue is that UCR data is derived directly from police agencies and includes only crimes reported to the police, implying that actual crimes are undercounted. Finally, the UCR data reflect the Hierarchy Rule meaning that only the most severe offense in a multiple-offense criminal incident is counted.
[27] Arson is also a Part I Index Offense, but due to limited participation and inconsistent data collection procedures by local law enforcement agencies, only limited data on that offense are available. Therefore, data for arson was not included in the crime rate variable for this study.

The data used in this study derives from the "Offenses Known and Clearance by Arrest" summary data. The total average crime rate was calculated in this study by first converting monthly UCR counts of Index crimes for each offense to annual counts of crime from 2010 to 2012, then to annual crime rates (total annual crimes divided by the population and multiplied by 100,000), and finally by averaging crime rates for the three years.

**Hypothesis 8a:** Higher crime rates will increase the likelihood of police early adoption of BWCs.

*Officer Safety.* Higher levels of the rate of officers killed or assaulted suggests that agencies may be incentivized to adopt BWCs for purposes of accountability and legally protecting their officers. A higher rate could also justify adoption out of officer safety concerns. The FBI collects data on police officers killed or assaulted in the line of duty through the UCR program and publishes annual data on officers killed or assaulted while performing their duties in the LEOKA collection as a subset of the UCR. From 2010 to 2012, first, LEOKA data was extracted from the UCR data set. Then, monthly reports were summed for the total crimes reported each year and averaged. Finally, the rate of officer deaths and assaults per 1,000 officers was calculated.

**Hypothesis 8b:** Higher rates of officer deaths or assaults in the community will increase the likelihood of police early adoption of BWCs.

*Citizen Complaints and Use of Force.* The courts significantly impact police adoption of new technologies (White & Malm, 2020). Due to the nature of police work and dangerous situations they encounter, officers are frequently required to use force, but this exposes them to public scrutiny (Archibold & Maguire, 2002). Complaints against police officers can arise due to police misconduct, imposing high economic and social costs (Ariel et al., 2014). A rise

in litigation may significantly impact officer behavior, for which they may be held liable. Several benefits of adopting BWCs were outlined based on the experiences with dashboard cameras. These benefits include reducing instances of officer-civilian conflict, including the use of force and citizen complaints while promoting transparency and accountability for complaints and excessive force. Agencies with higher use of force rates or citizen complaints may be under more pressure to adopt BWCs for purposes of accountability and legally protecting their officers.

LEMAS 2013 did not collect data on the number of citizen complaints filed asking instead whether citizens could file agency or officer complaints using the agency's website. However, the 2007 LEMAS survey asked for the total number of civilian complaints for officer use of force. The number of citizen complaints self-reported on the 2007 LEMAS Q47d is used to calculate a citizen complaint variable, expressed as a ratio of the total number of citizen complaints per number of full-time sworn officers.

The 2013 LEMAS asked about the number or internally generated use of force incidents and reports. Nowacki and Willits (2016) created a use of force rate using the total number of incidents reported in LEMAS 2013, divided by population served, and multiplied by 100,000. This measure was not statistically significant with BWC adoption in their sample. The number of use of force incidents is culled from LEMAS 2013 QH5, which asks agencies to enter the total number of recorded use of force incidents in the 12-month period ending

on December 31, 2012. Like the citizen complaint variable, the use of force is expressed as a ratio of the total number of reports per full-time sworn officers.[28]

> **Hypothesis 8c:** Higher rates of citizen complaints will increase the
>
> likelihood of police early adoption of BWCs.

> **Hypothesis 8d:** Higher rates of use of force incidents will increase the
>
> likelihood of police early adoption of BWCs.

### Analytical Strategy

First, bivariate analyses will illustrate how strongly the variables appear to be related. Chi-square tests of independence will be conducted to analyze the relationship between the nominal-level factors and body camera adoption. Independent sample *t*-tests will be conducted to examine differences in the continuous-level variables and adoption. Multicollinearity of the variables will be checked using the variance inflation factor (VIF).

Logistic regression will determine whether the independent variables predict the dependent variable using SPSS version 28.0 to address the research questions. Logistic regression is a suitable statistical technique for determining whether a set of independent variables accurately predicts a dichotomous dependent variable (Sweet & Grace-Martin, 2003). Because the error terms are not normally distributed, dichotomous dependent variables violate the assumptions of ordinary least squares (OLS), making use of OLS inappropriate (Weisburd & Britt, 2014). Additionally, this type of analysis can be used with

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[28] Some agencies do not keep records of the use of force incidents. Agencies that record these incidents may do so in various methods. Therefore, the LEMAS Codebook warns that "the accuracy of these data is currently unknown, and users are recommended to proceed with caution."

continuous, discrete, or a combination of continuous and discrete independent variables (Weisburd & Britt, 2014).

The logit model is estimated using Maximum Likelihood Estimation (MLE), which allows for the interpretation of the coefficients as a probability of success (Weisburd & Britt, 2014). MLE is an iterative method, as it attempts numerous solutions before arriving at the result (Weisburd & Britt, 2014). Each iteration begins with an estimate of the coefficient (a tentative solution) for each predictor variable and then adjusts these coefficients repeatedly until no additional improvement in the ability to predict the value of the outcome variable (either 0 or 1) is observed for each case (Menard, 2011). Finally, a larger sample size is recommended when using the maximum likelihood method, as using discrete variables requires that each category has an adequate number of responses because the reliability of estimates declines significantly for combinations of cases where there are only a few cases (Laerd Statistics, 2017).

Logistic regression analysis enables the estimation of the probability of BWC adoption based on the values of the independent variables. The logistic regression model evaluation procedure includes an overall model evaluation called the Omnibus Tests of Model Coefficients which provides the overall statistical significance of the model.

The Cox & Snell and Nagelkerke coefficients are pseudo-$R^2$ values like the R-square in OLS regression that help to calculate and understand how much variation in the dependent variable can be explained by the model (McShane & Williams, 2008). Naglekerke's $R^2$ is a modified Cox and Snell R square value. Nagelkerke will always be higher as it adjusts Cox and Snell's formula so that the maximum value is 1 (Pallant, 2020). Unfortunately, both pseudo-$R^2$ values exhibit computational issues, causing erroneously high

or low values. Thus, Hosmer-Lemeshow is another frequently used goodness-of-fit measure based on the chi-square test. Hosmer-Lemeshow goodness of fit test analyzes how poor the model is at predicting the categorical outcomes. For this test, statistical significance would indicate a poor fitting model. SPSS Statistics reports that Hosmer-Lemeshow is the most reliable test of model fit (Pallant, 2020). The best approach is to present all available goodness of fit tests; thus, all three will be reviewed.

Finally, the Wald statistic is used to determine the statistical significance of individual regression coefficients (Weisburd & Britt, 2013). This statistic informs us of the contribution or significance of each predictor variable (Pallant, 2020). Variables that are less than .05 contribute significantly to the predictive ability of the model.

## CHAPTER FIVE

The purpose of this study is to determine which organizational and environmental factors contribute to large police departments' early adoption of BWCs. The results of the data analyses are presented in this chapter. First, descriptive statistics were used to examine the relationships between the variables of interest. Then, a series of binary logistic regressions were conducted to test the hypotheses. Finally, statistical significance was evaluated at the generally accepted threshold of $p<=.05$.

### <u>Sample</u>

The original LEMAS 2013 data set contained 2826 cases. This data set was merged with LEMAS 2007, LEIAC, CSLLEA, UCR, ACS, CALEA, and the 2012 Republican presidential vote percentages to develop this sample for analysis. After merging the data and reducing the data set for state and tribal police departments, and full-time sworn officers below 100, 644 police departments remained.

The data set was further reduced by the listwise deletion of cases missing any values for the variables of interest. However, the use of force variable resulted in a significant loss of cases reducing the sample size to 332. The use of force variable did not appear related to BWC use in the additional bivariate and multivariate analyses of the smaller sample. The 2013 LEMAS survey instrument added new questions to capture the number of incidents of use of force that were not collected in previous iterations. The Codebook warns that the "accuracy of these data is currently unknown, and users are recommended to proceed with caution" (p. 8). Furthermore, many agencies do not keep records of the use of force incidents, and those that do record these incidents may do so in various methods resulting in

missing data. For these reasons, this analysis excluded the use of force variable, resulting in a

final sample size of 532 after the listwise deletion procedure.

## **Descriptive Statistics**

Frequencies and percentages for the nominal-level variables, including binned full-

time sworn personnel, BWC adoption, use of dashboard cameras in 2013 and 2007, mobile

video camera use in 2007, CALEA accreditation by 2013, region, and active collective

bargaining agreement are presented below in Table 8 for the analyzed cases.

**Table 8: Frequencies and Percentages for Nominal Variables (*n*= 532)**

| Variable | *n* | % |
|---|---|---|
| Agency size | | |
| 1000+ | 37 | 7.0 |
| 500-999 | 50 | 9.4 |
| 250-499 | 108 | 20.3 |
| 100-249 | 337 | 63.3 |
| Agency type | | |
| Local police departments | 384 | 72.0 |
| Sheriff's offices | 138 | 28.0 |
| BWC | | |
| No | 420 | 78.9 |
| Yes | 112 | 21.1 |
| Dashboard camera use by 2013 | | |
| No | 147 | 27.6 |
| Yes | 385 | 72.4 |
| Dashboard camera use by 2007 | | |
| No | 182 | 34.2 |
| Yes | 350 | 65.8 |
| Mobile video camera use by 2007 | | |
| No | 362 | 68.0 |
| Yes | 170 | 32.0 |
| CALEA accreditation by 2013 | | |
| No | 407 | 76.5 |

| Variable | n | % |
|---|---|---|
| Yes | 125 | 23.5 |
| Region | | |
| Northeast | 77 | 14.5 |
| Midwest | 97 | 18.2 |
| South | 236 | 44.4 |
| West | 122 | 22.9 |
| Union | | |
| Expired or no collective bargaining agreement | 266 | 50.0 |
| Active | 266 | 50.0 |

Summary statistics for the continuous-level variables used in the study are presented in Table 9 for the listwise-reduced data set ($n = 532$).

**Table 9: Descriptive Statistics for Continuous Variables ($n = 532$)**

| Variable | Min | Max | Mean | SD |
|---|---|---|---|---|
| Agency size | 100.00 | 9920.00 | 391.96 | 708.65 |
| Slack | 20.88 | 1531.89 | 247.04 | 130.70 |
| Population served | 2,3921.00 | 5,231,351.00 | 294,290.92 | 485,246.90 |
| Functional differentiation | 0.00 | 137.00 | 6.44 | 8.07 |
| Vertical differentiation | 0.30 | 7.20 | 2.26 | 0.86 |
| Spatial differentiation | 0.00 | 99.00 | 4.31 | 7.43 |
| New hires with bachelor's | 0.00 | 558.00 | 9.43 | 30.41 |
| Training index | 312.00 | 11,999.00 | 1,494.45 | 1,057.10 |
| Max chief salary | 62,000.00 | 453,627.00 | 145,040.83 | 41,346.39 |
| Formalization (2007) | 7.00 | 17.00 | 14.40 | 1.82 |
| Centralization | 0.00 | 0.29 | 0.08 | 0.04 |
| Technology use index | 6.00 | 12.00 | 9.32 | 1.19 |
| Community policing activities | 0.00 | 5.00 | 3.07 | 1.38 |
| Taskforce participation | 0.00 | 5.00 | 2.63 | 1.19 |
| Outsider research index | 0.00 | 9.00 | 1.93 | 3.54 |
| Racial asymmetry | 0.00 | 7.69 | 0.59 | 0.60 |
| Ratio of youths to adults | 0.15 | 0.53 | 0.31 | 0.06 |
| Unemployment rate | 3.60 | 25.50 | 9.91 | 3.00 |
| Residential stability | 7.65 | 197.91 | 28.55 | 22.65 |
| Poverty rate | 1.76 | 89.96 | 10.43 | 6.88 |

| Variable | Min | Max | Mean | *SD* |
|---|---|---|---|---|
| Income Inequality | 0.34 | 0.62 | 0.45 | 0.04 |
| Percent voting Republican | 9.22 | 77.19 | 45.32 | 13.29 |
| Number of citizen complaints (2007) | 0.00 | 188.46 | 6.51 | 15.62 |
| Crime rate | 0.00 | 20,286.04 | 4,861.23 | 2,655.45 |
| LEOKA rate | 0.00 | 69.97 | 8.56 | 11.37 |

## **Bivariate Analyses**

A series of chi-square tests of independence were conducted to analyze the relationships between nominal-level factors and body camera adoption. A chi-square test of independence is appropriate when assessing the relationship between two nominal-level variables (Pallant, 2020). Table 10 presents the findings of the cross-tabulations.

The results indicate that size was not significant for BWC adoption. The largest agencies (1000+) represented the smallest category of agencies (7%) in this sample and fewest number of adoptions (9.8%) in the overall sample. Similarly, the smallest agencies (100-249) contributed 63.3% of the agencies in the overall sample and 62.5% of adoptions.

The findings indicated a significant relationship between body camera use and use of dashboard cameras in 2013. BWC adoption was significantly higher in agencies with prior camera experience from dashboard camera use in 2013 with 89.3% and 2007 with 72.3%. Additionally, there was a significant relationship between body camera use and region. Higher percentages of early adoptions occurred in the South and West as compared to the North which had the lowest percentage of adoptions. The remaining factors were not significantly associated with use.

**Table 10: Cross-tabulations of Body-Worn Camera Adoption and Nominal Agency and Environmental Variables (*n*= 532)**

| Variable | No | Yes | $\chi^2$ | *p* |
|---|---|---|---|---|
| | Body-worn Camera | | | |
| Agency size | | | 3.68 | .298 |
| 1000+ | 26 (6.2%) | 11 (9.8%) | | |
| 500-999 | 37 (8.8%) | 13 (11.6%) | | |
| 250-499 | 90 (21.4%) | 18 (16.1%) | | |
| 100-249 | 267 (63.6%) | 70 (62.5%) | | |
| Agency type | | | .076 | .783 |
| Local police | 302 (71.9%) | 82 (73.2%) | | |
| Sheriff's office | 118 (28.1%) | 30 (26.8%) | | |
| Dashboard camera use by 2013 | | | 20.30 | < .001 |
| No | 135 (32.1%) | 12 (10.7%) | | |
| Yes | 285 (67.9%) | 100 (89.3%) | | |
| Dashboard camera use by 2007 | | | 2.69 | .101 |
| No | 151 (36.0%) | 31 (27.7%) | | |
| Yes | 269 (64.0%) | 81 (72.3%) | | |
| Mobile video camera use by 2007 | | | 0.08 | .782 |
| No | 287 (68.3%) | 75 (67.0%) | | |
| Yes | 133 (31.7%) | 37 (33.0%) | | |
| CALEA accreditation by 2013 | | | 0.45 | .501 |
| No | 324 (77.1%) | 83 (74.1%) | | |
| Yes | 96 (22.9%) | 29 (25.9%) | | |
| Region | | | 17.16 | < .001 |
| Northeast | 73 (17.4%) | 4 (3.6%) | | |
| Midwest | 80 (19.0%) | 17 (15.2%) | | |
| South | 173 (41.2%) | 63 (56.3%) | | |
| West | 94 (22.4%) | 28 (25.0%) | | |
| Union | | | 0.41 | .523 |
| Expired or no collective bargaining agreement | 207 (49.3%) | 59 (52.7%) | | |
| Active | 213 (50.7%) | 53 (47.3%) | | |

A series of independent sample *t*-tests were conducted to examine differences in the continuous-level variables based on body camera usage. An independent sample *t*-test is

appropriate when assessing for differences in a continuous-level variable between two

groups (Tabachnick & Fidell, 2019). The results of the *t*-tests are displayed in Table 11.

**Table 11: Independent Sample *t*-tests with Continuous Organizational and Environmental Variables (*n*= 532)**

| Variable | Did not use video cameras on patrol officers | | Used video cameras on patrol officers | | | |
|---|---|---|---|---|---|---|
| | *Mean* | *SD* | *Mean* | *SD* | *t* | *p* |
| Agency size | 361.64 | 548.75 | 505.65 | 1117.64 | -1.92 | .056 |
| Slack | 252.51 | 140.45 | 226.52 | 81.96 | 1.87 | .061 |
| Population served | 282,821.99 | 459,721.93 | 337,299.38 | 571,200.87 | -1.06 | .292 |
| Functional differentiation | 6.08 | 5.77 | 7.77 | 13.55 | -1.97 | .050 |
| Vertical differentiation | 2.21 | 0.85 | 2.45 | 0.86 | -2.70 | .007 |
| Spatial differentiation | 3.97 | 6.00 | 5.58 | 11.23 | -2.04 | .042 |
| New hires with bachelor's | 8.63 | 20.34 | 12.44 | 53.40 | -1.18 | .240 |
| Training | 1,488.59 | 1,056.28 | 1,516.44 | 1,064.61 | -0.25 | .805 |
| Max chief pay | 144,555.81 | 38,924.28 | 146,859.66 | 49,543.96 | -0.52 | .601 |
| Formalization (2007) | 14.42 | 1.80 | 14.34 | 1.89 | 0.41 | .680 |
| Centralization | 0.08 | 0.04 | 0.08 | 0.04 | -0.43 | .670 |
| Technology use | 9.36 | 1.21 | 9.13 | 1.14 | 1.82 | .070 |
| COP activities | 2.97 | 1.39 | 3.45 | 1.29 | -3.27 | .001 |
| Taskforce participation | 2.64 | 1.20 | 2.62 | 1.15 | 0.17 | .862 |
| Outsider research | 1.80 | 3.45 | 2.43 | 3.82 | -1.67 | .095 |
| Racial asymmetry | 0.59 | 0.53 | 0.61 | 0.80 | -0.28 | .781 |
| Ratio of youths to adults | 0.31 | 0.06 | 0.31 | 0.06 | -0.04 | .970 |
| Unemployment rate | 10.01 | 3.00 | 9.53 | 3.00 | 1.50 | .135 |
| Residential stability | 28.01 | 21.43 | 30.54 | 26.75 | -1.05 | .294 |
| Poverty rate | 10.02 | 5.54 | 12.00 | 10.35 | -2.74 | .006 |
| Income Inequality | 0.45 | 0.04 | 0.46 | 0.04 | -1.99 | .048 |
| Percent voting Republican | 44.73 | 13.07 | 47.51 | 13.91 | -1.97 | .049 |
| Citizen complaints (2007) | 6.00 | 13.62 | 8.43 | 21.49 | -1.47 | .143 |
| Crime rate | 4,794.33 | 2,686.06 | 5,112.07 | 2,533.22 | -1.13 | .261 |
| LEOKA rate | 8.56 | 11.11 | 8.56 | 12.36 | 0.00 | .998 |
| Use of force | 72.81 | 117.96 | 77.87 | 89.72 | -0.33 | .739 |

First, there were significant differences in the vertical differentiation (standardized

pay differential) based on BWC usage, with values for this variable being significantly higher

for the departments that used body cameras. Second, there were significant differences in the sum of all districts, precincts, substations, and fixed-site neighborhoods (spatial differentiation), with values for this variable being significantly higher for the departments that used the cameras. Third, there were significant differences in the index of adopted community policing activities, with values for this variable being significantly higher for the departments that used body cameras. Fourth, there were significant differences in the poverty rate, with values for this variable being significantly higher for the departments that used body cameras. Fifth, there were significant differences in the GINI index (GINI coefficient), with values for this variable being significantly higher for the departments with body cameras. Finally, there were significant differences in the percentage of Republican presidential votes in 2012 (Percent voting Republican), with values for this variable being significantly higher for the departments that used body cameras.

### Regression Tests

A series of binary logistic regression models were then developed to address the hypotheses. A binary logistic regression is appropriate when testing the predictive relationships between a series of factors and a dichotomous outcome variable (Pallant, 2020). The outcome variable in these analyses was BWC usage, coded 1 = Yes and 0 = No.

Multicollinearity of the variables was checked using the variance inflation factor (VIF), displayed in Table 12. The highest VIF score was 3.35. The relatively low VIF scores in the model indicate that multicollinearity is not a concern. The general rule is that VIFs exceeding 4 warrant further investigation, but multicollinearity becomes a concern when VIF values exceed 10.

**Table 12: Variance Inflation Factors (VIFs) for Predictor Variables**

| Variable | VIF |
| --- | --- |
| Agency size | 2.42 |
| Operational Slack | 2.15 |
| Population served | 2.03 |
| Functional differentiation | 1.54 |
| Vertical differentiation | 2.28 |
| Spatial differentiation | 1.46 |
| New hires with bachelor's | 1.13 |
| Training index | 1.07 |
| Max chief pay | 3.12 |
| Centralization | 1.30 |
| Formalization (2007) | 1.25 |
| Technology use | 1.26 |
| Community policing activities | 1.29 |
| CALEA accreditation by 2013 | 1.30 |
| Taskforce participation | 1.27 |
| Outsider research | 1.21 |
| Region | 1.35 |
| Racial asymmetry | 1.54 |
| Ratio of youths to adults | 1.74 |
| Unemployment rate | 1.75 |
| Residential stability | 2.54 |
| Poverty rate | 3.35 |
| Income Inequality | 2.59 |
| Percent voting Republican | 1.63 |
| Collective bargaining | 1.45 |
| Crime rate | 1.99 |
| LEOKA rate | 1.23 |
| Rate of citizen complaints | 1.16 |
| Dashboard camera adopted by 2013 | 1.84 |
| Dashboard camera adopted by 2007 | 1.95 |
| Mobile video camera adopted by 2007 | 1.13 |

**Preliminary Logistic Regressions with Theoretically Grouped Subsets of Indicators**

Preliminary models (not shown) were run to get a sense of which variable sets were significant overall and most important in explaining variance in BWC use. Then, each set was combined to perform regression on the full multivariate model.

*Organizational Predictors.* The findings of this regression model were statistically significant, $\chi2(21) = 37.10$, p $= .016$, indicating that collectively there was a significant relationship between the organizational factors and body camera usage. The Cox & Snell $R^2$ was .07, and the Nagelkerke $R^2$ was .11, indicating that the predictor variables could explain approximately 7-11% of the variance in body camera usage. However, the Hosmer and Lemeshow test findings were statistically significant, $\chi2(8) = 17.78$, p $= .023$, indicating a poor model fit.

*Environmental Predictors.* The findings of this regression model were statistically significant, $\chi^2(23) = 66.05$, $p < .001$, indicating that there was collectively a significant relationship between the environmental predictors and body camera usage. The Cox & Snell $R^2$ was .11, and the Nagelkerke $R^2$ was .18, indicating that the predictor variables could explain approximately 11-18% of the variance in body camera usage. The Hosmer and Lemeshow test findings were not statistically significant, $\chi^2(8) = 6.17$, $p = .628$, indicating an acceptable model fit.

*Prior Camera Use Predictors.* The findings of the overall regression model were statistically significant, $\chi^2(10) = 31.60$, $p < .001$, indicating that there was collectively a significant relationship between body camera usage and prior use of other camera technologies. The Cox & Snell $R^2$ was .06, and the Nagelkerke $R^2$ was .09, indicating that the predictor variables could explain approximately 6-9% of the variance in body camera usage.

The Hosmer and Lemeshow test findings were not statistically significant, $\chi^2(8) = 7.43$, $p = .491$, indicating an acceptable model fit.

**Multivariate Logistic Regression**

Outliers were identified in each regression using casewise diagnostics based on Studentized residuals greater than 2.00 in magnitude. In the multivariable regression model, 15 outliers were identified, and the highest residual was 2.65. All outliers were from departments that had adopted body cameras. The outlying cases were further examined to determine if any warranted exclusion from the analysis. No cases presented any unusual characteristics that warranted exclusion; therefore, all cases were retained.

The findings of the overall regression model were statistically significant, indicating that there was collectively a significant relationship between the predictive factors and body camera usage. The Cox & Snell $R^2$ was .17, and the Nagelkerke $R^2$ was .26, indicating that the predictor variables could explain approximately 17-26% of the variance in body camera usage. The Hosmer and Lemeshow test findings were not statistically significant, indicating an acceptable model fit. Therefore, the individual predictor variables were examined further.

Table 13 presents the findings of the logistic regression analysis. The operating budget per population (slack) was negatively related to body camera use, but it was not statistically significant. The index of adopted community policing activities was positively related to body camera use, indicating that a one unit increase in this scale was associated with a 34% increase in the odds of BWC adoption. Region was related to body camera use such that agencies in the South had 5.40 times greater odds of adopting body cameras compared to the Northeast, and agencies in the West had 6.81 times greater odds of adopting body cameras compared to the Northeast. The unemployment rate was related to

BWC use such that a 1-unit increase in this variable decreased the odds of adopting BWCs by 0.908 times. The poverty rate was also positively related to BWC use, indicating a 7% increase in the odds of BWC adoption for each one-unit increase in the poverty rate. Citizen complaints of officer use of force in 2007 were related to BWC use such that a 1-unit increase in this variable increased the odds of adopting BWCs by 1.014 times. Finally, departments that used dashboard cameras in 2013 had 5.40 times greater odds of adopting body cameras compared to those that did not.

**Table 13: Logistic Regression Results Predicting Body Camera Adoption (*n*=532)**

| Variable | *B* | Wald | *p* | OR | 95% CI *OR* Lower | Upper |
|---|---|---|---|---|---|---|
| Agency size [ref = 1000+] | | | | | | |
| 500-999 | -0.08 | 0.13 | .908 | 0.69 | 0.26 | 1.78 |
| 250-499 | -0.59 | 0.63 | .424 | 0.64 | 0.21 | 1.92 |
| 100-249 | 0.65 | 0.01 | .935 | 0.41 | 0.17 | 1.00 |
| Slack | -0.004 | 5.62 | .016 | 0.996 | 0.99 | 1.00 |
| Technology use | -0.20 | 3.22 | .073 | 0.81 | 0.65 | 1.02 |
| Community policing activities | 0.29 | 7.92 | .005 | 1.34 | 1.09 | 1.64 |
| Region [ref = Northeast] | | | | | | |
| Midwest | 0.96 | 2.11 | .146 | 2.59 | 0.71 | 9.49 |
| South | 1.66 | 7.17 | .007 | 5.26 | 1.58 | 18.45 |
| West | 1.92 | 8.56 | .003 | 6.81 | 1.90 | 25.18 |
| Unemployment rate | -0.10 | 3.76 | .053 | 0.91 | 0.83 | 1.00 |
| Poverty rate | 0.07 | 3.72 | .054 | 1.07 | 1.00 | 1.14 |
| Citizen complaints (2007) | 0.14 | 3.85 | .050 | 1.01 | 1.00 | 1.03 |
| Dashboard camera use by 2013 [ref = No] | | | | | | |
| Yes | 1.69 | 15.86 | < .001 | 5.40 | 2.40 | 12.76 |
| Yes | -0.10 | 0.14 | .708 | 0.90 | 0.54 | 1.52 |

## Summary and Hypotheses

In summary, the bivariate and multivariate analyses highlighted several organizational, prior experience, and environmental variables that significantly predicted early adoption of BWCs. The bivariate analyses indicated a significant relationship with BWC adoption for 2013 dashboard camera adoption, region, functional differentiation, vertical differentiation, spatial differentiation, community policing activities, poverty, unemployment, and Republican voting percentages. The multivariate regression model indicated significance for slack, community policing activities, the South and West regions, unemployment rate, poverty rate, citizen complaints, and dashboard camera use in 2013. However, many other factors thought to be related to police innovation did not predict early adoption of BWCs. Below is a summary of the specific hypotheses supported and not supported. The implications and limitations of the findings will be discussed further in the next chapter.

**Hypothesis 1a** was not supported, as agency size was not significantly related to body camera use in the regression. When agency size was used as a continuous variable (rather than categorized into smaller groups), it approached significance at .056 in a bivariate analysis.

**Hypothesis 1b** was partially supported, as the regression demonstrated a negative relationship between resource availability (slack) and body camera use. However, the odds ratio and 95% confidence interval indicated no association

**Hypothesis 2a** was not supported, as functional differentiation was not significantly related to body camera use in either regression.

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**Hypothesis 2b** was not supported, as vertical differentiation was not significantly related to body camera use in the multivariate model.

**Hypothesis 2c** was not supported, as spatial differentiation was not significantly related to body camera use the multivariate model. Agencies with greater spatial differentiation were more likely to have BWCs in bivariate analysis. However, this association was not significant in the multivariate model.

**Hypothesis 2d** was not supported, as the number of new officers holding at least a four-year college degree was not significantly related to body camera use in the regression.

**Hypothesis 2e** was not supported, as hours of training were not significantly related to body camera use in either regression.

**Hypothesis 2f** was not supported, as chief salary was not significantly related to body camera use in regression.

**Hypothesis 2g** was not supported, as centralization of power was not significantly related to body camera use in regression.

**Hypothesis 2h** was not supported, as formalization was not significantly related to body camera use in regression.

**Hypothesis 3a** was not supported, as technology adoption was not significantly related to body camera use in regression.

**Hypothesis 3b** was supported, as the bivariate and multivariate results demonstrated that agencies using more community policing strategies were more likely to have adopted BWCs.

**Hypothesis 3c** was partly supported, as the use of dashboard cameras in 2007 was not significantly related to body camera adoption in the multivariate regression model. The

use of dashboard cameras in 2013 was positively related to body camera use in the regression model.

**Hypothesis 3d** was not supported, as the use of mobile video surveillance cameras in 2007 was not significantly related to body camera use.

**Hypothesis 4a** was not supported, as CALEA accreditation was not significantly related to body camera use.

**Hypothesis 4b** was not supported, as participation in multijurisdictional task forces was not significantly related to body camera use.

**Hypothesis 4c** was not supported, as connections with outside researchers were not significantly related to body camera use.

**Hypothesis 5** was supported, as the regression demonstrated that agencies in the South and West were more likely to use body cameras. There was a 5.26 times higher likelihood of BWC adoption by agencies located in the South, and a 6.81 times higher likelihood for agencies in the West.

**Hypothesis 6a** was not supported, as a representation of Black residents was not significantly related to body camera use.

**Hypothesis 6b** was not supported, as the proportion of youths was not significantly related to body camera use.

**Hypothesis 6c** was partially supported, as the unemployment rate was significantly related to body camera use, but the relationship was negative.

**Hypothesis 6d** was not supported, as rates of owner-occupied housing were not significantly related to body camera use.

**Hypothesis 6e** was supported, as the model indicated that poverty had a significant positive relationship with BWC use. However, the t-tests indicated there were significant differences in the poverty rate based on body camera adoption as the values were significantly higher for departments that indicated adoption.

**Hypothesis 6f** was not supported, as community income inequality (GINI coefficient) was not significantly related to body camera use. However, the bivariate analyses indicated there were significant differences in the income inequality measure based on body camera adoption as the values were significantly higher for departments with the cameras.

**Hypothesis 7a** was not supported, as the percentage of voters for Republican candidates was not significantly related to body camera use in the multivariate regression. However, there were significant differences in the percentage of Republican presidential votes in 2012 based on body camera usage, with values for this variable being significantly higher for the departments that used body cameras

**Hypothesis 7b** was not supported, as collective bargaining agreements were not significantly related to body camera use.

**Hypothesis 8a** was not supported, as the crime rate was not significantly related to body camera use.

**Hypothesis 8b** was not supported, as officer deaths or assaults (LEOKA rate) were not significantly related to body camera use.

**Hypothesis 8c** was supported, as the regression demonstrated a positive relationship between citizen complaints and body camera use.

Continuing with the literature connections, the findings of the data analyses will be explored in the next chapter. Limitations and recommendations for future research will also be addressed.

**CHAPTER SIX**

This study examined whether organizational characteristics and environmental elements contributed to early BWC adoption in large U.S. law enforcement organizations. Independent variables were constructed from LEMAS surveys and census data to investigate specific relationships between factors identified in the innovations and organizational literature for early adoption. The following discussion analyzes results from the bivariate and multivariate logistic regression models concerning the components of diffusion of innovations theory. Finally, a discussion of the study implications and ideas for future research are presented, followed by a conclusion.

## Discussion

The sample for this dissertation was derived from the 2013 LEMAS survey and matched to the 2007 LEMAS survey for specific data on written policies, camera use, and citizen complaints. The main advantage of using this data set is that the 2013 survey was the first to include questions about law enforcement agencies' adoption of BWCs, allowing for the first opportunity to examine a nationwide sample of earlier adopters. Nowacki and Willits (2016) and Lawshe (2022) also used the 2013 LEMAS to study BWC adoption.

### Agency Size and Slack

In innovation studies, size is used as an indicator of an organization's capacity to mobilize the resources necessary to meet the needs of the population it serves. Therefore, innovation research indicates that size is generally positively associated with innovativeness because nonadopters have fewer resources than adopters. Similarly, innovation research on police organizations has found evidence that size and slack can influence police innovation

adoption. For example, size was positively correlated with the adoption of community policing strategies (Burruss & Giblin, 2014; Morabito, 2010), LPRs (Lum, 2016; Lum, Koper, et al., 2019), and homeland security innovations (Randol, 2012). However, numerous studies have indicated that size is not significant, mainly when using slack as a proxy for size (Leong & Chan, 2014; Lum, Koper, et al., 2019; Morabito, 2014).

Specifically, for earlier adopters of BWCs, Nowacki and Willits (2016) and Lawshe (2022) reported that the natural log of operating budgets, typically a measure of slack, was negatively correlated with early BWC adoption for agencies of all sizes. Nowacki and Willits argued that the larger operational budgets meant additional resources and that this slack insulates police departments from external pressures. However, departments fitting that description are not likely earlier adopters because it is the early adopters that bring attention to innovations and create the conditions for institutionalization and peer or community pressures.

Their alternative explanation is that implementation would be prohibitively high for larger agencies because of their size. The cost argument could negatively influence early adoption in the largest agencies because even a small technology trial would likely involve more equipment or service acquisition than a smaller agency with fewer officers to equip would encounter. Indeed, a full implementation would entail a significantly more significant investment for departments with more officers. In fact, Goodison et al. (2018) reported that the cost of BWCs was low at approximately $5,000 a year or less, but this was because most departments had a small number of officers or they only partially deployed BWCs to a few of their officers. Further, they suggested that BWC costs would run into the millions of dollars for large agencies specifically when training, support staff, and IT costs are

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considered. Nonetheless, earlier adopters are more likely to investigate new technology instead of attempting a full implementation, and this is an important distinction to make at this stage of the innovation's lifecycle.

The results of this dissertation revealed that size was not a significant factor for early BWC adoption among large agencies with at least 100 full-time officers ($n= 532$). The distribution of agencies and adopters is displayed in Table 14 below. Adoptions by 2013 of each strata in this study are: 21% of the 100-249, 17% of the 250-499, 26% of the 500-999, and 30% of the 1000+ had adopted. These findings indicate that size is not a good predictor of early innovation adoption among the larger agencies.

**Table 14: Body-Worn Camera Adoption by 2013**

| Agency size | Number of Agencies | Acquired BWCs |
|---|---|---|
| 1000+ | 37 (7%) | 11 (10%) |
| 500-999 | 50 (9%) | 13 (12%) |
| 250-499 | 108 (20%) | 18 (16%) |
| 100-249 | 337 (63%) | 70 (63%) |

Perhaps, at this stage, size is not a considerable constraint because the early-adopting agencies are testing the possibilities of new technology for the first time in this system. As a result, the agencies can determine the extent of the technology trial and therefore have more control over costs. Additionally, innovators and early adopters are expected to have more resources to absorb potential failures if innovations do not measure up to expectations, making experimental technology costs less relevant to their decision-making.

Generalizability is limited by the characteristics of the study population; thus, attempts are made by researchers to describe the size and types of agencies within a sample. For example, this study examined large local agencies with 100 or more sworn officers; therefore, these results would not be generalizable to small agencies who most likely serve smaller populations and rural areas. Reports that do not clearly indicate sample composition further add to the gaps in our understanding of innovation adoption and diffusion.

The findings of this study indicate that when assessing generalizability, adopter categories within a sample should also be considered. This sample was taken in 2013 during a period after early BWC adoption and may include innovators, early adopters, and early majority agencies—the earlier adopters. Any sample collected after 2013 would have to consider the effect of federal funding and national concerns on BWC adoption in the aftermath of a series of the highly publicized citizen deaths at the hands of police in 2014. Both federal funding (Gayadeen & Phillips, 2014) and community pressures (Burruss & Giblin, 2014; Morabito, 2010, 2014; Schuck, 2017; Zhao, 1996) have been shown to impact the diffusion of prior innovations. For BWCs specifically, BJS recorded an increase in adoption from 32% in 2013 to 46% by 2016. Several studies have declared that BWCs rapidly diffused in that period (Nix et al., 2020; Todak et al., 2018; White & Malm, 2020)

The rapid uptake of BWCs after 2014 could also be a product of mimesis. Peer pressure would not become a factor until the innovation had become more prevalent in the system. Prior to the majority of adoptions, early adopters introduce, validate, and deliberate on the innovation. Emulation by peers is more likely to occur after this group has adopted, and thus was not assessed in this study.

**Innovativeness**

Innovativeness is a measure of an organization's openness to change and risk tolerance, and it reflects the level of receptivity to innovations. Earlier adopters have a more positive attitude towards change, and the number of prior adoptions most commonly measures this. Nowacki and Willits (2016) suggested that police agencies that are more likely to use cameras in other contexts may be more likely to adopt BWCs. They created a technology use index out of the 2013 LEMAS question, including dashboard cameras, mobile video cameras, BWCs plus smartphones, LPRs, and gunshot detection systems. In addition, they included questions on social media use in the index to determine whether "contemporary technology" reflects an increased engagement with the community (p. 6). The current study created prior technology adoption variables to specifically test these influences.

For analysis in the current study, three variables were created to measure recent advanced technology adoptions, degree of community policing activities, and prior camera technology adoptions. The mobile video and dashboard cameras were separated into their own variables to test their specific influence on BWC adoption. The regression models found no significant differences in body camera adoption from the prior technology use index containing gunshot detection systems, license plate readers, smartphones, video cameras on weapons, and other types of video cameras. However, dashboard camera use was significant at the $p = 0.05$ level. Agencies that used dashboard cameras in 2013 had 5.40 greater odds of adopting body cameras than those that did not. Thus, the power of the technology use index was reduced by separating the camera use variables. Nonetheless, the 2013 dashboard camera usage statistics are significant. It is worth noting that while

dashboard camera use was non-significant in 2007, it was positively associated with BWCs in 2013. These findings suggest that the adoption of dashboard and body-worn cameras in 2013 may have been driven by similar factors.

As mentioned in Chapter 3, Lawshe (2022) created a measure for perviousness operationalized using the social media use and advanced surveillance technology use variables from LEMAS 2013. He argued that Nowacki and Willits' (2016) technology use variable was a measure of institutional perviousness. However, the variables as operationalized by Lawshe for perviousness and by Nowacki and Willits for structural contingency are part of the innovativeness factor in diffusion theory. On the other hand, if Lawshe's results do in fact indicate an institutional perviousness (openness to innovation or innovativeness) then that supports my argument that institutional factors influence later adopters more than earlier adopters.

This is a recent example of why policing innovation is unclear. Researchers have consistently borrowed theoretical frameworks from many different fields, and for this reason, we have an infinite number of variables that measure the same thing but for different reasons. Each year, it will become more challenging to analyze across studies for generalizations if we continue to create new terminology without putting results into context with prior literature. Malm (2019) and Gaub and White (2020) argued that scholars must agree on metrics for police innovation research, including dependent and independent variables, as this will facilitate the incorporation of individual case studies into a larger research framework.

The third innovativeness variable operationalizes community policing activities to measure adoption of prior radical or social innovations. The index of adopted community

policing activities was positively related to body camera use, indicating a 34% increase in the odds of BWC adoption. A positive influence was expected; however it is interesting that Strom et al. (2017) found no relationship between strategy and overall number of technological devices used by an agency. The only strategy they found to influence innovation adoption was zero-tolerance policing, which was associated with less technology overall. They also reported a relationship between hot-spot policing and BWCs. Their survey was administered in 2014 to all types and sizes of police agencies. However, in the large-agency sample of 250 or more full-time sworn officers they found stronger relationships. Agencies that aligned with community policing, intelligence-led policing, and hot spot policing philosophies implemented and used more technology. There were no strong links at the national level between strategy and technology use. The exception was use of social media which was significantly related to community policing and hot-spot policing. Nowacki and Willits (2016) and Lawshe (2022) also found social media use was correlated with BWC adoption. The results from the current study showed a strong association with extent of community policing activities and BWC adoption

**Interconnectedness**

Communication in the diffusion of innovation theory is a crucial variable, and it is often left out of diffusion research. Variables were created for the current study to measure CALEA accreditation, participation in multijurisdictional task forces, and associations with outside organizations or individuals that conducted research or statistical analysis of the agency's computerized records of criminal incidents. The results indicated no significance for all three variables. A possible explanation for this result might be that these variables, as they were operationalized for this study, reflect activities that may be more prevalent with later

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adopters. Later adopters would be more likely to learn about new ideas from participation in CALEA, a task force, or outside researchers. Thus, it is still an open question about what kinds of communication processes would be associated with police innovators and early adopters. Diffusion literature suggests international or global reach for innovators. However, this information was not available in the 2007 or 2013 LEMAS surveys.

**Region**

Numerous organizational researchers assert that regional differences in organizational willingness to adopt innovations exist. The current study's findings indicate a significant positive correlation between BWC adoption and South and Western agencies. Early BWC adoption was 5.26 times more likely for agencies in the South and 6.81 times more likely for agencies in the West. These findings corroborate prior findings in the literature on policing innovation discussed in Chapter 3.

Scholars have suggested many reasons for these differences, but regional differences are still open questions for BWCs. Several studies have found the agencies in the Northeast to be less innovative (Burruss & Giblin, 2014; Nix et al., 2020; Schuck, 2017). Nowacki and Willits (2016) and Schuck (2017) found that unionization was associated with fewer cameras in large police departments. These scholars have suggested that the presence of unions as third parties may constrain the police chief's decision-making concerning innovations that affect the officers they represent. As with prior research on collective bargaining, these findings suggest that union representatives resist changes that reduce officer discretion or alter the relationship between the officer and the administration. Morabito (2014) discovered, however, that unions may perceive a need to combat negative public perceptions through an innovation such as BWCs, though this theory does not appear to apply to early

BWC adoption. Although 50% of large agencies in my sample had collective bargaining agreements, Northern agencies had the lowest percentage of representation in the current study's final sample, which could explain the findings. On the other hand, Lawshe (2022) examined the entire 2013 LEMAS sample and discovered that 85% of agencies had collective bargaining agreements and observed a negative correlation between BWC adoption and unions.

Nix et al. (2020) also found more agencies with BWCs in the South and West. Gaub and White (2020) speculate that a "southern culture of violence" may have influenced BWC adoption as a result of the region's increased number of violent police-citizen encounters. The authors note, however, that this possibility has not been tested for its effect on BWC adoption and represents a fertile area for future research (see p. 906).

Policing practices may differ based on regional differences in political structures. In addition, there may be regional differences in the diffusion of innovation networks that affect how police departments adopt innovative programs. There are also likely to be differences in the historical development of police departments based on regional differences. Agencies within geographic proximity can affect the frequency of communication, enhancing the spread of information and ideas (Rogers, 2003; Weiss, 1992; Wejnert, 2002; Wilson, 2005). Therefore, it is possible that agencies that are closer within geographic proximity to vendors or share communication networks with vendors of BWCs would be more likely to have heard about or been approached by an agent to adopt BWCs.

**Citizen Complaints**

One of the presumed benefits of BWC implementation is the reduction of civil liability and citizen complaints. Goodison et al. (2018) attempted to assess whether BWCs

might reduce the number of civil lawsuits against police departments; however, they could not obtain enough data to make strong conclusions about whether BWCs did work to reduce lawsuits. They suggest that most cities do not record the information about the lawsuits filed against them.

A variable measuring the number of citizen complaints was created for the current study using 2007 LEMAS data. Unfortunately, missing data was also an issue and perhaps for the same reasons that Goodison et al. (2018) had with their survey of municipal agencies in 2015. Nevertheless, using listwise deletion to remove agencies with missing data from consideration shows no association between BWC adoption and agencies that report more citizen complaints about the use of force.

The measure intended to examine use of force incidents was also a casualty of missing data. Listwise deletion with the use of force variable cut the sample down by 62%. This is a disappointing outcome. It was hypothesized that increased use of force incidents would increase the likelihood of adoption. However, the use of force variable was not significant, thus the decision was made to drop further analysis of the reduced model ($n=$ 332). However, the model (not shown) resulted in similar findings to the full model ($n=$ 532) presented in Chapter 5. Vertical differentiation was positively related to body camera use ($B = 0.90$, $OR = 2.456$, $p = .012$), indicating that a 1-unit increase in this variable increased the odds of adopting body cameras by 2.46 times. This result was different than the full model which indicated that vertical differentiation was not significant. The index of adopted community policing activities was positively related to BWC use ($B = 0.29$, $OR= 1.341$, $p = .037$), indicating that a 1-unit increase in this variable increased the odds of adopting body cameras by 1.34 times. The region was related to BWC use such that departments in the

West had 15.65 times greater odds of adopting BWCs compared to the Northeast ($B = 2.75$, Wald $= 7.92$, $p = .005$). Departments with an active collective bargaining agreement had 3.21 times greater odds of adopting BWCs compared to those that did not ($B = 1.17$, Wald $= 6.62$, $p = .010$). Citizen complaints per 100 officers were positively related to BWC use ($B = 0.02$, Wald $= 5.24$, $p = .022$), indicating that a 1-unit increase in this variable increased the odds of adopting BWCs by 1.02 times. Finally, departments that used dashboard cameras in 2013 had 10.52 times greater odds of adopting BWCs compared to those that did not ($B = 2.35$, Wald $= 15.65$, $p < .001$). Recall from the full model that indicated agencies that used dashboard cameras in 2013 had a 5.4 times greater odds of BWC adoption.

## Study Limitations

As with most research, there is no perfect data or analysis that achieves all the study's goals without some limitations. While these limitations are significant, this dissertation remains a valuable resource if they are kept in mind when interpreting results. The first limitation of the data is that the survey instrument was developed before this dissertation began. Instead of tailoring the survey to the study, the study must use what is available already. Because of this, not all potential correlates to the early adoption of BWCs could be examined. This dissertation is limited to what was already present on the survey instrument, and unfortunately, there is no way to overcome this short of creating a new survey.

Due to the limitations of surveys and the absence of a comprehensive set of accurate time series and case studies, it is difficult to precisely document trends in policing. The ambiguity surrounding which camera systems were included as MVRs in the 2007 LEMAS makes it impossible to analyze early BWC adoption. The 2013 LEMAS captured 32% of the earlier adopters, however, it does not account for agencies that may have tested BWCs

before 2013 and decided not to adopt or adopted but discontinued use. Several reports of BWC trials before 2010 were discovered in news media sources, practitioner magazines, and websites. Erlanger and Lafayette police departments employed fewer than 100 officers and would not have been included in this study's sample, but they serve as an example of earlier adoptions that were not captured in the study's findings.

The 2013 LEMAS survey also did not capture how extensively BWCs were being used such as the number of cameras in use, how many officers are equipped, or how long BWCs were in use. However, the purpose of this study was not to determine the extent of use, but rather to determine whether agencies had decided to adopt the cameras in any significant way by 2013 and to determine what factors made these early adopters more likely to adopt than other agencies in the system. Nonetheless, the 2016 LEMAS-BWCS, which was published after the start of this study, includes information on the year of adoption and extent of use.

It is well documented that functionally similar organizations respond and perform differently in adopting similar innovations (Kimberly and Evanisko, 1981). However, the process by which the organizations adopt makes a difference (Van de Ven et al., 2000). The adoption of one innovation was examined in a sample of large local and county law enforcement agencies that were earlier adopters. Therefore, the results of this study are not generalizable to smaller agencies of different sizes, types, environmental contexts, or later adopters. Later adopters have different types of communication channels and motivations for adopting than earlier adopters. Thus, these results are likely not generalizable to later adopter categories. However, future research could use this integrated model to examine different types of police organizations and different innovations.

A frequent criticism leveled at organizational innovativeness studies is whether the chief executive officer's data accurately reflects the organization's actual innovation behavior. According to some, data collected from a few individuals at the top of large organizations did not provide particularly valid measures of the concepts under study. However, establishment surveys, such as LEMAS, collect information about the structure and operations of an institution or organization rather than asking about individual characteristics such as attitudes or experiences (Maguire, 2003). In addition, surveys with a single point of contact are generally more effective at determining agency structure because the phenomenon can be counted or quantified relatively easily by a single point of contact (Matusiak et al., 2014).

Furthermore, evaluating innovativeness solely through the lens of adoption decisions is strained, as the measurement is influenced by the innovation's adoptability and any associated environmental requirements or constraints. An agency may have had multiple chiefs, each with a distinct predisposition for innovation. As a result, the organization's interactions with innovations may not accurately reflect the organization's true willingness to innovate.

Finally, there were several issues with missing data specifically for salary information, citizen complaints, and use of force. These issues were discussed in this chapter and others.

**<u>Ideas for Future Research</u>**

There were at least three meta-analyses mentioned in this dissertation from the organization or innovation literature (Damanpour, 1991; Rogers, 2003; Wejnert, 2002); however, a meta-analysis is missing from extant policing innovation studies. Some of the gaps in this literature come from a misunderstanding of fundamental innovation theory

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concepts and research streams. As a result, it is challenging to compare prior studies because the samples consistently vary in types, sizes, and adopter categories—three highly relevant factors in innovation research. Future studies should describe how they fit within prior research streams, identify the stage of diffusion under examination, and identify the adopter categories represented in the study samples.

For example, explore the size factor for large agencies. Several studies found negative or not significant relationships with adoption; however, significance often changed with different subsets within the data. For example, Hendrix et al. (2017) suggested that at the 250 full-time officer level, the size variable ceased to be positive, and Strom et al. (2017) found strategies became significant in agencies with over 2500 full-time sworn officers. Goodison et al. (2018) reported that the largest agencies of 500 or more had the highest adoption rate with just under half (46%).

The results of this study indicated a positive correlation between current dashboard and body-worn camera use. Schuck (2017) argued the continuous adoption and discontinuation. Several early adoptions discussed in Chapter 3 indicated that small- to mid-sized agencies had stopped buying dashboard cameras for their patrol vehicles and began testing BWCs instead because of costs. One dashboard camera roughly costs $5,000 and a BWC costs much less per unit. These agencies have fewer officers to equip with BWCs and fewer vehicles to phase out outdated systems. On the other hand, the current study produced evidence that larger agencies were concurrently using dashboard and body-worn cameras. Larger agencies are likely to have more vehicles already equipped with cameras and may be put off from discontinuing due to the sunk costs. Alternately, these agencies may have needs for dashboard cameras that differ from the intended use of BWCs. Future

studies could look to mixed method approaches to investigate agencies that discontinue and switch to the newest technologies versus those who continue to use both concurrently.

This chapter previously mentioned that communications with vendors might be a significant factor. Using ACS data, researchers could use GIS mapping to examine the distance between agencies or vendors to examine the relationship with adoption. For example, vendors often attend professional conferences. They are also likely to visit agencies already using their prior technology to advertise new technology. Additionally, Koen et al. (2021) reported that an agency started a BWC trial with a particular vendor because the agency was offered an opportunity to beta test the systems.

Police leaders are another source to consider for future studies. There is a potential to examine agencies and identify how their adoption decisions or structure changed when police chiefs changed. What were the chiefs' leadership styles? How did these styles correlate with innovations during their tenure?

The characteristics of the five adopter categories are often overlooked in research. For example, innovators and early adopters have more resources, are more interested in science, are higher educated, and can cope with higher levels of uncertainty. Earlier adopters were described as more rational and discrete in their adoption choices versus innovators who seem willing to adopt anything new. Is it possible then that those early adopters make rational decisions and innovate to be effective and efficient to achieve maximum performance? Logically, earlier adopter characteristics and adoption tendencies seem to follow the ideas outlined in the contingency theory.

On the other hand, later adopters tend to adopt based on peer pressure or emulation. These tendencies seem to mirror perspectives of institutional theory. For

example, Katz (2001) described a chief's creation of a special gang unit because of directly traceable institutional pressures. Is it possible that the agency was a later adopter? Do later adopters consistently innovate because of institutional concerns? For these reasons, police innovation researchers should continue to conduct qualitative and mixed methods research to provide additional context for adoption decisions.

This dissertation provides insight into the early adoption of innovative technology for law enforcement agency administrators and researchers and gain better understanding of the relationship between organizational and environmental characteristics and adoption decision-making. Additionally, this research contributes to the body of knowledge regarding technology adoption and change management in organizations.

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# BIOGRAPHY

Jennifer Bailey Embrey received an Associate of Science degree December 2002 from Tidewater Community College in Virginia Beach, Virginia. She earned a Bachelor of Science degree in Business Administration in 2005, a Master of Business Administration degree with Distinction in 2007, and membership in the Delta Mu Delta and Pi Gamma Mu Honor Societies from Hawaii Pacific University in Honolulu, Hawaii. Jennifer began law school in August 2007 at Widener Law School in Wilmington, Delaware. She studied abroad at the Widener University Nairobi Institute in Kenya in summer 2009. While in law school, she was a member of the Moot Court Honor Society, earned a Certificate of Achievement in Interviewing and Counseling, and was a recipient of the Outstanding Student Service Award. Jennifer served as President of the Alternative Dispute Resolution Society, Layout Editor of the Widener Law Forum, Vice President of the Military Law Society, Secretary of the International Law Society, and Chairperson of the Philip C. Jessup Moot Court Competition. She worked as a legal research assistant for Professor John Nivala, a summer intern with the Montgomery County District Attorney's Office, a Legalman (U.S. Navy paralegal) in the U.S. Navy Reserve, and a certified legal intern with the Pennsylvania Criminal Defense Clinic. Jennifer received a Juris Doctorate and Certificate of Trial Advocacy with Honors from the Taishoff Institute of Advocacy, Technology and Public Service in May 2010. In August 2011, she began graduate school in the Department of Criminology, Law and Society at George Mason University. From August 2015 to May 2017, she served as a graduate teaching assistant for Professor Lisa Newmark's Criminology Capstone course. In addition, she worked as an adjunct from April 2014 to the present. Her coursework focuses on domestic criminal justice, international crimes, human rights, and international criminal law.

Jennifer enlisted in the United States Navy as an undesignated Airman in June 2000. Her operational tours include the U.S.S. Enterprise (CVN-65), Patrol Squadron Four Seven (VP-47), and the Office of Military Commissions (OMC) Chief Defense Counsel. Onboard CVN-65, she served as an aircraft director, a training petting officer, a Divisional Career Counselor, a Photography Lab studio supervisor, and a flight deck photographer. On the aircraft carrier platform, she qualified as an Enlisted Aviation Warfare Specialist (EAWS) and an Enlisted Surface Warfare Specialist (ESWS). Next, she served as the Public Affairs Supervisor, Departmental Career Counselor, Coordinator and Counselor for the Navy College Program for Afloat Education, and Electronic Imaging Specialist while assigned to VP-47. Jennifer requalified as an EAWS on the P-3C Orion platform at VP-47. During her time as Chief Petty Officer at OMC, she worked as a defense Legal and Terrorism Analyst for several trials and appellate teams, including the detainees charged with acts of terrorism on the U.S.S. Cole and the five 9/11 co-conspirators awaiting trial at Guantanamo Bay, Cuba. Jennifer contributed original research and writing to the *United States v. al Bahlul* and *Hamdan v. United States* appellate briefs and oral arguments before the D.C. Circuit Court and the U.S. Supreme Court. In support of these exceptional military commission cases, she conducted primary research at the National Archives on Civil War General Orders and General Yamashita's trial at the International Military Tribunal for the Far East (IMFTE).

She drafted motions and arguments in *Hamdan v. United States*, *Hicks v. United States*, *Khadr v. United States*, and *al Qosi v. United States* before the D.C. Circuit Court and the United States Court of Military Commission Review (CMCR). From March 2017 to April 2022, she was an Associate at Booz Allen Hamilton, where she developed a methodology for assessing the mission support requirements and challenges faced by application developers of cloud-based Signals Intelligence systems at the National Reconnaissance Office (NRO). Jennifer will begin her new position as Mission Compliance Officer in the NRO's Office of Policy and Strategy in May 2022.