A PARTIAL TEST OF THE INTELLIGENCE-LED POLICING MODEL

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CHAPTER 1

INTRODUCTION

Motivated by the tragic events of September 11 and by revelations in the events’ aftermath that underscore the importance of improved intelligence exchange between national agencies, the proposal emphasizes the United States’ need of a better system for the analysis, dissemination and use of criminal intelligence data [bold added]. Such improvements are critical to law enforcement and other emergency agencies’ capacities to better protect the American public not only against acts of terrorism, but also against any criminal acts that threaten its safety.

International Association of Chiefs of Police Report, 2002

Because of the massive deficit we inherited and the enormous costs of this financial crisis [bold added], we have made some tough choices that will cut our deficit in half by the end of my first term and reduce it by $2 trillion over the next decade. That will bring discretionary spending for domestic programs as a share of the economy to its lowest level in nearly half a century.

U. S. President Barack H. Obama, 2009

These recent quotes demonstrate the need for law enforcement to continually strive for more effective and efficient practices. One such approach that has been suggested as both effective and efficient is intelligence-led policing (ILP), particularly the 3-i policing model (Ratcliffe, 2008), in which data analysis from the criminal environment is used fundamentally to help with decision-making.

As Walker (1992, p. 866) has stated, “Nothing stands still. Modern society continues to change and those changes create new problems” (see also Walker & Katz, 2005). Organizations must innovate or make the necessary changes to improve their
performance (Damanpour & Evan, 1984) at preventing crime, apprehending criminals, enforcing the law, and maintaining order. Sometimes, there may be a perception of a need (Rogers, 1995) in the social system that attracts change and innovation. Even criminals refine their tactics to the environment and the context in which they find themselves. They also make use of technological innovations. Therefore, “all police organizations must be aware of, and attempt to adapt to, environmental changes” (Roberg & Kuykendall, 1997, p. 99).

In American policing, change and progress is incremental (Goldstein, 1990; Lindblom, 1959), but with radical events (such as the tragic 9/11 terrorist attack on the United States) the equilibrium may be punctuated (Baumgartner & Jones, 1993), and the change might become unavoidable. As Goldstein also writes, “Change in policing…occurs unevenly and in small increments. An unpredictable event—a crisis in the community or in the police agency—often is the factor that propels a police agency to adopt new approaches” (1990, p. 50). No doubt, policing has developed new appearances and applications, sometimes with radical changes and sometimes with just slight changes (Kelling & Moore, 1991; Roberg & Kuykendall, 1997) that overcome the weaknesses, inefficiencies, or failures of the previous ones with renewal of mission and purpose (Weisburd, Feucht, Hakimi, Mock, & Perry, 2009). Weisburd and his associates argue that although there were significant and impressive changes and innovations as a response to the problems and inefficiencies of previous applications, “the terrorist attacks of 9/11 challenged this new sense of confidence in policing and raised a set of problems

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1 Baumgartner and Jones (1993) state that with that change, the disequilibrium turns into equilibrium, where the change is normally incremental.
that seemed to have little connection to the innovations of the previous decade” (2009, p. 2). Now, it seems to be the time for the ILP model of policing. McGarrell, Freilich, and Chermak (2007) found that:

Pressure to change is not new to law enforcement; indeed, it could be argued that no other public bureaucracy has changed as dramatically as law enforcement has since the early 1960s. Law enforcement organizations are constantly responding to external demands, implementing and evaluating new initiatives, and adopting strategies to ensure public safety. Recent years have witnessed calls for law enforcement to move toward an intelligence-led model of policing (ILP). (p. 143)

The ILP model has developed in Kent, United Kingdom, and later in the United States. It is quite popular in this decade as many scholars have argued for and studied the ILP approach (Anderson, 1997; Baker, 2009; Cope, 2004; Maguire, 2000; McGarrell et al., 2007; Peterson, 2005; Ratcliffe, 2008). It is a new way of policing that uses crime analysis to analyze crime data in order to help make decisions about preventing and reacting to crime. Despite its popularity, its effectiveness and/or efficiency has not been sufficiently tested. Indeed, there is not even a standard definition and approach to ILP that is agreed upon by scholars. ILP is perceived and framed differently, depending on the perspectives of various scholars and/or practitioners.

Police agencies do not operate nor provide service in a vacuum. Their work is highly complex (Wilson, 1968) and nonroutine in unstable environments (Burns & Stalker, 1961; Kuykendall & Robeg, 1982) and in a risk society (Ericson & Haggerty, 1997). O’Shea (1998) states that because “police organizations operate in a decision making environment characterized by uncertainty” (p. 83). They collect data, which is transformed into a useable format and then disseminated to relevant people in order to
reduce the uncertainty. In other words, police use crime analysis in order to lessen uncertainty and provide better, more-effective, and more-efficient decisions proactively and reactively. In that regard, ILP has been popularized in the last decade as the newest, most efficient, and most effective policing model.

In this study, the researcher focused on this new way of policing, which has been described as a managerial philosophy, a business model, and even a paradigm in policing (Ratcliffe, 2008). Particularly, Ratcliffe’s 3-i model of ILP was partially tested. The 3-i model has three components (i.e., crime intelligence analysis, decision-making, and criminal environment) and three processes (i.e., interpret, influence, and impact). It is assumed in this model that crime analysts will interpret and analyze the data collected from the criminal environment and then (using those useable outcomes) try to influence the decision-makers to make decisions that might impact the criminal environment. In this study, only the association between crime analysis and decision-making was tested; therefore, the testing is considered to be partial. Even though it is not a direct test of the effectiveness or efficiency of this new policing model, the partial test does look at the association between crime analysis and decision-making. Clearly, the crime analysis function in this study is considered to be effective if any significant impact on the organizational decision-making process is found. Further, crime analysis is considered effective when the law enforcement agency is collecting more information and analyzing more data, which in turn may lead to a more cost-effective and/or more efficient policing strategy (Ratcliffe, 2002).
The researcher in this study compiled a cross-sectional data set by merging several data sources, namely the Crime Analysis Survey (CAS) by O’Shea and Nicholls (2000), Law Enforcement Management and Administration Statistics (LEMAS), Uniform Crime Reports (UCRs), and Law Enforcement Agency Identifiers Crosswalk as primary data sources that are all contemporaneous. Using this comprehensive data set, the following questions will be explored:

1. **Primary**: To what extent does crime analysis influence police decision-making?

2. **Secondary**: Do crime analysis functions influence command-level managers, detectives, and patrol officers equally?

### Aim of the Study

There are several aims of the current study. First, it is neither easy nor cheap to make changes and innovations in police departments in the United States. Therefore, it is critical to know if a new paradigm or popular approach (i.e., the 3-i model) is worthwhile to adapt and apply; a new application may attract the federal government funds and support that may result in a waste of money, which is particularly problematic in the current global economic crisis. As Office of Management and Budget Director Peter R. Orszag (2009), wrote,

One of the principles motivating the President’s [Barack H. Obama’s] Budget is that, as a nation, we haven’t been making the right investments to build a new foundation for economic prosperity—and we need smarter investments in education, health care, and social services….Many programs were founded on good intentions and supported by compelling anecdotes, but don’t deliver results.
In that regard the 3-i model was tested partially.

Second, several important organizational factors are not part of the 3-i model, although they might be important in organizational decision-making. Whether they have an association with the decision-making process will help to determine if there is spuriousness in the models.

Third, the decision-makers in the organization who are more associated with specific types of crime analysis functions are identified. However, the association of crime analysis functions (through the decision-making process) with the criminal environment is not covered in this study, although it is part of the 3-i model. Therefore, whether Ratcliffe’s (2008) 3-i model, which is “a simplified conceptual framework of how crime reduction is achieved in an intelligence-led policing environment” (p. 272), was tested partially.

Summary

In this chapter, it was noted that policing is changing and developing. When needed because of internal and/or external factors, change happens and a new policing model is offered as a way to cover the flaws of the previous models. Recently, ILP, where the fundamental element of crime analysis is used actively, has been popularized. Does the analysis really matter in terms of organizational decision-making? Is it worthwhile to spend funds on this new model in this financially critical time? To explore these questions, a merged comprehensive, nationwide data set was used.
CHAPTER 2

LITERATURE REVIEW

This chapter presents the literature review on crime analysis and decision-making. Second, a brief explanation about some of the previous influential policing models, which used analytical methods and techniques in policing and decision-making at varying levels, is provided.

There are varying degrees of studies on crime analysis in the literature. Although many studies of crime analysis per se have been conducted, these studies are mainly about the methodologies and processes of different types of crime analysis rather than examinations of their effect on policing decisions and/or operations. One of the very early studies regarding crime analysis and crime analysis units in law enforcement agencies is Buck’s (1973) prescriptive package titled *Police Crime Analysis Handbook* that was prepared with the support of Law Enforcement Assistance Administration. Although it provides useful information on how crime analysis and crime analysis units can help law enforcement personnel with decision-making and operations (in general), the handbook is more like a guideline than an evaluation of crime analysis studies and successes. It does not empirically test anything. Buck argues that crime analysis “supports police operation through strategy planning, manpower deployment and investigation assistance” (p. 1), and “it is one more ‘tool’ of law enforcement which can serve the varying needs of several different masters” (p. 2).
Again with the support of the Law Enforcement Assistance Administration, Reinier, Greenlee, Gibbens, and Marshall (1977) conducted a survey study in 1975 on crime analysis and its impact on decision-making about patrol allocation and deployment. They found in some departments that “analysis existed in isolation from the operations groups and had little influence on allocation and deployment decisions” (p. 54), whereas in other departments, “the analysis was conducted in close association with the operations groups and regularly influenced the decisions” (p. 54). However, as they also point out, “it was difficult to identify the extent to which analysis influenced the decisions” (p. 54).

Second, contrary to the belief that “more sophisticated mathematical analysis techniques…have intrinsically greater value in supporting allocation and deployment decisions” (p. 82), they found that “such analyses are useless because they really do not tell them [the officers] how to deal with the crime problem” (Reinier et al., p. 54). Put differently, they state that the police were suspicious of some sophisticated types of analysis, such as statistical analysis, because such analysis cannot predict the next incident or help patrol officers solve cases and deal with problems. The researchers add that “the only valid measure of the quality of patrol supported by Crime Analysis is measurement of the use of analysis products [underline original] in deciding how, when and where to assign personnel and other resources, the strategies and tactics to be employed by those resources” (Reinier et al., 1977, p. 82).

The Crime Mapping Research Center of the National Institute of Justice (NIJ) conducted one of the broadest studies on crime mapping and crime analysis nationwide “to determine who uses geographical information systems (GIS) and why other agencies
are not using this mapping technology” (Mamalian & LaVigne, 1999, p. 1). However, because the focus of the survey was mainly on crime mapping and GIS, the survey contained only a few questions about crime analysis. A total of 2,004 agencies out of 2,768 departments responded (with a 72% response rate) to the survey. Mamalian and LaVigne (1999) found that “departments reported that mapping improves information dissemination, evaluation, and administration” (p. 3). They also reported that 94% of the departments use crime mapping to inform police officers and investigators; 56% use crime mapping to make decisions about resource allocation; 49% use it to evaluate interventions; 47% use it to inform residents; and 44% use it to organize calls for service.

Demirci (2007) studied the space and time issues of neighborhood homicide crimes in the Richmond, Virginia, area with crime analysis methods. He chose a widely used technique of spatial analysis: GIS (geographic information system) software. Moreover, he used sophisticated statistical tools to analyze the data. He recommended that “the City of Richmond Police Department should have their crime analysts trained with advanced GIS applications and other advanced analytical techniques such that they can plausibly process the integrated information to improve police decision making” (2007, p. 239).

Demir (2009) studied crime mapping and its impact on management-level decision-making using a merged comprehensive secondary data set. He used crime mapping as the technology and tested its impact on decision-making (on issues of resource allocation and redistricting) and indirectly on crime clearances in the United States. He found that when the information provided for the decision-making process is
too little to be helpful, it is not used. Interestingly, as he found that when too much
information was available, that information is not used, either. He explains:

In that sense, the quality of information available to decision makers is crucial
since they use available information when they are making decisions. Not all
information, however, is relevant to the decision being considered or is refined
enough for a to-the-point decision. Police departments generate too much
information and police managers are required to make decisions about many
issues. In order for the optimum decision, which is both accurate and swift, to be
made, the police manager needs refined information that is relevant to the
decisions and that is concise enough to allow for swift strategic decision-
making. Such information can be obtained through strategic and directed analysis of
information. (p. 156)

In sum, information provided from crime mapping should not be too much but
enough and relevant when it is to be used in organizational decision-making on resource
allocation and redistricting. However, it is not clear from Demir’s (2009) explanation and
study what the relevant and irrelevant information is. He concludes his study by stating
that “crime mapping and crime analysis has little direct impact on police effectiveness in
terms of increased crime clearances” (p. 153).

Paulsen (2004) did a study on the effects of crime maps on the perceptions of
officers. He states that “central to the success of intelligence-led policing strategies is the
ability of individual police officers accurately to identify problem areas within a
jurisdiction” (p. 234). He goes on to state that “if police officers have an accurate
understanding of crime patterns in their jurisdiction, then it is assumed that resources will
be deployed judiciously and that intelligence-led policing strategies will be more likely to
have beneficial results” (p. 234). He found some significant outcomes “regarding the use
of crime maps to inform officers about patterns of crime within their jurisdiction. Most
important of these results was the finding that, simply providing officers with maps of crime distributions will not alone improve their understanding of crime patterns within their jurisdiction” (p. 243), as they need more training to fully understand the crime mapping outcomes.

Cope (2004) did a qualitative study about the perceptions of police officers and crime analysts in two police forces that also apply some of the processes of ILP in the United Kingdom. The data were collected using participant observations and interviews with crime analysts, police officers, and managers. In this study, Cope tried to determine how and why crime analysis is important in supporting ILP, and whether and why any conflict exists between civilian analysts and police officers. She concluded that “the analysis had become a descriptive formality, partly because the analysts lacked the quality information to improve their products” (p. 201), whereas the “officers were unable to ask the right questions of analysis and their mistrust of it…also contributed to their reluctance to share information with analysts” (p. 201). In that regard, “Without a detailed understanding of their mutual roles, processes, epistemologies and expertise, the hope of developing a productive relationship seems unachievable” (p. 201). Secondly, she found that there were cultural barriers for the integration of analysts into the police organization. Cope further notes that “for a mutually supportive and productive relationship…[there should be] recognition of skills of both cultures and their expertise” (p. 202).

On the other hand, although it may not be a direct connection to the literature, a study of crime analysis would be incomplete without mention of contemporary and
influential policing models such as problem-oriented policing, compstat, and evidence-based policing that deal with crime incidents and criminal places using crime analysis functions and tools by those who make the decision and those who implement the decisions. In other words, these policing models were successful and had common attributes. Mainly because each application has crime analysis, decision-making, problem solving, and crime prevention in their applications, it is believed that a brief explanation and review of related empirical literature would be relevant to the present study and would shed light on the whole discussion.

### Previous Policing Models

This section briefly presents some of the influential policing models in order to show how these models differ with and are relevant the ILP model. Although some of those models resemble ILP more closely than others in terms of their assumptions and applications, each model has contributed to the discussion.

Historically, three eras of policing can be identified. First was the political era. It was followed by the reform (professional) era and then by the community policing era (Braga, 2002; Kelling & Moore, 1988; Trojanowicz & Bucqueroux, 1990; Zhao, 1996). All three types of policing had major differences compared with previous methodologies, philosophies, and applications of policing (Kelling & Wycoff, 2001; Uchida, 2005; Walker, 1977). Next were conceptual models\(^2\) of policing, including problem-oriented policing.

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policing (Goldstein, 1979, 1990), compstat policing (Bratton, 1998; Bratton & Knobler, 1998; Silverman, 1999, 2006), and evidence-based policing (Sherman, 1998, 2002; Welsh, 2006). Of the conceptual models of policing, however, community-oriented policing and problem-oriented policing “represent the most radical departures from standard police work” (Braga & Weisburd, 2006, p. 342). According to Rattcliffe (2008), although some of these models may differ conceptually, “the tactics they advocate (such as saturation patrols or greater use of civil enforcement) can be incorporated within broader frameworks such as problem-oriented policing” (p. 66).

Sometimes these new approaches/paradigms were separated from each other with a straight line; sometimes they were mentioned together as a complementing part of the other. In still other cases, the distinction was not clearly articulated. Interestingly, in almost all such policing innovations, the concept of “paradigm/paradigm shift” has been used to describe their greatness and impact. For example, Oliver and Bartgis (1998) say that community-oriented policing is a paradigm shift, but “it was not until the publication of two articles that the paradigm began to shift” (p. 494). These articles are Goldstein’s 1979 article on the problem-oriented approach to policing and Wilson and Kelling’s (1982) article on the broken windows theory.

Duman (2007) contends that community-oriented policing is “a perceptual revolution and enlightenment in understanding the core problems traditional policing has suffered for centuries” (p. 10). Walsh and Vito (2004) believe that community-oriented policing is a paradigm shift but its paradigmatic impact is “more philosophical than
organizational” (p. 57). O’Shea (2009) argues that community policing is better and more encompassing than claimed. It has two sides: administrative and operational. He contends that people usually do not see the operational attribute and mention only the policing style’s administrative effects. In that regard, as he points out, problem-oriented policing is part of the operational branch of community-oriented policing. However, Eck (2006) contends that community policing, and other policing innovations, such as hot-spots policing and compstat, can only “highlight aspects of a problem-oriented approach. These are not alternatives, but elaborations on problem identifications, interventions, and management systems that have been or could be adapted to a problem-oriented approach” (p. 127). Walsh (2001) argues that “[compstat] is an emerging police organizational management paradigm” (p. 347). On the other hand, according to Sherman (2002), “evidence-based practice is a paradigm for making decisions” (p. 220). For his part, Baker (2009) creates a policing paradigm with an integrated model: “ILP + COP + POP + CompStat = Consolidated Intelligence and Coordinated Decision-Making” (p. 99). In the following sections, some of these most popular policing models will be discussed further.

**Community-Oriented Policing**

Skogan (2006) discusses the popularity of community-oriented policing and contends that it is more than just a set of policing programs. Rather, as he continues, “it involves changing decisionmaking processes and creating new cultures within police departments. It is an organizational strategy [italics original]” (p. 27). In terms of

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3 This information is from a telephone conversation with T. C. O’Shea on February 27, 2009.
definition, community policing was considered as elastic and abstract (Weatheritt, 1988), making its definition differ among scholars (Mastrofski, 2006). Therefore, “it is this ambiguity and flexibility that gives community policing its all-things-to-all-people character and has contributed to its political viability over two decades” (Mastrofski, p. 44). As Duman (2007) also indicates, “even though there are countless definitions for community policing in the literature, there is not one that academicians agree upon” (p. 6). Although as Ratcliffe (2008, p. 70) points out, “community policing is difficult to define, the following definition gives a general idea of what community policing means:

community policing is a loosely related body of philosophical principles regarding the role, authority, and mandate of the public police, and the related set of internal organizational and operational reforms. Community policing advocates a broad, social role of police and enhanced community responsibility and participation in policing. It is argued that to meet the policing requirements of different citizens and neighborhoods effectively, public policing should become more visible accessible, and responsive…[by] adopting various organizational strategies such as management decentralization, planned police response, mixed neighborhood patrol strategies, and mechanisms for community accountability and consultation. (Murphy, 1988, p. 177)

Skogan and Roth (2004) write that “community policing is the most important development in policing in the past quarter century….which supplements traditional crime fighting with a problem-solving and prevention-oriented approach that emphasizes the role of the public in helping set police priorities” (p. xvii). The policing style was born as an alternative vision and challenges the professional policing model and most of its applications. Professional policing also was a cure for corrupt and politicized American police during the 1970s until the early 1980s (Kelling & Moore, 1988; Walker, 1977, 1992). The professional model emphasized responding to calls rapidly, dealing
with criminals and crime (reactively), and specializing in its applications for the sake of efficient outcomes. The police were conducting random street patrols as a preventive practice, believing that the visibility of the police would deter crime. However, this dominant idea of random patrol was broken with the Kansas City, Missouri, preventive-patrol experiment (Kelling, Pate, Dieckman, & Brown, 1974). Most importantly, however, the professional model of policing neglected the most important component: the community. Greene and Taylor (1988) label this model of policing as bureaucratic policing. They assert that bureaucratic policing had several drawbacks, “the most salient of which are police detachment from the community, the exclusion of police constituent groups from policy making, and emphasis on the means of controlling police behavior to the exclusion of the ends of policing, providing public safety, and a feel of security” (p. 196). Put differently, bureaucratic policing provided a service to the public with the establishment of barriers and walls between the police and the public (Skogan & Roth, 2004; Zhao, 1996). Therefore, community-oriented policing “relies on an intimate relationship between police and citizens” (Kelling & Moore, 1988, p. 21). Further, Bailey (1988) criticizes community-oriented policing, but admits that “community policing does not represent a small technical shift in policing; it is a paradigmatic change in the way police operate. It is the most fundamental change in policing since the rise of police professionalism early in this century” (p. 236).

Given all these arguments, community-oriented policing is considered to be an approach that attracts both criticism and praise. For instance, Mastrofski (2006) criticizes community-oriented policing for not being effective in crime prevention. Duman (2007)
used a nationwide U.S. data set with community-oriented policing as the dependent variable. The objective was to determine which individual, organizational, and societal determinants/factors may influence the use of community-oriented policing. He found that “internal contingencies (both individual and structural) play a relatively more significant role than external contingencies (both societal and environmental) in police departments’ decisions to implement community policing or any other policing strategies” (p. 89).

Problem-Oriented Policing

Goldstein (1979, 1990) created problem-oriented policing so the police would do more than reactively respond to crime. He proposed a more analytical, broad, and proactive look at crime and its components. Moreover, he emphasized effectiveness rather than efficiency in policing. Another emphasis in his approach was the syndrome of means-over-ends in policing. He also argues that problem-oriented policing “is more than just a new tactic or program to be added on the prevalent forms of policing. It entails more than identifying and analyzing community problems and developing more effective responses to them” (1990, p. 3). Problem-oriented policing imposes more responsibilities on street officers because analysis is one of its main tools. As Goldstein argues, even “in a police agency in which individual officers may not know what has occurred outside the areas in which they work or during periods when they are not on duty, crime analysis has been the primary means for pooling information that may help solve crimes” (1990, p. 37).
Weisburd, Telep, Hinkle, and Eck (2008) contend that “POP [problem-oriented policing] has emerged as one of the most widely accepted and widely used strategies in American policing” (p. 9). In terms of definition, it is “…considerably easier to define” (Ratcliffe, 2008, p. 70) when compared to community-oriented policing.

Eck and Spelman (1987) operationalized problem-oriented policing with their SARA (Scanning, Analyzing, Responding, and Assessing) model in the Newport News, Virginia, Police Department, where Goldstein also contributed to the project as a consultant. The Newport News study is perhaps the first and most widely applied, discussed, and well-known application of problem-oriented policing (Eck, 2006). It was even considered as the synonym for problem-oriented policing (Scott, 2000). However, after applying the SARA model to a case study, Clark and Goldstein (2003) offered the following caution:

[Although] the SARA model…teaches police the value of thinking sequentially about scanning, analysis, response, and assessment….it can also be misleading in suggesting the sequence of steps to be followed in any project. In fact, projects rarely follow a linear path from the initial scanning and analysis stages through the stages of response and assessment. Rather, the process is iterative so that an unfolding analysis can result in refocusing of the project (as happened more than once in the present case), and questions about possible responses can lead to the need for fresh analyses. (p. 21)

Spelman and Eck (2000) assert that problem-oriented policing is “a state of mind, not a program, technique, or procedure” (p. 133) and that the “heart of problem-oriented policing is systematic thinking” (p. 129). Therefore, there is not one type of solution or approach to a problem, but many, and these alternative solutions can be different in each department. In scanning, “officers are expected to look for possible problems” (p. 129).
For analysis, information is collected to “examine offenders, victims, the social and physical environment, and previous responses to the problem. The goal is to understand the scope, nature, and causes of the problem” (p. 130). Regarding the response component, Spelman and Eck note that “the knowledge gained in the analysis stage is then used to develop and implement solutions. Officers seek the assistance of other police units, public and private organizations, and anyone else who can help” (p. 130). In the assessment phase, “officers evaluate the effectiveness of their response. They may use the results to revise the response, collect more data, or even redefine the problem” (p. 130).

Other advocates of problem-oriented policing, Clark and Goldstein (2003) admit after concluding their case study that the project “illustrated just how complex it is to examine a large problem…. [and] confirmed that, in its most ambitious form, problem-oriented policing is indeed, contrary to the frequent claim, a complex process that requires much patience at its beginning, and much persistence in blasting through to the end” (pp. 39-40).

Braga (2002) expresses the importance of crime analysis in problem-oriented policing and states that “solid analyses of the underlying conditions that generated crime problems were the cornerstones of the successful prevention projects…. Thus, police departments interested in improving their crime prevention capacities should work hard to improve their ability to analyze crime problems” (p. 108). Similarly, Weisburd and McEwen (1998) note that by providing spatial and temporal information about a crime and its environment, crime mapping and its analytical tools all can help solve crime problems. Clarke and Goldstein (2003), in his case study of the Charlotte-Mecklenburg
Police Department in North Carolina, considers crime analysis to be “the heart of problem-oriented policing…. [but also added that a] crime analysis unit cannot implement problem-oriented policing without the involvement of both line police officers and police leadership” (p. 34).

Eck (2006) says that problem-oriented policing redefines policing and restates the police mission by presenting the problem as the new unit of analysis and problem reduction as the measure of success. Therefore, success is to be measured. Moreover, Eck explains, problem-oriented policing “shifts policing to a scientific approach to preventing crime and away from the routine application of the law. And it replaces the notion of the police as gatekeepers to the criminal justice system with the idea that police are central to many networks that affect public well-being” (2006, p. 117). Weisburd, Telep, Hinkle, & Eck (2008) performed a meta-analysis and found that problem-oriented policing had a modest effect on the reduction of crime and disorder.

Scott (2000) argues that although the line between problem-oriented policing and community-oriented policing is blurred for several reasons, there are differences between them. For instance, he differentiates problem-oriented policing from community-oriented policing in terms of decision-making and states that “community policing emphasizes that the police share more decision-making authority with the community; problem-oriented policing seeks to preserve more ultimate decision-making authority for the police, even while encouraging the police to solicit input from outside the department” (p. 20).
However, according to Ratcliffe (2008), problem-oriented policing focuses more on crime events rather than criminal offenders. On the other hand, Braga and Weisburd (2006) criticized much of the literature on problem-oriented policing (but not problem-oriented policing per se), and asserted that “too often, the principles envisioned by Herman Goldstein are not being practiced in the fields” (p. 133). Put differently, Braga and Weisburd contend that although problem-oriented policing is an innovation in American policing, it is not truly and appropriately put into practice.

As indicated in the introduction section of this chapter, scholars have taken a variety of approaches to community-oriented policing and problem-oriented policing. Which of these two comes first, or whether they are each a part of a whole, or whether one is an offspring of the other is hard to determine from the wide range of literature. However, because community-oriented policing and problem-oriented policing are not the main focus of this study, these questions are not explored here in detail. Greene and Taylor (1988) contend that there were several attempts that helped community-oriented policing develop, one of which is Eck and Spelman’s (1987) SARA model of problem-oriented policing. Another study, the Baltimore (Maryland) County Citizen Oriented Police Enforcement (COPE) project “initially began as a community-oriented policing strategy [but] evolved into a problem-oriented policing strategy” (Cordner, 1988, p. 135). Therefore, as Cordner continues to state, “COPE strategy should be understood as both community-oriented and problem-oriented” (p. 151).
Sherman and Eck (2002), on the other hand, believe that although community- and problem-oriented policing are considered overlapping in many ways, “they actually have very different historical and theoretical roots” (p. 298). They go on to explain:

Community policing arises from the crisis of legitimacy after the urban race riots of the 1960s…. The reports claimed police had lost contact with minority group residents, both by changing from foot patrols to radio cars and by taking a more legalistic approach to law enforcement…the police were urged to increase their contact with citizens in more positive settings than just responding to emergencies…. Problem-oriented policing, in contrast, arose from the crisis of police effectiveness at crime prevention provoked in the 1970s by some of the very studies reviewed in this chapter…. The strategy of problem-oriented policing conceived by Professor Goldstein (1979) provided a new paradigm in which to focus innovation, regardless of any contact with the citizenry. Where the core concept of community policing was community involvement for its own sake, the core concept for problem-oriented policing was results [italics original]: the effect of police activity on public safety, including (but not limited to) crime prevention. (pp. 298-299)

Compstat

Compstat was introduced by New York Police Department Commissioner William Bratton in 1994 to control crime and disorder and has been discussed extensively by various scholars (Braga, 2002; Bratton, 1998; Bratton & Knobler, 1998; Moore & Braga, 2003; Silverman, 1999, 2006; Vito, Walsh, & Kuselman, 2005; Walsh, 2001; Walsh & Vito, 2004; Weisburd, Mastrofski, McNally, Greenspan, & Willis, 2003; Willis, Mastrofski, Weisburd, & Greenspan, 2004). And, according to Weisburd, Mastrofski and Willis (2008, p. 1) compstat “has already been recognized as a major innovation in American Policing.”

Compstat policing has four basic premises. Bratton (1998, p. 36) describes them as “timely accurate intelligence data; rapid response of resources; effective tactics and relentless follow-up” (see also Bratton & Knobler, p. 224). In the compstat model, hot-
spot data are analyzed and mapped and then discussed in biweekly meetings of district commanders. These commanders are held accountable for their districts and are questioned about the situation in his or her district. These operational commanders develop strategies and make operational plans depending on the analysis of the crime data. Silverman (2006) describes some of the elements of compstat and summarizes them as “up-to-date computerized crime data, crime analysis, and advanced crime mapping as the bases for regularized, interactive crime strategy meetings which hold managers accountable for specific strategies and solutions in their areas” (p. 268). Further, he clarifies a conceptual misuse of compstat in the literature: “Contrary to most accounts, the acronym Compstat is not short for ‘computer statistics.’ Compstat actually arose from a computer file, ‘compare stats,’ in which the data was originally stored” (p. 271). However, Bratton and Knobler (1998, p. 233) describe compstat as “computer-statistics meetings.” In another study, Bratton (1998, p. 36) uses the phrase “Comprehensive Computer Statistics.”

Weisburd, Greenspan, Mastrofski, and Willis (2008, p. 12) argue that “Compstat refines and reinforces traditional structures of policing.” In addition, they contend that with compstat, the elements of strategic leadership and management are applied to police under the rubric of problem-oriented policing. Put differently, “Compstat brings many of these management prescriptions together in a single program customized for police organizations. We characterize this approach more generically as ‘strategic problem solving’” (p. 2). Another scholar sees compstat as a “police managerial accountability mechanism” (Ratcliffe, 2008. p. 76), where middle-level managers are held accountable
for their decisions about strategies for reducing crime. Walsh (2001) described compstat as “a goal-oriented strategic management process that uses computer technology, operational strategy and managerial accountability to structure the manner in which a police department provides crime-control services” (p. 347). Further, “Compstat was awarded the prestigious Innovations in American Government Award from the Ford Foundation [italics original] and the John F. Kennedy School of Government” (Vito et al., 2005, p. 187). Walsh and Vito (2004) argue that compstat is a paradigm shift and contend that it “is an attempt to synthesize the elements of the rational-legal bureaucratic and community problem-solving paradigms with strategic management concepts taken from the business world” (p. 66).

However, Willis et al. (2004) found that the implementation of compstat was not as effective in a smaller police department (e.g., Lowell Police Department in Massachusetts) as in a larger one (e.g., New York Police Department). Walsh (2001) notes that small agencies may not be able to implement compstat because the analysis part of this policing model requires sophisticated computer hardware and software that might be too expensive for small agencies; however, this was not an issue for the Lowell Police Department. Indeed, Willis et al. (2004, p.4) note that “Compstat’s low cost and flexibility contributed to its rapid development within Lowell’s relatively small police department.”

In contrast to other policing scholars, Chu (2001) considers compstat to be part of community-oriented policing and states that “William Bratton achieved international recognition for his community policing efforts [italics added] in New York City, and he
clearly understood the benefits of IT [information technology]” (p. 29). One major
difference between community-oriented policing and compstat is the centralization-
versus-decentralization argument. Willis et al. (2004, p. 6) contend that “community
policing delegates decision-making authority as far down the chain of command as
possible, while Compstat concentrates decision-making power among middle managers
and holds them directly accountable to the top brass.”

Evidence-Based Policing

Welsh (2006) argues that evidence-based policing “involves the police using the
highest quality available research evidence on what works best to reduce a specific crime
problem and tailoring the intervention to the local context and conditions” (p. 305). He
also notes that evidence-based policing is “a part of larger and increasingly expanding
evidence-based movement” (p. 309).

Sherman, Farrington, Welsh, and MacKenzie (2002) contend that “effective
public policy and practice needs to be based on scientific evidence” (p. 1). Sherman
(2002) states that it is “the use of the best available research on the outcomes of police
work to implement guidelines and evaluate agencies, units, and officers….evidence-
based policing uses research to guide practice and evaluate practitioners” (p. 226). He
emphasizes that evidence-based policing is different from previous paradigms and that it
adds the “scientific evidence” (p. 233) component to the decision-making process. Put
differently, he concludes that “no other paradigm provides specific principles for making
decisions and evaluating outcomes” (p. 231). Further, this paradigm can be used by
officers of any rank—from street-level officers to top managers.
Sherman (1998) criticizes community-oriented policing and incident-specific policing for lacking outcome measures. Although he finds that problem-oriented policing is the “major source for” (p. 5), and the “most similar to” (Sherman, 2002, p. 232) evidence-based policing, he criticizes problem-oriented policing for lacking scientific evidence.

One of the main attributes of evidence-based policing, as Sherman (1998, 2002) has found, is the “evidence cop,” who is, in one sense, the bridge between the evidence and the practice. That person is responsible for conveying the latest developments and then making sure that they are properly applied in the field. Sherman adds that compstat also does not use the scientific method.

On the other hand, Moore (2006) criticizes evidence-based policing for putting “a bit too much of the load on science and scientists” (p. 335), as science, by itself, is not capable of doing many things that can be achieved only with the “experience of practitioners” (p. 335). In other words, “the world of crime and policing is far too important, far too complex, and far too urgent to leave entirely in the hands of scientists. We need a great deal of practical wisdom as well as a rigorous and responsive science to move the field forward” (p. 336).

When considering all of these models as a whole, perhaps there is nothing new under the sun; however, with the same ideas floating around and appearing only with some modifications (Kingdon, 1984), maybe it is only “a new sunrise on a fine old concept” (Wycoff, 1988, p. 120). Or perhaps all of these changes in American policing are “new successes, old problems” (Wadman & Allison, 2004, p. 159). Whether all of
these models of policing are like a swinging pendulum or represent real paradigm shifts (Kuhn, 1962, 1970) in policing will be sorted out in the future. Whether the changes in American policing in the last three decades “is greater than those of previous generations is difficult to know since systematic observation of police practices is a relatively modern phenomenon” (Weisburd & Braga, 2006, p. 1). However, whatever frame they are in, or whether they are a paradigm or not, “it is clear that they are significant movements in the current policing environment (Ratcliffe, 2008, p. 65).

**Summary**

In this chapter, the literature on crime analysis and decision-making was reviewed. Then, previous successful policing models such as community-oriented policing, problem-oriented policing, compstat, and evidence-based policing were discussed to shed light on the issue of using crime analysis in support of police practice, in general, and the new policing model (intelligence-led policing), in particular. In all of these previous policing models, analysis and decision-making to reduce and prevent crime are common concepts that have differing levels of involvement and importance. In the following chapter, the new policing model is discussed in detail.
CHAPTER 3

INTELLIGENCE-LED POLICING

Intelligence-led policing, which has gained popularity since late 1990s, gained additional momentum after the 9/11 terrorist attack on the United States. Intelligence-led policing will be discussed in the first section of this chapter. After that, a brief history of intelligence-led policing, its definition, and the ways that various scholars have framed the policing model will be provided. In the second half of this chapter, the main focus of the current study, the 3-i model, will be presented thoroughly. The discussion will include the components of the 3-i model (i.e., crime analysis, decision-making, and criminal environment) and its processes (i.e., interpret, influence, and impact).

A Brief History of Intelligence-Led Policing

Intelligence-led policing existed first in Kent, United Kingdom. Anderson (1997) summarizes the history of intelligence-led policing and its first British version in the Kent Constabulary policing area. He mentions several factors that influenced the development of intelligence-led policing in the early 1990s. He states that “crime levels had risen sharply in the preceding years, particularly the property-related offences of burglary and automobile theft…. At the same time, the economic recession had increased the pressure for restraint in public spending” (p. 4). Therefore, he adds, “the police were expected to produce more with budgets that either remained constant or were reduced in real terms”
Anderson further notes that a 1993 audit commission report recommended the use of intelligence from informants as well as other sources in order to prevent and detect crime in ways that would be more effective and efficient in terms of using police resources. And yet, one of the starting points of intelligence-led policing is the research claiming that “a relatively small number of individuals were responsible for a disproportionate amount of the total crime committed” (p. 4). Ratcliffe (2002, 2003, 2008; see also Maguire, 2000) also discusses similar points and says that there were two influential reports behind the existence of intelligence-led policing in the United Kingdom: The Report of Audit Commission (1993) and Her Majesty’s Inspectorate of Constabulary (1997). As he wrote, “Both of these reports focused on the information gathering and analysis facets of modern policing” (2002, p. 54). Both facets needed to be both cost-efficient and effective.

In the United States, however, the main triggering event for intelligence-led policing was the 9/11 terrorist attacks (Baker, 2009; Carter, 2005; IACP, 2002; Peterson, 2005; Ratcliffe, 2008). As stated previously, change in U.S. institutions occurs incrementally (Lindblom, 1959) and retains an equilibrium until punctuated by a radical event (Baumgartner & Jones, 1991, 1993)—namely, the 9/11 attacks. The following year, the International Association of Chiefs of Police hosted a Criminal Intelligence Sharing Summit where the importance of intelligence sharing and intelligence-led policing was emphasized. As stated in the report from that meeting:

It is difficult to enhance intelligence sharing without also having a shared understanding of what “criminal intelligence” is. Summit participants’ definitions placed emphasis on the various ways that intelligence supports the policing
mission. In particular, they noted that “information” is not the same thing as “intelligence.” Rather, intelligence is the combination of credible information with quality analysis—information that has been evaluated and from which conclusions have been drawn. Criminal intelligence is data that can be used proactively for strategic and tactical purposes. (IACP, 2002, p. v)

More important, “law enforcement and other collaborating agencies must be able to plan, gather, collate, analyze, manage, disseminate and then use intelligence data” (IACP, 2002, p. 13).

In summary, the reasons and events, as well as the purposes behind the existence of intelligence-led policing is different in the United Kingdom and in the United States. In the United Kingdom, financial issues provided the impetus for a policing model that would be more efficient and effective in agencies with limited resources; in the United States, the impetus was a tragic terrorist event that called for a better, proactive, and cooperative policing model. However, the fundamental element seems to be the same: data analysis.

What Is Intelligence-Led Policing?

There is no standard definition of and no one approach to intelligence-led policing in the literature (Baker, 2009; Carter, 2004; Cope, 2004; Maguire, 2000; McGarrell et al., 2007; Peterson, 1997, 2005; Ratcliffe, 2003, 2008). As Ratcliffe also notes, “there is still a lack of clarity among many in law enforcement as to what intelligence-led policing is, what it aims to achieve, and how it is supposed to operate” (2003, p. 1). Some scholars have referred to the same concept but used different terminology. For instance Taylor,
Kowalyk, and Boba (2007) used the term *information-led policing* instead of intelligence-led policing.

Although scholars use the same conceptualization for the most part, they may see the framework differently. Some scholars see intelligence-led policing as a way to fight against terrorist events, while others see it as a new way of policing that is information- and data-based and applicable to all types of crime. Still others see intelligence-led policing as an operational and tactical use of intelligence. A fourth group of scholars see intelligence-led policing as part of or descendant of problem-oriented policing, community-oriented policing, and/or compstat. Ratcliffe (2008) touches the same ambiguity issue and writes that some scholars have a confused conception of intelligence-led policing and “there has been a lack of clarity in regard to policing paradigms and the frameworks by which academics and practitioners articulate their vision of how policing should function” (p. 80). Although several definitions and perspectives will be presented in this chapter without exemption, Ratcliffe’s approach and framing of intelligence-led policing is taken as the basis for this dissertation and further arguments.

According to Ratcliffe (2008), intelligence-led policing is defined as follows:

> …a business model and managerial philosophy where data analysis and crime intelligence are pivotal to an objective, decision-making framework that facilitates crime and problem reduction, disruption and prevention through both strategic management and effective enforcement strategies that target prolific and serious offenders. (p. 89)

Milligan, Clemente, and Schader (2006) define intelligence-led policing as follows: “*Intelligence-led policing (ILP)* [italics original] is a law enforcement
management strategy aimed at collecting, analyzing, and disseminating intelligence information to efficiently connect criminal acts with the offenders who commit those acts” [italics original] (pp. 1-2). Intelligence-led policing “allows for a clear understanding of crime and criminality by identifying which criminals are active, which crimes are linked and where problems are likely to occur” (Wigget, Walters, O’Hanlon, & Ritchie, 2003, p. 113). Further, intelligence-led policing “enables valuable resources to be targeted more effectively against current challenges and emerging trends, ensuring the best opportunities for positive intervention and maximum value for money” (Wigget et al., p. 113).

Cope (2004) states that “policing is increasingly relying on intelligence to target, prioritize and focus interventions” (p. 201) and goes on to explain that “police can produce volumes of intelligence, which only becomes useful operationally after it has been interpreted, assessed and any potential patterns and linkages investigated. It is in the translation of raw information into operationally viable intelligence, that analysis plays its crucial role” (p. 201).

As mentioned previously, intelligence-led policing may differ in its conceptualization and application by scholars. For instance, Peterson (2005) argues that intelligence-led policing is no different than community-oriented policing, as both styles of policing complement each other and can be used together. Similarly, McGarrell et al. (2007) argue that there is an association between the intelligence-led policing and community policing. However, Ratcliffe (2005) contends that “intelligence-led policing is operationally the antithesis of community policing” (p. 87). He goes on to say that
“where community policing aims primarily for police legitimacy and is organizationally bottom-up and community centered, intelligence-led policing aims for crime reduction, is top-down and hierarchical, and uses crime intelligence to focus on offenders” (p. 87).

Peterson states that “intelligence-led policing is a collaborative enterprise based on improved intelligence operations and community-oriented policing and problem solving, which the field has considered beneficial for many years” (2005, p. vii). Baker (2009), on the other hand, contends that “ILP [intelligence-led policing] philosophy integrates with community-oriented policing, problem-oriented and CompStat policing strategies as foundations for collecting accurate criminal intelligence” (p. iv). He considers intelligence-led policing to be a broad notion of management that unifies “crime/intelligence analysis, CompStat, and other police strategies” (p. v) under one umbrella against crime fighting.

Ratcliffe (2008) contends that whereas some scholars consider intelligence-led policing to be a “new direction for policing,” others “have tied intelligence-led policing to existing policing paradigms” (p. 80). He adds that intelligence-led policing is different than and independent from models such as community-oriented policing, problem-oriented policing, and compstat, even though intelligence-led policing has partially overlapping and/or similar arguments. Peterson (2005), on the contrary, argues that community-oriented policing and intelligence-led policing complement each other. In the same vein, Baker (2009) argues that intelligence-led policing has a unifying and managerial broadness over other policing strategies. He states the “ILP [intelligence-led policing] philosophy integrates with community-oriented policing, problem-oriented and
CompStat policing strategies as foundations for collecting accurate criminal intelligence” (p. iv).

The following section focuses the discussion on the main focus of this study: Ratcliffe’s (2008) 3-i model of intelligence-led policing.

THE 3-I MODEL

Ratcliffe (2008) calls his model of intelligence-led policing the 3-i model. It is a business model that seeks meld efficiency with a rational approach. He states that “the end state of ILP is an attempt to reduce the effects of criminality, either through prevention and disruption or by effectively deploying the criminal justice system” (p. 112). The “3-i model addresses a simple but broad conceptual framework for intelligence-led policing that is likely to be applicable to most agencies” (p. 114). There are analysts who interpret the criminal environment and influence the decision-makers, who in turn make decisions and set policies that impact the criminal environment. It is, in one sense, and integrated theory of problem-oriented policing (Goldstein, 1990) and compstat (Bratton, 1998). Different than problem-oriented policing, intelligence-led policing focuses on serious and prolific offenders, not incidents or problems only. Unlike community-oriented policing, hierarchy (and centralization) is supported, while solving crime problems with the community is not. However, Ratcliffe (2003) acknowledges that a policing philosophy with a broader approach may help create the appropriate context for intelligence-led policing to be successful.
The 3-i Model

Criminal Environment

Interpret

Crime Intelligence Analysis

Influence

Decision-Maker

Impact

Figure 1. The 3-i model showing the interaction of interpretation, influence, and impact on policing.


Ratcliffe (2008) contends that the 3-i model provides a big picture and aims to apprehend serious and prolific offenders in order to decrease crime. Crime analysts have a critical role to influence the decision-makers in their decisions for achieving efficient outcomes in the criminal environment. This model, as argued, should be applied as a whole. Clearly, all of the three processes (i.e., interpret, influence, and impact) should be included. The absence of any of these processes may result in unsuccessful, inefficient, and undesired outcomes.
In the following section, more detailed information is provided about the main components of the 3-i model (i.e., crime analysis and decision-making) and the three processes (i.e., interpret, influence, and impact), although only a part of the model will be tested in this study.

**Crime Analysis**

Information analysis is an important attribute of intelligence-led policing (Boba, 2001, 2005; Cope, 2004; IACP, 2002; Maguire, 2000; Peterson, 2005; Ratcliffe, 2008), because without analysis, the data mean nothing. O’Shea and Nicholls (2002) found that “analysts were ‘counting’ crime more than they were ‘analyzing’ crime” (p. 56). Put differently, they were counting the data instead of analyzing it—a practice that is no different than the “dossier system” (Carter, 2005, p. 51) in the history of American policing. Therefore, crime analysis is the “central driver” (Taylor, Kowalyk, & Boba, 2007, p. 154) of intelligence-led policing and “an essential component of pro-active policing (Bruce, 2004, p. 36).

However, there also are differences among scholars about the importance of analyzing crime information. Peterson (2005) argues that “without analysis, there is no intelligence. Intelligence is not what is collected; it is what is produced after collected

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4 Carter (2005) writes the history of dossier system as in the following quotation: “Early law enforcement intelligence units, notably going back to the 1920s, borrowed an old method from the military known as the ‘dossier system.’ Essentially, intelligence files were nothing more than dossiers—files with a collection of diverse raw information—about people who were thought to be criminals, thought to be involved with criminals, or persons who were thought to be a threat to the safety and order within a community….The dossier system had become an accepted tool for law enforcement intelligence; hence, when new overarching challenges emerged, it was natural for law enforcement to rely on this well-established mechanism for keeping information….The dossier information typically was not related to specific crimes, rather, it was kept as a contingency should the information be needed in an investigation or prosecution” (pp. 52-53).
data is evaluated and analyzed” (p. 3). Bruce (2004) approaches this argument with different terminology and states that “data [italics original] becomes information [italics original] when it is effectively analyzed,” [italics original] and “information [italics original] becomes knowledge [italics original] when it is effectively communicated” [italics original] (p. 12). Ratcliffe (2008), on the other hand, argues that although the formula (i.e., information + analysis = intelligence) looks fine, it does not represent the reality. He therefore proposes Davenport’s (1997) DIKI (data–information–knowledge–intelligence) approach in his model. He explains this continuum with an example:

computer records are data…. [italics original] When a crime analyst accesses the data [and analyzes it] then this becomes information…. [italics original] If the analyst subsequently talks to a detective and shares this information….this collective wisdom becomes knowledge…. [italics original] Finally, when the crime analyst and the detective take their knowledge to a senior officer…then this knowledge becomes intelligence [italics original] (p. 99).

A brief history of crime analysis. No doubt “Human beings have analyzed crime and criminal behavior throughout history” (Boba, 2005, p. 19). Crime analysis “rests on the assumption that crimes are not totally random, isolated and unique events, but can be combined into sets sharing common features and showing distinct patterns” (Ekblom, 1988, p. 3). Further, crime analysis serves both preventive and reactive purposes. In order not to lose the focus of this study, the researcher will discuss the history of crime analysis only from the beginning of the modern policing in the early 1800s. Sir Robert Peel, who founded the London, England, Metropolitan Police Department in 1829, emphasized the importance and necessity of collecting information regarding crime and criminals in the city (Bruce, 2004; Baker, 2004; Massachusetts Association of Crime Analysts [MACA],
According to the Massachusetts Association of Crime Analysts (MACA, 2008, p. 2), “it was among the London Metropolitan Police that the concept of *modus operandi*, [italics original] and of classifying offenders and crimes based on it, was first developed. *Modus operandi* [italics original] helped police identify patterns and series more accurately, though it was applied primarily to cases of murder”.

In the United States, August Vollmer, who was considered the father of modern American policing, has contributed significantly to the development of crime analysis (Baker, 2004, 2009; Bruce, 2004; Grassie, Waymire, Burrows, Anderson, & Wallace, 1977; MACA, 2008; Reinier et al., 1977; Spelman, 1988), as he “directed the development of a basic records management system that helped organize police reports in a manner conducive to analysis. He encouraged regular review of police reports and mapped crime locations with colored pins. More important, he used crime information to create patrol districts” in 1906 (MACA, 2008, p. 2). In 1960s, a Vollmer’s protégé, Orlando W. Wilson, concretely contributed to the development of crime analysis by paying attention to the importance of crime analysis in policing and encouraging the establishment of crime analysis units in police departments (Baker, 2004; Bruce, 2004; Grassie et al., 1977; MACA, 2008; Reinier et al., 1977). Then in the 1970s, with the establishment of Law Enforcement Assistance Administration, many programs and crime analysis units were funded and supported (Baker, 2004; Buck, 1973; MACA, 2008; Reinier et al., 1977). Gottlieb, Arenberg, & Singh (1994) point out that Robert O. Heck in the Law Enforcement Assistance Administration elevated crime analysis “to a position of
prominence as a major tactical component for law enforcement service delivery” (pp. 3-4) with the Integrate Criminal Apprehension Program that emphasized paying attention to repeat offenders and their modus operandi. On the other hand, “the advances in computer technology and related applications, e.g., data processing, system modeling and simulation, resulted in an upsurge of interest in more sophisticated approaches to analysis and resource deployment and allocation” (Reinier et al., 1977, p. 12). Furthermore, the “escalating trends in police work toward professionalization, education and the adaptation of social science and business methods such as program planning and budgeting and systems analysis” (p. 13) also have contributed to the development of crime analysis.

Another professional organization, the International Association of Law Enforcement Intelligence Analysts, was created in 1980 “by a cadre of U.S. and Canadian analysts” (Peterson, 1994, p. 4) who trained regional and national law enforcement personnel on crime analysis and relate issues. In 1990, the International Association of Crime Analysts was formed “to provide assistance to agencies starting crime analysis units and to make crime analysis training available” (p. 4). Another institution, the FBI Academy in Quantico, Virginia, began crime analyst training in 1993 and “provided free training to those involved in both crime and intelligence analysis” (p. 5).

*Definitions of crime analysis.* Several scholars (Boba, 2001, 2005; Bruce, 2004; Gottlieb et al., 1994; Osborne & Wernicke, 2003; Peterson, 1994, 1997; Ratcliffe, 2008; Vellani & Nahoun, 2001) have defined crime analysis more or less the same, but there are differences. Sometimes these “varying definitions complement each other…[and
sometimes] they contradict” (Bruce, 2004, p. 17). Maybe it is a “field in law enforcement without standard definitions” (Osborne & Wernicke, 2003, p. 1). Gottlieb et al. (1994) define crime analysis as a

set of systematic, analytical processes directed at providing timely and pertinent information relative to crime patterns and trend correlations to assist the operational and administrative personnel in planning the deployment of resources for the prevention and suppression of criminal activities, aiding the investigative process, and increasing apprehensions and the clearance of cases. (p. 13)

Vellani and Nahoun (2001), on the other hand, define crime analysis as “a detail-oriented discipline wherein the analyst endeavors to seek the truth of a given situation utilizing methods and the right information to confirm the truth so that an effective plan can be formulated” (p. 8). Boba (2005) defines crime analysis as “the systematic study of crime and disorder problems as well as other police-related issues—including sociodemographic, spatial, and temporal factors—to assist the police in criminal apprehension, crime and disorder reduction, crime prevention, and evaluation” (p. 6). Boba (2001) further notes that “crime analysis uses both qualitative and quantitative data and analytical techniques” (p. 9). Peterson (1997) defines crime analysis as “the derivation of meaning from data” (p. 2) and goes on to state that “law enforcement has always been driven by impromptu forms of analysis as police officers and their managers have gathered information and drawn conclusions about the nature of crime, its perpetrators and their motives” (p. 2). In another study, she defines criminal analysis as “the application of particular analytical methods to data collected for the purpose of criminal investigation or criminal research” (1994, p. 1). Osborne and Wernicke (2003)
define crime analysis as “the breaking up of acts committed in violation of laws into their parts to find out their nature and reporting statements of these findings” (p. 1). A 2002 study (though not a comprehensive one) on organized crime and crime analysis from experts and scholars of the Council of Europe defined crime analysis as “a law enforcement function whereby data relating to crime are collected, collated, analysed, and disseminated. Simply put, crime analysis is the study of crime patterns and trends in an attempt to solve crimes or prevent their repeat occurrence [italics original]” (Council of Europe, 2002, p. 6). The council’s study, however, did not use crime analysis and criminal-intelligence analysis distinctly or differently. At the same time, the council reported that it considered analysis to be “the ‘heart’ of the intelligence process as it applies to law enforcement” (p. 13). Similarly, others have argued that the analysis stage is “the heart of it [crime analysis process] all” (Osborne & Wernicke, 2003, p. 33). Gill (2000), however, considers crime analysis to be the “brain” of the whole process because analysis “is essentially an intellectual activity” (p. 211). The researcher in the current study believes that both heart and brain together describe crime analysis better.

**Categorization and types of crime analysis.** As with the definition of crime analysis, there is no single type or categorization of crime analysis (Baker, 2009; Boba, 2005; Bruce, 2004; Osborne & Wernicke, 2003; Peterson, 1994, 2005; Ratcliffe, 2008). For instance, Peterson (1994) frames crime analysis narrowly and uses it as one of the subspecialties of a broader concept that is “criminal analysis.” She lists 26 analytical techniques, one of which is crime analysis. To mention a few: intelligence analysis,
criminal investigative analysis, visual investigative analysis, strategic analysis, and crime analysis.

On the other hand, Boba (2005) uses crime analysis in a more comprehensive way, and conceptualizes crime analysis as an umbrella term that represents the general field. According to Boba’s groupings, there are five subspecialties under the term *crime analysis*: intelligence analysis, criminal investigative analysis, tactical analysis, strategic analysis, and administrative analysis.

Gottlieb et al. (1994) categorized analysis into four groups, one of which is crime analysis. Their categorization is as follows: crime analysis (i.e., tactical analysis, strategic analysis, and administrative analysis), intelligence analysis, operations analysis, and investigative analysis. The researchers state that “each type of analysis has its own techniques and is used to accomplish specific goals and objectives” (p. 12).

Bruce (2004) provides four subcategories of crime analysis: tactical analysis, strategic analysis, administrative analysis, and police operations analysis.

Osbourne and Wernicke (2003) present the types of crime analysis as follows: tactical analysis, strategic analysis, administrative analysis, investigative analysis, intelligence analysis, and operations analysis.

Baker (2009) argues that intelligence analysis and crime analysis are separate subdisciplines of intelligence-led policing and that they should “merge to generate successful outcomes” (p. 15). As with Peterson (1997), Baker (2009) considers the broad concept to be criminal analysis and presents crime analysis as of its subgroup. Baker’s categorization is as follows: intelligence analysis; criminal investigative analysis; crime
analysis; crime analysis subsets strategic analysis and tactical analysis; tactical analysis subsets target analysis, target profiles analysis, and statistical analysis; and crime analysis subsets administrative analysis and operations analysis.

Ratcliffe (2007, 2008), however, suggests a different concept that integrates the terms crime analysis and criminal intelligence, yielding the term crime intelligence analysis. He argues that both terms have unique and key roles individually that should be integrated for better analysis and results. He expresses the importance of the integration and explains: “By blending crime analysis with criminal intelligence, it is suggested that crime analysis can provide the what is happening [italics original] picture of the criminal environment, and criminal intelligence can provide the why it is happening” [italics original] (2007, p. 2). He adds that “these two components, used in combination, are essential to a more complete understanding of criminality necessary to formulate effective crime reduction and prevention strategies” (p. 2). In addition, Ratcliffe (2008) argues that not many departments these separate components and that a distinction is not made outside the United States between these concepts, which are interdependent. Bruce (2004) states that “though they [crime analysis and criminal intelligence] have always shared common ground, they [crime analysis and criminal intelligence] developed on separate tracks…[and] the difference between the crime analyst and criminal intelligence analyst…lies primarily within the missions of the agencies that employ them” (p. 16).

Ratcliffe (2008) sees the three traditional analysis levels under crime intelligence: tactical, operational, and strategic. He argues that the distinction among tactical, operational, and strategic applications of crime intelligence analysis is not clear-cut. They
“can be fairly abstract, can merge organizationally and are largely dependent on the size and mission of the agency....[and for instance,] what is a strategic issue for a municipal department is often an operational one for a federal agency with a national responsibility” (2008, p. 101).

Regarding administrative analysis, Ratcliffe (2008) states that it “appears to be used to address analysis of organizational characteristics instead of crime” (p. 100) and should not be considered an issue of crime. Rather, administrative analysis is related to policy analysis or management statistics. Therefore, he continues, “any analytical issues falling outside the domain of crime or problem analysis should not be conducted by police analysts” (p. 100).

In the current study, however, Boba’s (2005) categorization, that is, the broader term crime analysis is preferred over Peterson’s (1994) term criminal analysis and Ratcliffe’s (2008) term crime intelligence analysis (Ratcliffe, 2008). One reason is because the crime analysis profession existed and developed with these two words: crime and analysis. Secondly, neither of these two terms is different enough or better enough to be replaced with the term crime analysis, although the term’s proponents have their reasons for doing so. However, still all of these terms (i.e., crime analysis, crime intelligence analysis, and criminal analysis) will be used interchangeably in this research study.

Crime analysis process. After discussing the definition, framing, and types of crime analysis, it would be incomplete not to discuss the processes of crime analysis. In general, crime analysis has five process stages: (a) collection, (b) collation, (c) analysis,
(d) dissemination, and (e) feedback and evaluation (Boba, 2005; Bruce, 2004; Buck, 1973; Osborne & Wernicke, 2003; see also Gottlieb et al., 1994). These step-by-step stages are interconnected (Buck, 1973) and cyclical, rather than linear (Osborne & Wernicke, 2003).

Data collection, the first stage is “simply the gathering of raw data concerning reported crimes and known offenders” (Buck, 1973, p. 8). The second stage, crime data collation is “the process of transforming raw data on crime and known offenders into an organized format for subsequent comparison and analysis” (p. 8). However, crime data collation is more than simply storing materials. Collation, “includes sifting out useless or irrelevant or incorrect information, the arranging of collected materials so that relationships between crime data elements may be established, and creating a system for rapid retrieval of stored (file) information” (p. 8). The third stage, data analysis, is “the function of assembling and comparing the bits and pieces of information which have been collected and placing them in such a manner as to show pattern and meaning” (p. 8). Bruce (2004) describes seven ways to analyze data: filtration, categorization, aggregation, comparison, correlation, causality and explanation, and projection. As indicated previously, data analysis stage is considered to be the heart of all of the crime analysis processes (Osborne & Wernicke, 2003). For an appropriate analysis, however, the first two stages (i.e., collection and collation) should be completed and not skipped (Osborne & Wernicke, 2003). The fourth stage, dissemination, is where the analyzed

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5 Bruce proposes six steps for the crime analysis process. In his framing, “strategy development” (p. 23) comes before the evaluation and feedback stage. In that stage, the analyst’s job is to make sure that the analysis output is used in organizational decision-making and strategy development.
information is distributed to the relevant and appropriate people at the correct time. However, this analyzed information should be clear and understandable, because “if it does not provide information that is meaningful and useful” (Osborne & Wernicke, 2003, p. 37) it has no value. The fifth and final stage, feedback and evaluation, is the “phase which returns user group assessment on the worthiness and validity of the crime analysis unit’s products and activity” (Buck, 1973, p. 8). Osborne & Wernicke (2003) argue that this final stage is the most neglected one.

Interpreting the Criminal Environment

The main component in intelligence-led policing is analysis. As Peterson (1997) writes, analysis “can take several forms, dependent upon jurisdiction and departmental mission. Whatever form it takes, however, the core element of intelligence-led policing is invariably analysis” (p. 2). As Cope (2004) argues, “crime analysis incorporates the collection and review of information into manageable summaries...to facilitate its interpretations” (p. 191), and “analysts are information translators, whose role is to review information and provide reliable intelligence in a practical and operational format” (p. 188). O’Shea and Nicholls (2002) state that “since Peel’s time the technology and the information demands have changed; however, the essence of records management remains the same: collect, collate, analyze, and disseminate data to facilitate informed decision making” (p. 5).

According to Ratcliffe (2008), “analysis and the accurate interpretation of the criminal environment are essential to intelligence-led policing and crime control” (p.
115), and intelligence-led policing “cannot serve law enforcement without incorporating crime analysis, into the department’s organization, operations and planning requirements” (Baker, 2009, pp. 14-15). Interpreting the data is more than just counting the beans (O’Shea, 1998; O’Shea & Nicholls, 2002; Ratcliffe, 2008; Spelman, 1988). It requires a proper and valid analysis to turn the information into a useable format, called intelligence (Peterson, 2005). Bruce (2004) argues that when used properly, “crime analysis reduces crime, reduces victimization, reduces loss, reduces suffering” (p. 36). Similarly, Manning (2001), in a case study, found that “problem solving, when combined with crime analysis…could re-engineer policing” (p. 84). In other words, he contends that “the most powerful tools with capacity, if applied ‘on the ground,’ to prevent, reduce, and control crime and disorder is crime analysis” (p. 83, abstract).

Influencing the Decision-Makers

Ratcliffe (2008) argues that for the analysts, simply interpreting the criminal environment is not enough; influencing the decision-makers also is important. In his words, it is “equally important to influence [italics original] decision-makers” (p. 142). Furthermore, analysts should determine which decision-maker would have an impact on the criminal environment and offenders and try to influence that person rather than just inform him or her. In other words, the analyzed data should be disseminated effectively to the appropriate decision-makers.

In this study, one part of the 3-i model—the idea that crime analysis is associated with the organizational decision-making process—will be tested. Therefore, the main
focus of this study is an exploration of the perceived relationship between crime analysis efforts on organizational decision-making of command level managers, patrol officers, and detectives.

**Decision-Makers/Decision-Making**

Bellman and Zadeh (1970) contend that “much of the decision-making in the real world takes place in an environment in which the goals, the constraints and the consequences of possible actions are not known precisely” (p. B141). Decision-making in law enforcement agencies is much more critical and sensitive compared to many other professional institutions. Smith and Visher (1981) said that “unlike other decision-makers in the criminal justice system (e.g., prosecutors, judges), police officers make legal decisions in a context of low visibility” (p. 167). Those critical decisions are not made in “a vacuum” (White, 2007, p. 174) and may affect “the life and liberty of citizens” (Walker, 1992, p. 218). For instance, an “arrest not only threatens individual liberty but involves many other social and economic liabilities as well” (Smith & Visher, 1981, p. 167). Therefore, the police have “complex—and sometimes conflicting—roles and responsibilities” (White, 2007, p. 174).

Smith and Visher (1981) examined variations in police decisions on arrest practices from data collected in 1977. “Trained civilians riding on 900 patrol shifts,” the researchers wrote, “recorded information on 5,688 police-citizen encounters. These data represent 24 police departments in the metropolitan areas of St. Louis, Missouri; Rochester, New York; and Tampa-St. Petersburg, Florida” (pp. 169-170). They found
that police decisions on arrests are affected by situational factors, such as the suspect’s race and behavior and the presence of bystanders. Further, if the offense is serious, the chance of an arrest is highly likely. They found no gender differences in decisions to arrest or not arrest a suspect.

Novak, Frank, Smith, & Engel (2002) examined “the situational- and community-level factors that influence the decision-making processes of police officers during encounters with citizens” (p. 88). They found that “assignment as a community policing officer has no direct effect on officers’ decisions to arrest” (p. 88). Similarly, “community-level crime rates do not significantly affect arrest decision making in any of the models” (p. 88). However, community-oriented policing officers (compared to their counterparts) were more likely to arrest citizens when the officers encountered victims or witnesses.

Petrillo and DelBagno (2001) define decision-making as “a conscious process for selecting a course of action from two or more alternatives for the purpose of achieving a desired result” (pp. 93-94). They also argue that decision-making may vary depending on the simplicity and complexity of the decision and its effect to others. As Goldstein (1990) wrote, “Difficult and often unpredictable situations are inherent in policing. Many of the people with whom the police must deal are antisocial, frequently despicable, and sometimes violent” (p. 6).

Sometimes, there is a critical moment in decision-making that may result in both life and death. It does not matter whether the decision-maker is a high-level or a street-level official. In addition, a decision may have a wide range of impacts on and many
positive and negative unexpected consequences for criminals, citizens, and law enforcement agencies, and the police officers themselves.

Baker (2009) argues that intelligence-led policing “helps reduce the unknown or information gaps, provides feedback, and enhances effective decision-making” (p. 121). Decision-makers are “people and institutions that can have an impact on the criminal environment” (Ratcliffe, 2008, p. 141). Leaders and people in decision-making positions may affect proactive and preventive operations and applications of policing before and after the event in the criminal environment. Ratcliffe states that “there are a range of potential decision-makers from both within and outside the police service, including front-line police officers, senior law enforcement managers, actors from the private sector and industry, stakeholders from outside law enforcement, and…security networks” (pp. 142-143).

Manning and Hawkins (1989) discussed police decision-making by using four criteria: consequentiality, degree of generality, visibility, and complexity. Moreover, they state that there are three types of decision-making: “The first of these is ‘street’ decision-making, which is basically decision-making based on primary data. The second is ‘paper’ decision-making, which is carried out by investigators, internal affairs units and others who deal with secondary or once-processed data in the form of cases. Finally, there are policy or administrative decisions” (p. 150). The researchers go on to say that the research “on decision-making has been directed towards patrol officer decision-making on the ground and with decisions which resulted in an arrest…. Some work on detective decisions…is also available” (p. 153). However, “there are no studies to speak
of which concern tertiary decision-making by higher ranking officers in police…. Little is known about police budgeting or the allocation of enforcement resources. When the strategies of policing are considered, most research is focused on reactive, patrol-based policing” (pp. 153-154) rather than proactive policing.

**Impacting the Criminal Environment**

One of the goals in the 3-i model is targeting prolific and repeat offenders, as most crimes are committed by very few criminals (Martin & Sherman, 1989; Wolfgang, Figlio, & Sellin, 1972). Ratcliffe (2008) argues that to have an impact on crime under his model, “it is necessary to reduce, prevent or disrupt [italics original] criminal activity” (p. 165). Although these three concepts typically are used interchangeably, they have different meanings. Therefore, eliminating prolific and serious offenders from the population (by having them sentenced to prison) supposedly will reduce crime. In other words, the criminal environment is characterized by the presence of serious offenders. However, no data are available in the current study to track down serious offenders. Even though the National Incident-Based Reporting System (Rantala & Edwards, 2000) allows for the study of offender characteristics at an incidental level through its “offender segment,” it is not possible to match identical offenders with different incidents. Therefore, it is not possible to detect prolific (and/or recidivist) offenders. Moreover, the crime statistics in the FBI’s uniform crime reports (UCRs) measure crimes at one place and one time that prevents tone from measuring real crime rates for use in this dissertation as a dependent variable. Therefore, further studies should conduct a time-
series panel-data analysis by gathering additional information about when and where specific crimes took place in order to obtain more valid and more measurable results.

In that regard, a measure for the criminal environment is lacking in the current study, which is the other half of the 3-i model; however, the UCR crime statistics will still be used (as an independent variable) to control the decision-making process, as it is believed that using such data as an independent variable is much safer compared to using it as a dependent variable.

Decision-making might be affected by various factors. Walker (1992) contends that the most important factors that may influence the discretionary decisions of officers are situational factors, immediate work environment, official department policy, and individual officer characteristics. White (2007), with slight differences, categorizes the influential variables on police decision-making into three groups: environmental, organizational, and situational. He proposes some areas on which police departments can focus in order to improve the rationality of police decision-making.

The researcher in the current study believes that there are environmental and organizational factors that are associated with decision-makers and/or decision-making institutions. Along these lines, Ratcliffe (2008) argues that a decision maker’s institutional environment can affect his or her decision. He refers to such environments as the “institutional and cultural domains in which clients [decision-makers] move in their professional life” (p. 154). Nonpolice governmental agencies, politicians, private sector individuals, and the media are some of the domains he mentions. Some of these domains will be used differently and more concretely in this dissertation. In addition to
explanatory independent variables, organizational (internal) factors, such as unions, budget, hierarchy and size, (King, 1998; Langworthy, 1986; Maguire, 2003; Zhao, 1996), also will be controlled. There will be only one environmental (external) control variable, which is crime.

Summary

In this chapter, a new policing model, intelligence-led policing was introduced. The model is considered to be a managerial philosophy and a business model. Then Ratcliffe’s (2008) 3-i model of intelligence-led policing was presented with detailed information about its components and processes. In this model, analysts interpret the data from the criminal environment and use that output to influence decision-makers in terms of helping them make decisions about impacting the criminal environment. The model’s analysis component generally has five stages: collection, collation, analysis, dissemination, and feedback and evaluation. Various definitions and conceptualizations also were discussed.
CHAPTER 4

METHODOLOGY

This chapter describes the data and measures selected for study. First, a description of the data and data-merging process is provided. Next, the variables are how they were operationalized is discussed. The limitations of the data and the variables along with possible solutions to these limitations are presented.

Unit of Analysis

The unit of analysis in this study is organizational level, with 544 cases (police departments) in a comprehensive, merged data-set. All of the law enforcement agencies in this study are large municipal departments with 100 or more sworn officers nationwide. The smallest department has 100 sworn officers, while the largest department has 13,271 sworn officers. The range of sizes is a strength for the study because the large departments serve larger populations than the small departments (King, 1998; Maguire, 1997; O’Shea & Nicholls, 2002). As O’Shea & Nicholls (2002) have written, “Only about 5% of all law enforcement agencies (state, county, municipal, and special purpose) have more than 100 sworn personnel; yet nearly 50% of all American law enforcement officers are employed by those departments” (p. 9); therefore, “more than 95% of all American law enforcement agencies can be considered small” (p. 9). Similar results were reported by Hickman & Reaves (2003).
Data Sets
The data that will be used in this study was constructed by combining several comprehensive, secondary data-sets. The decision to use secondary\(^6\) data sets was made for the following reason: to create a richer, replicable, and cheaper data set (Frankfort-Nachmias & Nachmias, 2000) for exploring the research questions of the current study. The following data sets were used:

1. O’Shea and Nicholls’ Crime Analysis Survey (CAS\(^7\)) from 2000
4. Federal Bureau of Investigation Uniform Crime Reports (UCRs) for 1999

Except the first data set, all of the data sets were derived or downloaded from the Interuniversity Consortium for Political and Social Research. The first data set was requested directly from O’Shea, the principal investigator, because it was not available on the Interuniversity Consortium Web site or any other Web site. The data were received via e-mail in SPSS format. SPSS is a statistical-analysis software program. The data-

\(^6\) Frankfort-Nachmias and Nachmias (2000) argue that there are both weaknesses and strengths in using secondary-data analysis. Further, they provide more pros of secondary-data analysis than cons. They say that there are three main factors that “are encouraging the increasing use of secondary data: conceptual-substance reasons, methodological reasons, and cost” (p. 277). On the other hand, they write, “Perhaps the most serious problem in using secondary data is that the data often only approximate the kinds of data that the investigator would like to employ for testing hypotheses” (p. 279).

\(^7\) The name and abbreviation for the Crime Analysis Survey was determined and used by the author of this dissertation, based on the permission and approval granted by the survey’s principal author, T. C. O’Shea, via e-mail and phone on March 3, 2009.
merging process was replicated three times in order to decrease potential mistakes and therefore increase the consistency of the merged data. More detailed information concerning these data sets and the merging process is provided later in this chapter.

*Crime Analysis Survey*

The Crime Analysis Survey (CAS) data “are derived from a national survey of law enforcement agencies” (O’Shea & Nicholls, 2002, p. 9), where the questionnaires were mailed to “all municipal police, sheriff’s offices, and state law enforcement agencies with 100 or more sworn personnel” (p. 9). One questionnaire is sent to each agency. A letter accompanying the questionnaire states that the questionnaire should be directed to the person⁸ who is knowledgeable about crime analysis applications and issues. The data set is the result of a study conducted by O’Shea and Nicholls at the Center for Public Policy at the University of South Alabama and sponsored by the Office of Community Oriented Policing Services. The response rate was 63% with 544 agencies (359 municipal, 159 sheriff, and 31 state) out of 859 agencies responding. As O’Shea & Nicholls (2002) wrote in their report:

The questionnaire consisted of 95 items. Items were coded in two ways: First, we coded simple presence or absence of some feature of crime analysis (e.g., do you have a CAD [computer-aided dispatch] system? yes/no). Second, items were coded for scaled responses (e.g., How would you rate crime analysis training? None offered, poor, only fair, good, excellent). In all, there were six categories of questions. (p. 11)

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⁸ The researcher of this dissertation asked to the principal investigator (Dr. O’Shea) on the phone whether the people who filled out the questionnaire were relevant ones as asked by the investigators, and he replied that they were, based on the respondent’s title and/or unit information in the questionnaire.
The authors state that their study suffers both from self-reporting bias and the measurement of conditions at just one point in time that does not allow one to observe change, over time, if any. This data set is the main source for the dependent variables and the main independent variables used in the current study.

*Law Enforcement Management and Administration Statistics*

The 2000 Law Enforcement Management and Administration Statistics (LEMAS) data set was added to the CAS data set in order to obtain several variables about the characteristics and structure of law enforcement agencies and law enforcement personnel. As Maguire & King (2004) report, “The major source of organization-level data on American police agencies is the Law Enforcement Management and Administrative Statistics (LEMAS) data series collected by the Bureau of Justice Statistics since 1987” (pp. 35-36). The data series “enable[s] researchers and police executives to better understand police agencies” (Maguire & Uchida, 2000, p. 507). The LEMAS survey “collects data from a nationally representative sample of publicly funded State and local law enforcement agencies in the United States” (Hickman & Reaves, 2003, p. 28), which provides information “in terms of their personnel, expenditures and pay, operations, community policing initiatives, equipment, computers and information systems, and written policies” (p. 1). This survey is repeated every three years, in general. Hickman and Reaves report that the “2000 LEMAS survey questionnaire was mailed to 3,132 State and local law enforcement agencies, including all 881 agencies with 100 or more sworn officers” (p. 1) with the response rate of 97.4%, and, “among local police departments, 1,975 of 2,019 surveys were returned for a 97.8% response rate” (p. 1).
Uniform Crime Reports

Uniform Crime Reports (UCRs) are collected by the FBI on two types of crime (White, 2007). The most serious crimes are called Part I offences,\(^9\) or index crimes; other less serious crimes are called Part II offences.\(^{10}\) UCR statistics have been reported voluntarily and monthly since the 1930s (Lindgren & Zawitz, 2001). Part I crimes are reported based on what is known as the hierarchy rule, meaning that only the most serious crime in an incident is reported. The most serious offenses of Part I crimes are reported regardless of whether or not an arrest was made, whereas Part II crimes are reported only when an arrest is made. Because the crime reports are available in a monthly format from the Interuniversity Consortium for Political and Social Research, the monthly crime rates are added together to obtain total annual crime rates.

Several scholars have criticized the FBI’s UCR data (Donohue, 1998; Lejins, 1966; Robison, 1966). For instance, Donohue (1998) states that because of “the poor quality of the [UCR] data…it is very hard to provide a comprehensive and accurate assessment” (p. 1425). Robison (1966) presents her criticisms on the meaning and source of the statistics in the reports and the validity of inferences made from the reports. She argues that in order to be better, the “FBI must resolve a three-horned dilemma by satisfying in one document the needs of the police, the demands of the general public, and the concern of scholars seeking to understand social deviance” (p. 1048).

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\(^9\) Part I offenses are murder, rape, robbery, aggravated assault, burglary, larceny, motor-vehicle theft, and arson.

\(^{10}\) Part II offences are other crimes, such as the sale of illegal drugs, fraud, prostitution, gambling, and disorderly conduct.
However, despite these criticisms, UCR data seem to be the best and most appropriate crime-data source for some research. Lejins (1966) argues that it is not easy to produce crime statistics on a national level in large measure because of the structure of the law enforcement organizations in the United States where “the statutes governing law enforcement, the operational procedures, and hence the concepts, definitions, and categories are not uniform and frequently are not even comparable” (p. 1012). Therefore, as Lejins further states, the development of these reports and the contributors to the reports should be appreciated, rather than criticized. He also mentions several limitations of and weaknesses in the data. For example, Lejins argues that for various reasons, not all crimes are reported. Moreover, the UCR data do not cover crimes that are recorded in other criminal justice institutions, other than police departments, because some offences may not be reported to the police. Overall, though, UCR reports are a good source of crime statistics about police departments and their districts.

*Law Enforcement Agency Identifiers Crosswalk*

The Law Enforcement Agency Identifiers Crosswalk data set is “designed to provide geographic and other identification information for each record included in either the Federal Bureau of Investigation’s Uniform Crime Reporting (UCR) Program files or in the Bureau of Justice Statistics’ Census of State and Local Law Enforcement Agencies (CSLLEA)” (Crosswalk, 2004, p. 2). The main variables ¹¹ “allow a researcher to take agency-level data, combine it with Bureau of the Census and BJS [Bureau of Justice

¹¹ These variables are “the alpha state code, county name, place name, government agency name, police agency name, government identification number, Federal Information Processing Standards (FIPS) state, county, and place codes, and ORI code” (Crosswalk, 2004, p.2).
Statistics] data, and perform place-level and government-level analyses” (p. 2). In the current study, several Crosswalk variables are used as complementary variable, which is especially helpful during the data-merging process.

Data-Merging Process

The data sets were merged by using common key identifiers, such as the Originating Reporting Agency Identifiers (ORIs) that police agencies use to report crime statistics to the FBI’s UCR program. Each reporting agency has its own unique identification number, which typically is referred to as an ORI number. As Lindgren and Lawitz (2001) have written,

By design, the ORI codes are the first seven digits of the FBI's National Crime Information Center (NCIC) number…[that] begin with a two-letter State designation…. The remaining five digits of the ORI code are generally numeric. Depending on the State, the first two or three digits identify the county within the State and the remaining digits identify the reporting agency within the county. (pp. 2-3)

By using these ORI codes, one can either merge some new variables to the main data set, or combine cases with it. In this study, the former function was performed.

While merging the data sets, the author of the current study first sorted the main data (CAS) and the LEMAS data set according to the names of the agencies (i.e., cases) and then compared them in order to determine whether all the agencies in CAS also are available in LEMAS. Matching was done one agency at a time. The agency was matched first, then the city, state, and county and, if necessary, the size of the population the agency served. Matching for population size is important because it is highly possible that more than one agency has the same name, for example, the LEMAS data set
contained more than one Peabody Police Department, which might lead to some mistakes while merging the data sets. After matching cases were determined, the remainder of the cases in the LEMAS data set were deleted. Although eight cases (i.e., agencies)\(^{12}\) in the CAS data set were not in the LEMAS data set, they were retained in the main data set (CAS) as the dependent variables. Another reason for retaining these eight cases is because the CAS data set contains the dependent variables. Before merging CAS with LEMAS, the author of the current study needed the ORI code for each agency. Then a variable named ORI was created in the main CAS data set to copy all the ORI codes from the other data sources (e.g., Crosswalk). The LEMAS data set does not have ORI codes. ORI codes were placed in LEMAS data set after the researcher merged it with Law Enforcement Agency Identifiers Crosswalk data set. In merging LEMAS with Crosswalk data set, the researcher used the 16-digit agency identification (agency ID) numbers that were available in both data sets and were unique to each law enforcement agency throughout the country. Then the ORI codes were transferred to the LEMAS data set. However, some cases (i.e., agencies) did not have an ORI code in any of the data sets. At that point, the researcher created fake ORI codes and pasted them into the relevant data sets. Finally, the researcher merged the new data set (CAS-LEMAS-Crosswalk) with UCR using the same ORI codes. In every stage of the data-merging process, the unmatched cases were deleted.

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\(^{12}\) These cases (agencies) are Allengan County Sheriff Department, Costa Mesa Police Department, Fort Smith Police Department, Hartford County Sheriff’s Department, Kissimmee Police Department, Maricopa Police Department, Revere Police Department, and Rockingham County Sheriff’s Office.
It should be noted that the ORI codes in the data sets used may not always be written or spelled 100 percent correctly. Sometimes, there might be slight differences or mistakes that could prevent the merging process or that might lead to mismatches, even if the rest of the data matched correctly. For example, the letter O may have been written instead of number 0, or vice versa, which can be quite difficult to notice.

Variables

*Dependent Variables: Decision-Makers/Decision-Making*

With the three decision-making variables (i.e., command-level manager, detective, and patrol officer), one can get an idea of which decision-makers are perceived to use a given type of crime analysis in their organizational decision-making. In Ratcliffe’s (2008) 3-i model, decision-makers are not clearly specified and can be any person or any institution. In this study, however, three decision-making levels are used as indicators of the dependent variables: command-level manager, patrol officer, and detective. It is critical to note that in most cases, a single individual reported on the level of crime analysis usage by each of the three user levels. For example, the manager of a crime analysis unit (the most likely organizational respondent) reported on how well crime analysis products were used by command-level managers, patrol officers, and detectives. While it would have been preferable to have each of these users report on their own perspectives, the crime analysis unit manager is thought to be the most knowledgeable single reporter.
One of the reasons for choosing these three positions is that the crime analysis unit provides the results of using crime data to support different levels of law enforcement personnel, particularly these three distinct levels. By “providing the police officer, detective or administrator with crucial information helps them make better decisions” (Baker, 2009, p. 6). Put differently, the collected, collated, and analyzed data are disseminated “primarily to patrol officers, investigators, and command staff” (Osborne & Wernicke, 2003, p. 36). Therefore, it is assumed that checking the association at the highest level (command-level manager), the lowest level (patrol officer) and a different functioning level (detective) would provide an opportunity to see difference in perspective when exploring the research questions. In addition, these three levels (i.e., command-level manager, patrol officer and detective) are vital information sources for the law enforcement agency’s crime analysis unit (Buck, 1973). At the same time, these three groups of officials interact heavily with the crime analysis unit. The extent of that interaction depends on their position within the organization.

In the CAS data set, the researchers asked to what degree the results of crime analysis efforts were thought to be utilized by command-level managers, detectives, and patrol officers. The measurement level of those variables is ordinal as the answering scale is categorized as “not utilized”, “utilized some”, and “highly utilized”. Contrary to the O’Shea and Nicholls’ study (2002, 2003), where they used this group of variables as independent variables, these variables will be used as dependent variables in the current study to represent decision-making. In their discussion of study findings, O’Shea and

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13 Command-level managers are chiefs and deputy chiefs, the ones who are able to make policies (telephone consultation with T. C. O’Shea on February 27, 2009).
Nicholls stated that “We caution the reader that the opposite may also be true; that is, the higher the levels of crime analysis, the greater the appreciation. Our analysis cannot say which way these are related” (2002, p. 35, footnote). The author of the current study believes that the way the current study is structured is more appropriate and sensible in terms of the causal, or perceptual, relationship of the three hypothetical models presented later in this chapter, than was the case with the O’Shea and Nicholls study. It is clear from their question (i.e., the degree to which the results of crime analysis efforts were thought to be used by the three personnel levels) that it was assumed that the police agency had a crime analysis function. Therefore, the crime analysis function comes first as an independent variable. This condition regarding the independent variable eases this study, as rules out an endogeneity problem because “the values our explanatory variables take on are sometimes a consequence, rather than a cause, of our dependent variable” (King, Keohane, & Verba, 1994, p. 185). The researchers go on to say that “the direction of causality is always a difficult issue. In nonexperimental research—qualitative or qualitative—explanatory and dependent variables vary because of factors out of the control (and often out of sight) of the researcher” (p. 186). However, once again, it is important to note that the current study does not look for causality. It looks only for the association between variables due to the nature of the data.
Independent Variables: Main (Explanatory)

There are two groups of independent variables in this study: main (explanatory) and control (organizational/internal). The main independent variables are the crime analysis types (i.e., statistical analysis, crime analysis, intelligence analysis, survey analysis, patrol strategy analysis, and displacement/diffusion analysis), which are used as latent variables. Control variables are organizational (internal) and environmental (external). The two types of control variables are discussed in the following two sections. In contrast to O’Shea and Nicholls (2002, 2003), the crime analysis types in the current study were used as independent variables rather than dependent variables. Another difference is that the authors created these crime analysis dimensions by making index variables; the author of the current study created them as latent variables by performing factor analysis.

The operationalization of crime analysis is based partially on O’Shea and Nicholls’ (2003) study. In their study, O’Shea and Nicholls conceptualized crime analysis with three main titles, which they referred to as the “dimensions of crime analysis” (p. 238). These three dimensions are as follows: crime analysis functions, statistical methods, and data utilization. However, only the first two groups of variables were used as main independent variables in this study. There were 22 types of crime analysis activities in O’Shea and Nicholls’ (2003) survey, in which they ask respondents to indicate how frequently they undertook each type of crime analysis. The answers were coded as never, some, often, and very often. The types of crime analysis specified are the following: target profile, victim, link, temporal, spatial, financial, flowcharting, program
evaluation, case management, crime scene profiling, crime forecasting, crime trends, citizen surveys, victim surveys, employee surveys, environmental surveys, intelligence, productivity, civil litigation, patrol strategy, workload distribution, and displacement/diffusion analyses. In the second dimension (i.e., statistical methods), for each statistical method, respondents were asked to indicate how frequently they use the corresponding method. These methods are the use of the following: frequencies, mean-median-mode, standard deviation, cross tabulations, correlation, regression, and cluster analysis. The answers were coded as “never,” “some,” “often,” and “very often.” Using these two groups of variables, an exploratory factor analysis was performed.14

As Kim & Mueller (1978) wrote, “Factor analysis refers to a variety of statistical techniques whose common objective is to represent a set of variables in terms of a smaller number of hypothetical variables” (p. 9). Factor analysis can be of two types: exploratory and confirmatory (Kim & Mueller, 1978; Loehlin, 2004; Tabachnick & Fidell, 1996). In exploratory factor analysis, the analytical technique is “an expedient way of ascertaining the minimum number of hypothetical factors that can account for the observed covariation, and as a means of exploring the data for possible data reduction” (Kim & Mueller, 1978, p. 9). In confirmatory factor analysis, the analytical technique “can be used as a means of testing specific hypotheses” (p. 9). The assumptions do not apply when factor analysis is done for purpose of exploration, whereas the assumptions apply strictly when the analysis is done for confirmatory purposes (Stevens, 1992; Tabachnick & Fidell, 1996).

14 SPSS version 16.0 software was used.
Table 1 shows the factor analysis results of the main independent variables. Based on the results, six factor coefficients were created. Factor component scores less than 0.50 were not taken into account. These six factor components are as follows: statistical analysis, crime analysis, intelligence analysis, survey analysis, patrol strategy analysis, and displacement/diffusion analysis. The rationale for using factor analysis is the possibility of a latent variable, which is not directly observable but can be assessed using indicators such as the frequency of employing specified crime analysis methods.

When factor analysis was used (see Table 1), variables were clustered as follows: five under the statistical factor correlated highly with the latent variable and had values ranging from 0.700 to 0.829; seven under the crime analysis factor correlated with the latent variable and had values ranging from 0.524 to 0.683; five under the intelligence analysis factor had component scores ranging from 0.556 to 0.756; four under the survey analysis factor had factor scores ranging from 0.587 and 0.818; three under the patrol strategy analysis component ranging from 0.663 to 0.744; and one correlated with the latent variable displacement/diffusion analysis and had a score of 0.523.
Table 1

*Exploratory Factor Analysis*

<table>
<thead>
<tr>
<th>Crime Analysis Type</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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<tbody>
<tr>
<td>Standard deviation</td>
<td>0.829</td>
<td></td>
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<tr>
<td>Mean, median, mode</td>
<td>0.735</td>
<td></td>
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<tr>
<td>Regression</td>
<td>0.734</td>
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<tr>
<td>Cross tabulations</td>
<td>0.702</td>
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<tr>
<td>Correlation</td>
<td>0.700</td>
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<tr>
<td>Target profile analysis</td>
<td>0.683</td>
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<tr>
<td>Crime trends</td>
<td>0.675</td>
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<tr>
<td>Victim analysis</td>
<td>0.619</td>
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<tr>
<td>Crime forecasting</td>
<td>0.586</td>
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<tr>
<td>Frequencies</td>
<td>0.554</td>
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<tr>
<td>Spatial analysis</td>
<td>0.534</td>
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<tr>
<td>Temporal analysis</td>
<td>0.524</td>
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<tr>
<td>Financial analysis</td>
<td>0.756</td>
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<tr>
<td>Flowcharting</td>
<td>0.684</td>
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<tr>
<td>Program evaluation</td>
<td>0.569</td>
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<td>Link analysis</td>
<td>0.564</td>
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<td>Intelligence analysis</td>
<td>0.556</td>
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<tr>
<td>Citizen surveys</td>
<td>0.818</td>
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<tr>
<td>Victim surveys</td>
<td>0.799</td>
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<tr>
<td>Employee surveys</td>
<td>0.703</td>
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<tr>
<td>Environmental surveys</td>
<td>0.587</td>
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<tr>
<td>Productivity analysis</td>
<td>0.744</td>
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<tr>
<td>Workload distribution</td>
<td>0.731</td>
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<tr>
<td>Patrol strategy analysis</td>
<td>0.663</td>
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<tr>
<td>Displacement/diffusion analysis</td>
<td>0.523</td>
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</tbody>
</table>

*Note.* The scores from 1 to 6 represent the number of principal components and latent variables. The values in these (component) columns indicate the level of correlation depending on the exploratory factor analysis.
In the following section, the control variables are discussed. Crime analysis unit, agency size, unions, organizational hierarchy, and total operating budget are the organizational (internal) independent variables; crime rate is the environmental (external) independent control variable.

**Independent Variables: Control (Organizational/Internal)**

*Crime analysis unit.* Whether an agency has a crime analysis unit is important (Boba, 2005; Buck, 1973; Gottlieb et al., 1994; Osborne & Wernicke, 2003; Reinier et al., 1977). This variable was derived from the LEMAS data set. The LEMAS questionnaire asked the respondents whether their agency had a separate crime analysis special unit (one with one or more full-time employees assigned to it) in the organization. The answering scale was 1 = agency has special unit with full-time personnel, 2 = agency has designated personnel only, 3 = agency has policies/procedures only, and 4 = problem/task not officially addressed. This variable was recoded for the current study in order to create a dummy variable. When the agency had a special crime analysis unit, the response was recoded as 1; the other response options were recoded as 0. Overall, 64.60% of the agencies had a special unit.

It was assumed and expected that when law enforcement agencies have a special crime analysis unit, the crime analysis unit’s output will be highly associated with the organizational decision-making process, particularly among command-level managers, detectives, and patrol officers. Put differently, when a department structurally and

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15 The LEMAS codebook and questionnaire for the year 2000 is used to complement unclear parts in the measurement scale.
institutionally had a special crime analysis unit, it was expected that more crimes and related events were analyzed to help personnel make better decisions in terms of preventing and fighting crime and criminals.

However, the unit’s position\textsuperscript{16} in the department’s organizational chart is important also because it may affect the unit’s efficiency and effectiveness. Some scholars (Bruce, 2004; Buck, 1973; Gottlieb et al., 1994; Osborne & Wernicke, 2003) argue that the crime analysis unit should be close to investigative and patrol personnel, but not too close to higher-level personnel or the administrative office. To protect interaction between the crime analysis unit and patrol and investigative officers, the unit “should be physically located where it is easily accessible to patrol and investigative officers” (Gottlieb et al., 1994, p. 84). This way, the unit can obtain information from officers on the street and in the field who are one of the main sources for the unit in terms of crime data (Buck, 1973; Ratcliffe, 2008). Buck argues that because there is a “wide diversity in which crime analysis [units] were located within various agencies’ organizational structures” (1973, p. 9) the interaction may differ. Further, because each possible crime analysis unit placement might have its own pros and cons, “there may not be an absolute ‘right’ way the unit must be organizationally placed…the crime analysis unit should be where ‘it will work best’” [italics original] (Buck, 1973, p. 9). Knight (1997), on the other hand, contends that a crime analysis “unit’s success depends on how

\textsuperscript{16} It is believed by the author of this dissertation that whether the structure of a law enforcement agency is centralized or decentralized matters in terms of the organizational decision-making process. Even though one variable existed in the current study to test this factor, it had a high number of missing values (208 out of a possible 544 cases, or 38.2%); therefore, the variable was not used. O’Shea and Nicholls (2002, 2003) asked about where on the organizational chart the crime analysis unit was located. The answers were Administration (44%), Patrol (8%), Investigation (27.4%), and Other (20.5%).
much the agency can rely on it; on the relationship established between the analysts and officers, investigators, and administrators; and on the quality of the output product” (p. 37). Ratcliffe (2008) argues that because influencing the decision-makers is important, the crime analysis unit should be close to those decision-makers. Moreover, having the unit closer to such people may maximize the unit’s influence as well.

*Agency size.* This variable is generated using the number of sworn officers in the agency and the size of the population they serve. The variable of sworn officers is derived from the CAS data set for number of sworn officer and from the LEMAS data set for population.\(^\text{17}\) The more sworn officers an agency has, the larger it is and the larger the population it serves; therefore, such agencies have a greater need to use crime analysis to support decisions about dealing with crime. Several scholars (King, 1999; Langworthy, 1986; Maguire, 1997, 2003) also used the size variable in their studies on law enforcement organizations.

As mentioned in the Unit of Analysis section of this chapter, the number of sworn officers in the CAS data set ranged between 100 and 13,271. In order to measure the size’s equal effect, the rate of the size of each case was used. The number of sworn officers was multiplied by 1,000 and divided by the size of the population each agency serves. It was assumed that more decisions are perceived to be made by using crime analysis output in larger agencies than in smaller agencies. It also was expected that in larger agencies, patrol officers are less likely to use crime analysis efforts in the organizational decision-making process.

\(^{17}\) The CAS data set contained a population variable, but it was for 1996.
Unions. A police union “is an organization of police officers which is their official representative in collective bargaining” (italics original) with the employer…. [and] collective bargaining is a formal process of negotiations (italics original) leading to a contract (italics original) or memorandum of agreement” (Walker, 1992, p. 370; see also Walker & Katz, 2005). Further, because of its fragmented nature, there is no national union that represents all officers in the United States (p. 370).

Kelling and Wycoff (2001) have noted that police unions that “had been dormant or non-existent since the famous Boston police strike of 1919, emerged as a major force in policing during the 1960s” (p. 1). Walker (1992) also notes that “police unions have had an extremely important impact on American policing” (p. 378), particularly on salaries and benefits, management, officer morale, police-community relations, and police professionalism. From a different point of view, Guyot (1991) found that police unions and civil service regulations are obstacles to change and innovation. However, contrary to previous literature, Kadlec (2001) found that “[her] research does not support the notion that unions are a significant barrier in terms of overt conflict” (p. 153). Put differently, she found in her study that police unions are not an obstacle to organizational innovations and implementations or community-oriented policing, as was perceived previously (Goldstein, 1979; Mastrofski, 1990; Sadd & Grinc, 1996; Walker, 1999; Zhao & Truman, 1997).

The unions variable was derived from the LEMAS data set, where respondents were asked whether their agency had collective bargaining for sworn employees. In 2000,
“nationwide, 40% of all local police departments, employing 72% of all officers, authorized collective bargaining for sworn personnel” (Hickman & Reaves, 2003, p. 9).

In the current study, it was expected that police unions would be perceived to be associated with the decision-making process as well as with new applications such as crime analysis and intelligence-led policing within the organization.

Organizational hierarchy. According to White (2007), “a hierarchical organization is characterized by several layers of command, with the amount of authority increasing at the upper levels of the department. This is often referred to as the chain of command, or order of authority” (p. 129). This variable was operationalized the same way that Langworthy (1986) did first and as several others (King, 1998; Maguire, 1997; 2003; Zhao, 1996) did in later studies. Langworthy (1986) used “height,” one of the three dimensions (along with concentration and layers) he identifies as comprising “hierarchical differentiation” (p. 40). For his study, Langworthy subtracted the lowest-paid officer’s salary from the highest-paid officer’s salary and divided the difference by the lowest salary in the police agency. He used the organizational hierarchy variable as one of the three components, or measures, of hierarchy (i.e., height, concentration, and layers). However, in this study, only the first dimension (i.e., height) is measured given the insufficiency of the data for the other two measures (i.e., concentration and layers). A supplementary data would be required in order to use all three of Langworthy’s hierarchy

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18 Langworthy (1986) notes that “layers of the hierarchy are simply a count of the ranks...[and that] concentration is measured by considering the size of the lower strata: first, as the proportion of employees that are civilians or who rank less than sergeant; and second, as the proportion of officers who rank less than sergeant” (p. 40).
components. Therefore, the inability to measure concentration and layers can be considered to be a limitation, or weakness, of the height variable.

The 3-i model might work better with agencies that have more hierarchical structures in terms of information flow and better control of operations in the criminal environment, as is the case with the compstat model. Therefore, it is expected that the hierarchy of the agency is perceived to be associated with all of the decision-making dependent variables in the current study.

*Total operating budget.* This variable was extracted from the LEMAS data set. It is the total operation budget of the agency over a 12-month period. The LEMAS questionnaire states: “Enter your agency’s total operating budget for the 12-month period that includes June 30, 2000. *If data are not available, provide an estimate and mark with an asterisk (*). Include jails administered by your agency. Exclude building construction costs and major equipment purchase*” [italics original] (LEMAS, 2000, CJ-Form, p. 2). An agency’s budget was considered to be an important factor in its ability to buy crime-mapping hardware and software in some law enforcement agencies (Mamalian & LaVigne, 1999; Walsh, 2001). For instance, Mamalian and LaVigne (1999) note that “significant costs exist in setting up a crime mapping system, including those related to accessing and cleaning data, importing data into the GIS [geographic information system], and maintaining the GIS, as well as related training and implementation issues” (p. 3). The authors add that the funding for such applications come from an agency’s annual budget rather than from federal or state sources. Therefore, it is assumed that the larger the agency’s budget, the better the crime analysis unit. More important, it is
assumed that an agency’s budget is perceived to be an important factor in decision-making, because the resources and means a department has are related to its budget. As Baker (2009) wrote, “Most police agencies in the United States do not have financial and human resources to assemble or reorganize intelligence and crime analysis functions” (p. 115). Finally, if intelligence-led policing is a cost-effective or efficient model (Ratcliffe, 2002), then controlling the agency’s budget is vital.

**Independent Variable: Control (Environmental/External)**

The independent control variable is crime. It is an environmental and external variable, the data for which comes from UCR data set. Offenses reported to the UCR program are murder, manslaughter, rape, robbery, burglary, larceny, aggravated assault, and vehicle theft. Because the real effect of crime cannot be seen independently from the area where it occurs, UCR annual crime rates are generated by multiplying the total number of all offences by 1,000 and dividing that by the population of the city or town where the offenses occurred. In other words, the same number of crimes in two different cities may have a different impact depending on the city’s population. Therefore, the rates of total number of crimes rather than just total number of crimes were used.

In addition, crime rates rather than crime *clearance* rates are used because the total crime rates are believed to be more reliable and valid than total clearance rates. For instance:

Some departments and officers conscientiously report offenses as cleared only when they have taken into custody a person against whom they have sufficient evidence to bring charges [, however,] such arrested persons may, and often do, admit that they have committed offenses other than that for which they were arrested; the police are entitled to count these as having been cleared…. Clearance
rates may vary substantially among departments for reasons having nothing to do with the objective probability of getting caught. (Wilson & Boland, 1978, p. 368)

Finally, the crime rates for 1999 rather than 2000 were used because of the time-sequence of relationship while controlling for the dependent variable. It was assumed that when crime levels increase, more decisions are perceived to be made based on crime analysis efforts.

Models and Hypotheses

There are three models in the current study. Each explores the relationship between crime analysis and the decision-making variables.

Model Equation

The following equation demonstrates the hypothesized relationships and the directions of the variables in general:

\[ Y_{\text{decision-making}} = \beta_1 X^*_{\text{statistical}} + \beta_2 X^*_{\text{crime analysis}} + \beta_3 X^*_{\text{intelligence}} + \beta_4 X^*_{\text{survey}} + \beta_5 X^*_{\text{patrol strategy}} + \beta_6 X^*_{\text{displacement}} + \beta_7 X_{\text{ca unit}} + \beta_8 X_{\text{size}} + \beta_9 X_{\text{unions}} + \beta_10 X_{\text{hierarchy}} + \beta_{11} X_{\text{budget}} + \beta_{12} X_{\text{crime}} + \varepsilon \]

*latent variables

Hypotheses

Based on the 3-i model and the various studies and discussions in the literature review, three main hypotheses were deducted and tested:

Hypothesis 1. The more crime analysis (functions) that law enforcement agencies
have, the more their command level managers are perceived to use those efforts in organizational decision-making.

*Hypothesis 2.* The more crime analysis (functions) that law enforcement agencies have, the more their patrol officers are perceived to use those efforts in organizational decision-making.

*Hypothesis 3.* The more crime analysis (functions) that law enforcement agencies have, the more their detectives are perceived to use those efforts in organizational decision-making.

**Summary**

In this chapter, the data and measures selected for the current study were discussed. A description of the data sets used and the data-merging process were provided in detail. Then, the variables were presented and their operationalization explained. Mainly there are three groups of variables: (a) dependent variables that represent organizational decision-making at three levels, (b) main independent variables that represent different types of analyses, and (c) control independent variables that are grouped as organizational (internal) and environmental (external). Finally, the model equation and hypotheses were introduced.
CHAPTER 5

STATISTICAL ANALYSIS AND FINDINGS

In the first section of this chapter, the statistical-analysis tools and research models that were applied for this study are discussed. In the second section, the findings of the analyses—based on the descriptive, bivariate, and multivariate statistical results—are presented.

Statistical-Analysis Tools

All of the processes regarding data merging and data analysis were done using two statistical software packages: Stata version SE10 and SPSS version 16.0. Because the dependent variables (i.e., command-level manager, patrol officer, and detective) have an ordinal/categorical level of measurement, it cannot be measured simply as an ordinary least squares (OLS) model (Agresti, 2002; Aldrich & Nelson, 1984; Long, 1997; Long & Freese, 2006; McCullagh & Nelder, 1989; Powers & Xie, 1999). If measured, the results of the ordinal outcome variable might be misleading (McKelvery & Zavoina, 1975; Winship & Mare, 1984). Therefore, models “specifically designed for ordinal variables” (Long, 1997, p. 115) should be used. OLS models cannot measure such equations with ordinal-level dependent variables as they violate some of the assumptions (e.g., linearity).

When dealing with such models that have ordinal or categorical dependent variables, there is not one way to measure them. Because they are nonlinear, “no single
approach to interpretation can fully describe the relationship between a variable and the outcome probability” (Long, 1997, p. 61). Therefore, “an elegant and concise way to summarize the results that does justice to the complexities of the nonlinear model” (p. 61), such as ordered logistic regression (OLR). The OLR model (unlike the OLS model, which is measured by the smallest sum of squared errors in the model) is “estimated by a method called Maximum Likelihood Estimation (MLE)” (Aldrich & Nelson, 1984, p. 49) that deals with “picking parameter estimates that imply the highest probability or likelihood of having obtained the observed sample Y” (p. 51; see also Agresti, 2002).

An ordered response model can be developed as a linear probability model with the use of a continuous latent\textsuperscript{19} variable (Long & Freese, 2006). One assumption of the ordered response model is that an unmeasured (latent) variable, \( y^* \), that ranges from \(-∞\) to \(+∞\) exists, and is “mapped to an observed variable \( y \)” (Long, 1997, p. 116), where the mapping from the latent variable is done with the response categories of not utilized, utilized some, and highly utilized in the current study. This division of \( y^* \) into three “values of the observed \( y \)” (Long, 1997, p. 117) is done by thresholds, or cut points, that are denoted as \( τ \). Here a linear equation model is created by using log odds, where standardized coefficients are used the same way that the coefficients are used in a linear regression model (LRM).

Another way of interpreting the results of ordinal-level outcomes is to use a non-linear model—specifically, odds ratios—rather than standardized coefficients. In that regard, one assumption of the ordinal regression model is the “parallel regression

\textsuperscript{19} In this section, the “latent” concept does not represent the same thing as it represented in the factor analysis section.
assumption [italics original] and, for the ordinal logit [logistic regression] model, the proportional odds assumption” [italics original] (Long & Freese, 2006, 197) where the intercepts may change, but the coefficients for the independent variables are unchanged for each equation (see also Powers & Xie, 1999). When “the assumption of parallel regressions is rejected, alternative models should be considered that do not impose the constraint of parallel regressions” (Long, 1997, p. 145). All of the three models in this study (i.e., command, patrol, and detective models) were tested with the likelihood-ratio test, particularly with omodel20 command in Stata (Long & Freese, 2006; Wolfe & Gould, 1998). It is “an omnibus test that the coefficients for all variables are simultaneously equal” (Long & Freese, 2006, p. 199), and it evaluates “how the log likelihood of the ORM would change if the constraint…was removed” (Long, 1997, p. 143). In the current study, the approximate likelihood-ratio tests of proportionality of odds across response categories provided no evidence that the proportional-odds assumption is violated. Therefore, “the slope coefficients are identical across each regression [model]” (Long & Freese, 2006, p. 198) in this dissertation. The test results also showed that all three models in the current study are appropriate for the data.

Another issue with the merged data set is missing values. Although merging separate data sources produced a rich and comprehensive data set on large municipal law enforcement agencies throughout the country, some departments have missing data on some of the variables because all of the agencies did not respond to all of the surveys or they did not respond to questions properly. As a result, some measures were excluded

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20 This is not an official Stata command.
from the analysis when the full multivariate model was run. In other words, even though the variables do not have many missing values individually or bivariately, the number of missing cases increases because listwise deletion excludes “cases in which there are missing values for any of the variables in the model” [italics original] (Long & Freese, 2006, p. 79). As Long and Freese write, “When you compare coefficients across models, you want the samples to be exactly the same” [italics original]. If they are not, you cannot compute likelihood-ratio tests, and any interpretations of why the coefficients have changed must take into account differences between the samples” (p. 79). Therefore, although all of the models in this study had a high number of cases individually, the number\(^{21}\) of cases dropped when adjusted to have only the same cases in all three models (i.e., command, patrol, and detective models), which is needed to obtain valid and comparable results. Concern about whether the “missing information influences study results” (McKnight, McKnight, Sidani, & Figueredo, 2007, p. 6) systematically in the models, meant that the missing information had to be checked. Even though some of the independent variables are related to the missing values, the absence of that information is not a fatal problem for the models, as the dependent variables are in better condition in terms of their association with systematic missing values.

Findings

**Descriptive Statistics**

The descriptive statistics of all variables (i.e., dependent, explanatory

\(^{21}\) Long (1997, p. 54) argues that “it is risky to use ML [maximum likelihood] with samples smaller than 100, while samples over 500 seem adequate.”
independent, and control) used in the models are presented in the Table 2.

Table 2

Descriptive Statistics for Dependent, Explanatory Independent, and Control Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Measure</th>
<th>Min.</th>
<th>Max.</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Command-level use CA(^a) efforts</td>
<td>519</td>
<td>Ordinal</td>
<td>0.00</td>
<td>2.00</td>
<td>1.280</td>
<td>0.621</td>
</tr>
<tr>
<td>0 = not utilized</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = utilized some</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = highly utilized</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detectives use CA(^a) efforts</td>
<td>521</td>
<td>Ordinal</td>
<td>0.00</td>
<td>2.00</td>
<td>1.250</td>
<td>0.627</td>
</tr>
<tr>
<td>0 = not utilized</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = utilized some</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = highly utilized</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patrol officers use CA(^a) efforts</td>
<td>518</td>
<td>Ordinal</td>
<td>0.00</td>
<td>2.00</td>
<td>1.050</td>
<td>0.607</td>
</tr>
<tr>
<td>0 = not utilized</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = utilized some</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = highly utilized</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Explanatory</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 1: Statistical analysis</td>
<td>423</td>
<td>Continuous</td>
<td>-2.020</td>
<td>3.940</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Factor 2: Crime analysis</td>
<td>423</td>
<td>Continuous</td>
<td>-2.290</td>
<td>3.300</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Factor 3: Intelligence analysis</td>
<td>423</td>
<td>Continuous</td>
<td>-2.210</td>
<td>3.640</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Factor 4: Survey analysis</td>
<td>423</td>
<td>Continuous</td>
<td>-1.940</td>
<td>4.210</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Factor 5: Patrol strategy analysis</td>
<td>423</td>
<td>Continuous</td>
<td>-2.560</td>
<td>3.120</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Factor 6: Displacement analysis</td>
<td>423</td>
<td>Continuous</td>
<td>-3.060</td>
<td>3.740</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td><strong>Control</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crime analysis unit(^a) (yes = 1, no = 0)</td>
<td>517</td>
<td>Dummy</td>
<td>0.00</td>
<td>1.00</td>
<td>0.650</td>
<td>0.479</td>
</tr>
<tr>
<td>Unions in the agency(^a) (yes = 1, no = 0)</td>
<td>535</td>
<td>Dummy</td>
<td>0.00</td>
<td>1.00</td>
<td>0.610</td>
<td>0.489</td>
</tr>
<tr>
<td>Agency size(^a)</td>
<td>493</td>
<td>Continuous</td>
<td>0.090</td>
<td>6.320</td>
<td>1.637</td>
<td>0.983</td>
</tr>
<tr>
<td>Total operating budget(^a) (dollars in 12-month period)</td>
<td>535</td>
<td>Continuous</td>
<td>4.554</td>
<td>1,492,567</td>
<td>153,366</td>
<td>112,401</td>
</tr>
<tr>
<td>Organizational hierarchy(^b) [min - max salary]/min salary]</td>
<td>535</td>
<td>Continuous</td>
<td>0.190</td>
<td>4.650</td>
<td>1.330</td>
<td>0.627</td>
</tr>
<tr>
<td>Crime rates(^a)</td>
<td>500</td>
<td>Continuous</td>
<td>0.000</td>
<td>421.470</td>
<td>61.270</td>
<td>39.170</td>
</tr>
</tbody>
</table>

\(^a\) CA = crime analysis.

\(^b\) Unit in dollars.
As Williams (2003) has noted, “bivariate relationships are an important stage in explanation” (p. 134). Two of the independent variables (unions and crime analysis unit) that are nominal in scale are cross-classified with the dependent variables bivariately, using the chi-square test. It is “a general test designed to evaluate whether the difference between observed frequencies and expected frequencies under a set of theoretical assumptions is statistically significant” (Frankfort-Nachmias & Nachmias, 2000, p. 450).

Unions and crime analysis unit. According to the bivariate (chi-square) statistical results (see Table 3), both of the independent variables (i.e., unions and crime analysis unit) are significantly associated with command-level managers. Clearly, when law enforcement agencies have unions and/or crime analysis units, command-level managers highly use crime analysis efforts in their organizational decision-making. However, it does not matter whether the law enforcement agencies have unions in terms of the organizational-level decision-making of patrol officers and/or detectives in using crime analysis efforts. On the other hand, when the agencies have crime analysis units, both patrol officers and detectives are perceived to highly use crime analysis efforts in their organizational decision-making.

The rest of the independent variables were analyzed bivariately using analysis of variance (ANOVA), also known as the F-test. However, “a statistically significant F ratio tells you only that it appears unlikely that all population means are equal. It doesn’t tell you which groups are different from each other” (Norusis, 2004, p. 309). Therefore, in
order to see the significantly different means between one category and other categories, the Bonferroni post-hoc multiple-comparisons test (Norušis, 2004) was performed.

Table 3

<table>
<thead>
<tr>
<th>Bivariate Results for Unions and Crime Analysis Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Command-level managers</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>0 = Not utilized</td>
</tr>
<tr>
<td>16 8.1 31 9.9**</td>
</tr>
<tr>
<td>1 = Utilized some</td>
</tr>
<tr>
<td>96 48.7 180 57.5**</td>
</tr>
<tr>
<td>2 = Highly utilized</td>
</tr>
<tr>
<td>85 43.1 102 32.6**</td>
</tr>
<tr>
<td><strong>Patrol officers</strong></td>
</tr>
<tr>
<td>0 = Not utilized</td>
</tr>
<tr>
<td>30 15.1 50 16.1</td>
</tr>
<tr>
<td>1 = Utilized some</td>
</tr>
<tr>
<td>130 65.3 191 61.6</td>
</tr>
<tr>
<td>2 = Highly utilized</td>
</tr>
<tr>
<td>39 19.6 69 22.3</td>
</tr>
<tr>
<td><strong>Detectives</strong></td>
</tr>
<tr>
<td>0 = Not utilized</td>
</tr>
<tr>
<td>23 11.6 29 9.3</td>
</tr>
<tr>
<td>1 = Utilized some</td>
</tr>
<tr>
<td>100 50.3 177 56.5</td>
</tr>
<tr>
<td>2 = Highly utilized</td>
</tr>
<tr>
<td>76 38.2 107 34.2</td>
</tr>
</tbody>
</table>

* $p < .000$, df = 2.
** $p < .055$, df = 2.

Crime. According to Table 4, crime rates are significantly related only with command-level managers’ decision-making within the organization because there is a significant difference between the means in the post-hoc test results. Clearly, when the crime-rate mean is around 50, command-level managers are not perceived to use the crime analysis efforts in their organizational decision-making; however, when the crime rate increases to a mean of 59, there is perceived use of some crime analysis efforts by command-level managers in their organizational decision-making. Further, when the
crime rate increases to a mean of 66, there is a perceived *high* use of crime analysis efforts in the organizational decision-making of command-level managers. For the other two decision-making levels, there is no significant change depending on crime.

Table 4

*ANOVA Results for Crime*

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>N</th>
<th>Mean</th>
<th>df</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command-level managers&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2</td>
<td>4.000 (0.019)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 = Not utilized</td>
<td>44</td>
<td>50.235</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Utilized some</td>
<td>254</td>
<td>59.275</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = Highly utilized</td>
<td>183</td>
<td>65.592</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patrol Officers</td>
<td>2</td>
<td>0.240</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Not utilized</td>
<td>71</td>
<td>63.079</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = Utilized some</td>
<td>304</td>
<td>60.619</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 = Highly utilized</td>
<td>106</td>
<td>59.395</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detectives</td>
<td>2</td>
<td>0.052</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 = Not utilized</td>
<td>44</td>
<td>62.441</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Utilized some</td>
<td>264</td>
<td>60.981</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = Highly utilized</td>
<td>176</td>
<td>60.514</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* F-test significant probability values are in parentheses. The *N* and mean values are from the Bonferroni post-hoc test results.

<sup>a</sup>Significantly different means (within groups): 0 from 2, *p* = .027.

*Agency size.* Table 5 shows that the size of the agency is significantly associated only with command-level managers’ decision-making in the organization (as there is a significant difference between means according to the post hoc test). Clearly, when the mean of the agency size is 1.231, there is no perceived use of crime analysis efforts by the command-level managers in their decision-making process within the organization. However, when the mean increases to 1.615, then there is *some* perceived use of crime
analysis output by command-level managers in their organizational decision-making. Moreover, when the mean reaches a value of 1.834, the use of crime analysis efforts in organizational decision-making is perceived to be high. For the remainder of the decision-making levels, there is no significant change depending on agency size.

Table 5

ANOVA Results for Agency Size

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>N</th>
<th>Mean</th>
<th>df</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command-level managers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 = Not utilized</td>
<td>45</td>
<td>1.231</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Utilized some</td>
<td>250</td>
<td>1.615</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = Highly utilized</td>
<td>176</td>
<td>1.834</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patrol officers</td>
<td>2</td>
<td>0.954</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 = Not utilized</td>
<td>72</td>
<td>1.616</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Utilized some</td>
<td>297</td>
<td>1.700</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = Highly utilized</td>
<td>102</td>
<td>1.550</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detectives</td>
<td>2</td>
<td>0.730</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 = Not utilized</td>
<td>46</td>
<td>1.501</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Utilized some</td>
<td>256</td>
<td>1.672</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = Highly utilized</td>
<td>170</td>
<td>1.695</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. F-test significant probability values are in parentheses. The N and mean values are from the Bonferroni post-hoc test results.

Significantly different means (within groups): 1 from 0, \( p = .044 \); 2 from 0, \( p = .001 \).

Budget. According to Table 6, the total operating budget of the agency is significantly associated only with command-level managers’ decision-making within the organization. When the mean of the agency budget is $117,237 in a 12-month period, there is no perceived use of crime analysis output by command-level managers in the organizational decision-making process. On the other hand, when the mean budget
increases to $151,047, then there is some perceived use of crime analysis efforts by command-level managers in the organizational decision-making process. Finally, when the mean budget increases to $163,811, the use of crime analysis efforts in the organizational decision-making is perceived to be high. For the remaining decision-making positions, there is no significant change in the bivariate associations depending on agency budget.

Table 6
ANOVA Results for Budget

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>N</th>
<th>Mean^a</th>
<th>df</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command-level managers^b</td>
<td></td>
<td></td>
<td>2</td>
<td>4.105 (0.017)</td>
</tr>
<tr>
<td>0 = Not utilized</td>
<td>47</td>
<td>117237.22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Utilized some</td>
<td>276</td>
<td>151046.65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = Highly utilized</td>
<td>187</td>
<td>163810.55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patrol officers</td>
<td>2</td>
<td></td>
<td>1.427</td>
<td></td>
</tr>
<tr>
<td>0 = Not utilized</td>
<td>80</td>
<td>135956.19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Utilized some</td>
<td>321</td>
<td>154128.88</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = Highly utilized</td>
<td>108</td>
<td>160198.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detectives</td>
<td>2</td>
<td></td>
<td>2.776</td>
<td></td>
</tr>
<tr>
<td>0 = Not utilized</td>
<td>52</td>
<td>123832.62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Utilized some</td>
<td>277</td>
<td>153530.85</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = Highly utilized</td>
<td>183</td>
<td>161177.29</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

^aAmounts in dollars.

^bSignificantly different means (within groups): 2 from 0, p = .014.

Note. F-test significant probability values are in parentheses. The N and mean values are from the Bonferroni post-hoc test results.

Hierarchy. According to Table 7, the organizational hierarchy is significantly related only with command-level managers’ decision-making within the organization, as
the post-hoc test results show a significant difference between means within the group. There is no perceived use of crime analysis efforts by the command-level managers in the organizational decision-making process, where the mean hierarchy value is 1.261. When the mean hierarchy increases to 1.292, then there is some perceived use of crime analysis efforts by command-level managers in the organizational decision-making process. When the mean hierarchy reaches a value of 1.435, the use of crime analysis efforts in the organizational decision-making is perceived to be high. For the remainder of the decision-making levels, there is no significant change in the bivariate associations depending on hierarchy. Put differently, the level of hierarchy in the organization makes no difference in patrol officers’ and detectives’ perceived use of crime analysis efforts in the organizational decision-making process.
Table 7

ANOVA Results for Hierarchy

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>N</th>
<th>Mean</th>
<th>df</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command-level managers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>3.330(.037)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 = Not utilized</td>
<td>47</td>
<td>1.261</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Utilized some</td>
<td>276</td>
<td>1.292</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = Highly utilized</td>
<td>187</td>
<td>1.435</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patrol officers</td>
<td></td>
<td>0.817</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 = Not utilized</td>
<td>80</td>
<td>1.266</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Utilized some</td>
<td>321</td>
<td>1.363</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = Highly utilized</td>
<td>108</td>
<td>1.323</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detectives</td>
<td></td>
<td>0.146</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 = Not utilized</td>
<td>52</td>
<td>1.298</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Utilized some</td>
<td>277</td>
<td>1.343</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = Highly utilized</td>
<td>183</td>
<td>1.351</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. F-test significant probability values are in parentheses. The N and mean values are from the Bonferroni post-hoc test results.

aSignificantly different means (within groups): 2 from 1, p = .049.

Statistical analysis (factor 1). According to Table 8, statistical analysis is significantly associated with all of the decision-making variables. There is no perceived use of crime analysis efforts by command-level managers in the organizational decision-making process when the mean of the statistical analysis type is -0.496. When the mean increases to 0.069, then there is some perceived use of crime analysis efforts by the command-level managers in the organizational decision-making process. Finally, if the mean of the statistical analysis increases to 0.233, then the use of crime analysis efforts in the organizational decision-making process is perceived to be high.
Similarly, there is no perceived use of crime analysis efforts by patrol officers in the organizational decision-making process; as shown in Table 8, the mean value for statistical analysis is -0.262. However, when the mean increases to -0.012, there is some perceived use of crime analysis efforts by patrol officers in the organizational decision-making process. If the mean of the statistical analysis increases to 0.174, then the use of crime analysis efforts by patrol officers in the organizational decision-making process is perceived to be high.

Finally, there is no perceived use of crime analysis efforts by detectives in the organizational decision-making process, as the mean of the statistical analysis is -0.524. However, when the mean increases to -0.063, then there is some perceived use of crime analysis efforts by the detectives in the organizational decision-making process. If the mean of the statistical analysis increases to 0.209, then the use of crime analysis efforts in the organizational decision-making is perceived to be high.
Table 8

ANOVA Results for Statistical Analysis (Factor 1)

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>N</th>
<th>Mean</th>
<th>df</th>
<th>F</th>
</tr>
</thead>
</table>
| Command-level managers
  0 = Not utilized          | 40 | -0.496|    |      |
  1 = Utilized some         | 225| 0.069 |    |      |
  2 = Highly utilized       | 154| 0.233 |    |      |
| Patrol officers
  0 = Not utilized          | 68 | -0.262|    |      |
  1 = Utilized some         | 259| -0.012|    |      |
  2 = Highly utilized       | 92 | 0.174 |    |      |
| Detectives
  0 = Not utilized          | 41 | -0.524|    |      |
  1 = Utilized some         | 230| -0.063|    |      |
  2 = Highly utilized       | 148| 0.209 |    |      |

Note.  F-test significant probability values are in parentheses. The N and mean values are from the Bonferroni post-hoc test results.

Significantly different means (within groups): 1 from 0, \( p = .034 \); 2 from 0, \( p = .000 \); 2 from 1, \( p = .010 \).

Significantly different means (within groups): 2 from 0, \( p = .017 \).

Significantly different means (within groups): 1 from 0, \( p = .016 \); 2 from 0, \( p = .000 \); 2 from 1, \( p = .024 \).

Crime analysis (factor 2). According to Table 9, the F-test and post-hoc test results show that crime analysis is significantly associated with all of the decision-making variables, as there is a significant difference between means within and between groups. There is no perceived organizational decision-making where command-level managers use crime analysis efforts when the mean for crime analysis is -0.888. However, when the mean increases to -0.118, there is some perceived use of crime analysis efforts by
command-level managers in the organizational decision-making process. If the mean increases to 0.407, then the use of crime analysis efforts in the organizational decision-making process is perceived to be high.

Table 9

ANOVA Results for Crime Analysis (Factor 2)

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>N</th>
<th>Mean</th>
<th>df</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command-level managers</td>
<td>2</td>
<td></td>
<td></td>
<td>34.673 (0.000)</td>
</tr>
<tr>
<td>0 = Not utilized</td>
<td>40</td>
<td>-0.888</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Utilized some</td>
<td>225</td>
<td>-0.118</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = Highly utilized</td>
<td>154</td>
<td>0.407</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patrol officers</td>
<td>2</td>
<td></td>
<td></td>
<td>45.938 (0.000)</td>
</tr>
<tr>
<td>0 = Not utilized</td>
<td>68</td>
<td>-0.696</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Utilized some</td>
<td>259</td>
<td>-0.059</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = Highly utilized</td>
<td>92</td>
<td>0.687</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detectives</td>
<td>2</td>
<td></td>
<td></td>
<td>58.528 (0.000)</td>
</tr>
<tr>
<td>0 = Not utilized</td>
<td>41</td>
<td>-0.962</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Utilized some</td>
<td>230</td>
<td>-0.179</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = Highly utilized</td>
<td>148</td>
<td>0.559</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. F-test significant probability values are in parentheses. The N and mean values are from the Bonferroni post-hoc test results.

\(^a\)Significantly different means (within groups): 1 from 0, \(p = .000\); 2 from 0, \(p = .000\); 2 from 1, \(p = .000\).

\(^b\)Significantly different means (within groups): 1 from 0, \(p = .000\); 2 from 0, \(p = .000\); 2 from 1, \(p = .000\).

\(^c\)Significantly different means (within groups): 1 from 0, \(p = .000\); 2 from 0, \(p = .000\); 2 from 1, \(p = .000\).

Similarly, there is no perceived use of crime analysis efforts by patrol officers in the organizational decision-making process, as the mean value for crime analysis is -0.696. On the other hand, when the mean increases to -0.059, there is some perceived use.
of crime analysis efforts by patrol officers during the organizational decision-making process. When the mean increases to 0.687, the use of crime analysis efforts by patrol officers in the organizational decision-making process is perceived to be high.

With a mean value of -0.962, there is no perceived use of crime analysis efforts by detectives in the organizational decision-making process. However, when the mean increases to -0.179, there is some perceived use of crime analysis efforts by detectives in the organizational decision-making process. If the mean increases to 0.559, then the use of crime analysis efforts by detectives in the organizational decision-making process is perceived to be high.

*Intelligence analysis (factor 3)*. Table 10 shows that intelligence analysis is significantly associated with all of the decision-making. There is no perceived organizational decision-making where command-level managers use crime analysis efforts, as the mean of intelligence analysis is -0.427. However, if the mean increases to -0.048, there is some perceived use of crime analysis efforts by command-level managers in the organizational decision-making process. When the mean increases to 0.161, the use of crime analysis efforts in the organizational decision-making is perceived to be high.

Similarly, there is no perceived use of crime analysis efforts by patrol officers in the organizational decision-making process, as the mean for intelligence analysis -0.228. On the other hand, when the mean increases to -0.021, there is some perceived use of crime analysis efforts by patrol officers during the organizational decision-making process. Finally, when the mean increases to 0.205, the use of crime analysis efforts by patrol officers in the organizational decision-making process is perceived to be high.
Table 10

ANOVA Results for Intelligence Analysis (Factor 3)

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>N</th>
<th>Mean</th>
<th>df</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command-level managers&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2</td>
<td>6.062 (0.003)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 = Not utilized</td>
<td>40</td>
<td>-0.427</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Utilized some</td>
<td>225</td>
<td>-0.048</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = Highly utilized</td>
<td>154</td>
<td>0.161</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patrol officers&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2</td>
<td>3.806 (0.023)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 = Not utilized</td>
<td>68</td>
<td>-0.228</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Utilized some</td>
<td>259</td>
<td>-0.021</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = Highly utilized</td>
<td>92</td>
<td>0.205</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detectives&lt;sup&gt;c&lt;/sup&gt;</td>
<td>2</td>
<td>8.462 (0.000)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 = Not utilized</td>
<td>41</td>
<td>-0.348</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Utilized some</td>
<td>230</td>
<td>-0.105</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = Highly utilized</td>
<td>148</td>
<td>0.245</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. F-test significant probability values are in parentheses. The N and mean values are from the Bonferroni post-hoc test results.

<sup>a</sup>Significantly different means (within groups): 1 from 0, \( p = .003 \).

<sup>b</sup>Significantly different means (within groups): 2 from 0, \( p = .020 \).

<sup>c</sup>Significantly different means (within groups): 2 from 0, \( p = .002 \); 2 from 1, \( p = .002 \).

When the mean value for intelligence analysis is -0.348, there is no perceived use of crime analysis efforts by detectives in the organizational decision-making process. However, when the mean increases to -0.105, there is <em>some</em> perceived use of crime-analysis efforts by the detectives in the organizational decision-making process. When the mean increases to 0.245, the use of crime analysis efforts in the organizational decision-making process is perceived to be <em>high</em>.

Survey analysis (factor 4). Table 11 shows that survey analysis is significantly associated only with command-level managers’ organizational decision-making and that
there is a significant difference between the means of two scales: not utilized and highly utilized. First, there is no perceived organizational decision-making involving command-level managers’ use of crime analysis efforts, as the mean for survey analysis is -0.400. When the mean increases to -0.045, there is some perceived use of crime analysis efforts by command-level managers in the organizational decision-making process. When the mean increases to 0.179, the use of crime analysis efforts in the organizational decision-making process is perceived to be high. However, the degree of survey analysis used in the organization has no perceived (significant) association with patrol officers’ and detectives’ organizational decision-making processes.
Table 11

ANOVA Results for Survey Analysis (Factor 4)

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>N</th>
<th>Mean</th>
<th>df</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command-level managers&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2</td>
<td></td>
<td></td>
<td>6.006 (.003)</td>
</tr>
<tr>
<td>0 = Not utilized</td>
<td>40</td>
<td>-0.400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Utilized some</td>
<td>225</td>
<td>-0.045</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = Highly utilized</td>
<td>154</td>
<td>0.179</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patrol officers</td>
<td>2</td>
<td></td>
<td></td>
<td>1.512</td>
</tr>
<tr>
<td>0 = Not utilized</td>
<td>68</td>
<td>-0.191</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Utilized some</td>
<td>259</td>
<td>0.042</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = Highly utilized</td>
<td>92</td>
<td>0.032</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detectives</td>
<td>2</td>
<td></td>
<td></td>
<td>1.858</td>
</tr>
<tr>
<td>0 = Not utilized</td>
<td>41</td>
<td>-0.278</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Utilized some</td>
<td>230</td>
<td>0.016</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = Highly utilized</td>
<td>148</td>
<td>0.057</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. F-test significant probability values are in parentheses. The N and mean values are from the Bonferroni post-hoc test results.

<sup>a</sup>Significantly different means (within groups): 2 from 0, p = .003.

Patrol strategy analysis (factor 5). Table 12 shows that there is no perceived organizational decision-making about command-level managers’ use of crime analysis efforts when the mean of the patrol strategy analysis is -0.444. When the mean increases to -0.129, there is some perceived use of crime analysis efforts by command-level managers in the organizational decision-making process. When the mean increases to 0.309, the use of crime analysis efforts in the organizational decision-making is perceived to be high.
Table 12

**ANOVA Results for Patrol Strategy Analysis (Factor 5)**

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>N</th>
<th>Mean</th>
<th>df</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command-level managers&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2</td>
<td>13.988 (0.000)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 = Not utilized</td>
<td>40</td>
<td>-0.444</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Utilized some</td>
<td>225</td>
<td>-0.129</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = Highly utilized</td>
<td>154</td>
<td>0.309</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patrol officers&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2</td>
<td>3.313 (0.037)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 = Not utilized</td>
<td>68</td>
<td>-0.181</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Utilized some</td>
<td>259</td>
<td>-0.017</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = Highly utilized</td>
<td>92</td>
<td>0.216</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detectives</td>
<td>2</td>
<td>2.438</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 = Not utilized</td>
<td>41</td>
<td>-0.250</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Utilized some</td>
<td>230</td>
<td>-0.020</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = Highly utilized</td>
<td>148</td>
<td>0.122</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* F-test significant probability values are in parentheses. The N and mean values are from the Bonferroni post-hoc test results.

<sup>a</sup>Significantly different means (within groups): 2 from 0, *p* = .039; 2 from 1, *p* = .000.

<sup>b</sup>Significantly different means (within groups): 2 from 0, *p* = .000.

Similarly, there is no perceived use of crime analysis efforts in patrol officers’ organizational decision-making process, as the mean is -0.181. On the other hand, when the mean increases to -0.017, there is *some* perceived use of crime analysis efforts by patrol officers during the decision-making process. Finally, when the mean increases to 0.216, the use of crime analysis efforts by patrol officers in the organizational decision-making process is perceived to be *high*. Finally, there is no significant association of patrol strategy analysis with organizational decision-making by detectives.
Displacement/diffusion analysis (factor 6). None of the models are bivariately significant as shown in Table 13. There is no significant mean difference either within or between the three groups. Put differently, the perceived degree of using displacement/diffusion analysis in the organizational decision-making process does not matter for command-level managers, patrol officers, and detectives.

Table 13
ANOVA Results for Displacement/Diffusion Analysis (Factor 6)

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>N</th>
<th>Mean</th>
<th>df</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command-level managers</td>
<td>2</td>
<td></td>
<td>2</td>
<td>2.424</td>
</tr>
<tr>
<td>0 = Not utilized</td>
<td>40</td>
<td>0.027</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Utilized some</td>
<td>225</td>
<td>-0.087</td>
<td></td>
<td>0.027</td>
</tr>
<tr>
<td>2 = Highly utilized</td>
<td>154</td>
<td>0.142</td>
<td></td>
<td>0.087</td>
</tr>
<tr>
<td>Patrol officers</td>
<td>2</td>
<td></td>
<td>2</td>
<td>1.364</td>
</tr>
<tr>
<td>0 = Not utilized</td>
<td>68</td>
<td>-0.041</td>
<td></td>
<td>0.027</td>
</tr>
<tr>
<td>1 = Utilized some</td>
<td>259</td>
<td>-0.033</td>
<td></td>
<td>0.033</td>
</tr>
<tr>
<td>2 = Highly utilized</td>
<td>92</td>
<td>0.160</td>
<td></td>
<td>0.142</td>
</tr>
<tr>
<td>Detectives</td>
<td>2</td>
<td></td>
<td>2</td>
<td>1.691</td>
</tr>
<tr>
<td>0 = Not utilized</td>
<td>41</td>
<td>0.131</td>
<td></td>
<td>0.131</td>
</tr>
<tr>
<td>1 = Utilized some</td>
<td>230</td>
<td>-0.073</td>
<td></td>
<td>0.073</td>
</tr>
<tr>
<td>2 = Highly utilized</td>
<td>148</td>
<td>0.099</td>
<td></td>
<td>0.099</td>
</tr>
</tbody>
</table>

Note. F-test significant probability values are in parentheses. The N and mean values are from the Bonferroni post-hoc test results.

Multivariate Analysis

Logit coefficients. As indicated in the previous sections, the results from nonlinear models are not easy to interpret. The ordered logit is mostly “interpreted in terms of odds ratios for cumulative probabilities” (Long, 1997, p. 138). In the current study, the results of ordered logit models are presented in terms of the percent change in
odds. In other words, the percent change of the metric values in the odds of “higher versus lower outcomes” (Long & Freese, 2006, p. 218) in the dependent variable will be provided in this section.

According to the results shown in Table 14, all of the factor variables are positively associated with the dependent variable of the first (i.e., command) model.

Table 14

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>z</th>
<th>P &gt;</th>
<th>z</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crime rates</td>
<td>-0.002</td>
<td>0.004</td>
<td>-0.57</td>
<td>0.571</td>
<td></td>
</tr>
<tr>
<td>Agency size</td>
<td>0.275</td>
<td>0.180</td>
<td>1.52</td>
<td>0.128</td>
<td></td>
</tr>
<tr>
<td>Unions</td>
<td>-0.200</td>
<td>0.249</td>
<td>-0.80</td>
<td>0.421</td>
<td></td>
</tr>
<tr>
<td>Budget</td>
<td>-7.10e-07</td>
<td>1.39e-06</td>
<td>-0.51</td>
<td>0.610</td>
<td></td>
</tr>
<tr>
<td>Hierarchy</td>
<td>0.166</td>
<td>0.190</td>
<td>0.87</td>
<td>0.383</td>
<td></td>
</tr>
<tr>
<td>Crime analysis unit</td>
<td>0.636</td>
<td>0.275</td>
<td>2.31</td>
<td>0.021</td>
<td></td>
</tr>
<tr>
<td>Statistical analysis</td>
<td>0.417</td>
<td>0.121</td>
<td>3.43</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Crime analysis</td>
<td>0.797</td>
<td>0.133</td>
<td>5.99</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>Intelligence analysis</td>
<td>0.363</td>
<td>0.127</td>
<td>2.86</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>Survey analysis</td>
<td>0.426</td>
<td>0.117</td>
<td>3.65</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>Patrol strategy analysis</td>
<td>0.641</td>
<td>0.124</td>
<td>5.16</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>Displacement analysis</td>
<td>0.177</td>
<td>0.121</td>
<td>1.47</td>
<td>0.142</td>
<td></td>
</tr>
<tr>
<td>τ1</td>
<td>-2.217</td>
<td>0.456</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>τ2</td>
<td>1.503</td>
<td>0.448</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note.** N = 352. Approximate likelihood-ratio test of parallel regression assumption: \( \chi^2 (12 df) = 15.67, p = .2067. \)

The only significant control variable is crime analysis unit, which is positively associated with the dependent variable.
**Odds ratios for command model.** Table 15 provides the odds ratios for the command model. The perceived odds of having command-level managers use crime analysis efforts in organizational decision-making are 88.9% more for departments that have a crime analysis unit,22 holding other variables constant. Consider the first factor (i.e., statistical analysis). For a standard deviation increase in the use of statistical analysis, the odds of respondents’ perceptions being higher versus lower among command-level managers using the crime analysis efforts in organizational decision-making are increased by 52.2%, holding other variables constant. Similarly, for a standard deviation increase in the use of crime analysis, the odds of respondents’ perceptions being higher rather lower among command-level managers’ using crime analysis efforts in organizational decision-making are increased by 115.7%, holding other variables constant. The perceived odds of being greater versus smaller among command-level managers using crime analysis efforts in organizational decision-making are 40.1% greater for every standard deviation increase in the use of intelligence analysis. Again, the odds of perceptions of being higher versus lower among command-level managers using crime analysis efforts in organizational decision making are 55.4% greater for every standard deviation increase in the use of survey analysis. Finally, the perceived odds of being greater rather than smaller among command-level managers’ using crime analysis-efforts in organizational decision-making are 88.5% greater for every standard deviation increase in the use of patrol strategy analysis within the organization.

22 This variable is dichotomous, meaning there is a percent change for one unit, rather than percent change for one standard deviation, is used in all three models (i.e., command, patrol, and detective).
Table 15

**Odds Ratios for Command Model**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Percent change for 1-unit increase</th>
<th>Percent change for 1-SD increase</th>
<th>SD of x</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crime analysis unit</td>
<td>88.9</td>
<td>34.4</td>
<td>0.465</td>
</tr>
<tr>
<td>Statistical analysis</td>
<td>51.8</td>
<td>52.2</td>
<td>1.007</td>
</tr>
<tr>
<td>Crime analysis</td>
<td>121.9</td>
<td>115.7</td>
<td>0.964</td>
</tr>
<tr>
<td>Intelligence analysis</td>
<td>43.8</td>
<td>40.1</td>
<td>0.928</td>
</tr>
<tr>
<td>Survey analysis</td>
<td>53.1</td>
<td>55.4</td>
<td>1.036</td>
</tr>
<tr>
<td>Patrol strategy analysis</td>
<td>90.0</td>
<td>88.5</td>
<td>0.988</td>
</tr>
</tbody>
</table>

*Note.* Only relationships found statistically significant at $p \leq .05$ are included in this table.

The findings of the first model (i.e., command model) support the first hypothesis (i.e., *Hypothesis 1*) but not in a causal way. An association exists between the variables based on the odds ratios rather than on causality.

*Logit coefficients of patrol model.* According to the results shown in Table 16, all of the factor variables—except survey analysis and displacement/diffusion analysis—are positively associated with the dependent variable of the second model (i.e., patrol model). Among the control variables, crime analysis unit is the positively associated with the dependent variable, while size is negatively associated with the dependent variable.
Table 16

Logit Coefficients of Patrol Model with Dependant Variable Patrol Officers’ Use of Crime Analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>z</th>
<th>P &gt;</th>
<th>z</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Crime rates</td>
<td>0.002</td>
<td>0.004</td>
<td>0.46</td>
<td>0.644</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agency size</td>
<td>-0.520</td>
<td>0.173</td>
<td>-3.01</td>
<td>0.003</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unions</td>
<td>0.396</td>
<td>0.248</td>
<td>1.60</td>
<td>0.111</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Budget</td>
<td>1.33e-06</td>
<td>1.34e-06</td>
<td>0.99</td>
<td>0.321</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hierarchy</td>
<td>0.111</td>
<td>0.189</td>
<td>0.59</td>
<td>0.557</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crime analysis unit</td>
<td>0.629</td>
<td>0.275</td>
<td>2.29</td>
<td>0.022</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Statistical analysis</td>
<td>0.315</td>
<td>0.119</td>
<td>2.65</td>
<td>0.008</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crime analysis</td>
<td>1.060</td>
<td>0.139</td>
<td>7.62</td>
<td>0.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intelligence analysis</td>
<td>0.357</td>
<td>0.126</td>
<td>2.82</td>
<td>0.005</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Survey analysis</td>
<td>0.059</td>
<td>0.109</td>
<td>0.54</td>
<td>0.592</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patrol strategy analysis</td>
<td>0.273</td>
<td>0.117</td>
<td>2.33</td>
<td>0.020</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Displacement analysis</td>
<td>0.079</td>
<td>0.120</td>
<td>0.66</td>
<td>0.508</td>
<td></td>
<td></td>
</tr>
<tr>
<td>τ₁</td>
<td>-1.990</td>
<td>0.438</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>τ₂</td>
<td>1.880</td>
<td>0.437</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. N = 352. Approximate likelihood-ratio test of parallel regression assumption:
\( \chi^2 (12 \text{ df}) = 7.58, p = .8169. \)

Table 17 shows the odds ratios for the patrol model. The perceived odds of patrol officers using crime analysis efforts in organizational decision-making are 38.4% lower for larger departments, holding other variables constant. The perceived odds of patrol officers using crime analysis efforts in organizational decision-making are 87.9% more for departments that have a crime analysis unit, holding other variables constant. For a standard deviation increase in the use of statistical analysis, the perceived odds of respondents saying that patrol officer use of crime analysis efforts in organizational
Table 17

**Odds Ratios for Patrol Model**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Percent change for 1-unit Increase</th>
<th>Percent change for 1-SD Increase</th>
<th>SD of x</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agency size</td>
<td>-40.6</td>
<td>-38.4</td>
<td>0.931</td>
</tr>
<tr>
<td>Crime analysis unit</td>
<td>87.9</td>
<td>34.1</td>
<td>0.465</td>
</tr>
<tr>
<td>Statistical analysis</td>
<td>37.1</td>
<td>37.4</td>
<td>1.007</td>
</tr>
<tr>
<td>Crime analysis</td>
<td>188.5</td>
<td>177.9</td>
<td>0.965</td>
</tr>
<tr>
<td>Intelligence analysis</td>
<td>43.0</td>
<td>39.4</td>
<td>0.928</td>
</tr>
<tr>
<td>Patrol strategy analysis</td>
<td>31.5</td>
<td>31.1</td>
<td>0.988</td>
</tr>
</tbody>
</table>

*Note.* Only relationships found statistically significant at \( p \leq .05 \) are included in this table.

decision-making would be high rather than low are increased by 37.4\%, holding other variables constant. For a standard deviation increase in the use of crime analysis, the odds of respondents’ perceptions being higher rather than lower on patrol officers’ use of crime analysis efforts in organizational decision-making are increased by 177.9\%, holding other variables constant. The odds of respondents’ perception being higher rather than lower on patrol officers’ use of crime analysis efforts in organizational decision-making are 39.4\% greater for every standard deviation increase in the use of intelligence analysis. Finally, the perceived odds of being higher rather than lower on patrol officers’ use of crime analysis efforts in organizational decision-making are 31.1\% greater for every standard deviation increase in the use of patrol strategy analysis within the organization.

The findings in the second model (i.e., patrol model) support the second hypothesis (i.e., *Hypothesis 2*), but not in a causal way. Rather, it is an association.
Logit coefficients of detective model. Table 18 shows that three of the factor variables (i.e., statistical analysis, crime analysis, and intelligence analysis) are positively associated with the dependent variable (i.e., detectives’ use of crime analysis). As in the previous models (i.e., command model and patrol model), crime analysis unit is positively significant when controlled.

Table 18

Logit Coefficients of Detective Model with Dependent Variable Detectives’ Use of Crime Analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>z</th>
<th>P &gt;</th>
<th>z</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crime rates</td>
<td>-0.003</td>
<td>0.004</td>
<td>-0.65</td>
<td>0.516</td>
<td></td>
</tr>
<tr>
<td>Agency size</td>
<td>-0.071</td>
<td>0.175</td>
<td>-0.41</td>
<td>0.683</td>
<td></td>
</tr>
<tr>
<td>Unions</td>
<td>0.425</td>
<td>0.252</td>
<td>1.69</td>
<td>0.092</td>
<td></td>
</tr>
<tr>
<td>Budget</td>
<td>-2.29e-08</td>
<td>1.36e-06</td>
<td>-0.02</td>
<td>0.987</td>
<td></td>
</tr>
<tr>
<td>Hierarchy</td>
<td>0.095</td>
<td>0.020</td>
<td>-0.50</td>
<td>0.618</td>
<td></td>
</tr>
<tr>
<td>Crime analysis unit</td>
<td>0.610</td>
<td>0.276</td>
<td>2.21</td>
<td>0.027</td>
<td></td>
</tr>
<tr>
<td>Statistical analysis</td>
<td>0.460</td>
<td>0.125</td>
<td>3.68</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>Crime analysis</td>
<td>1.184</td>
<td>0.147</td>
<td>8.05</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>Intelligence analysis</td>
<td>0.499</td>
<td>0.129</td>
<td>3.85</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>Survey analysis</td>
<td>0.211</td>
<td>0.114</td>
<td>1.84</td>
<td>0.065</td>
<td></td>
</tr>
<tr>
<td>Patrol strategy analysis</td>
<td>0.210</td>
<td>0.121</td>
<td>1.72</td>
<td>0.085</td>
<td></td>
</tr>
<tr>
<td>Displacement analysis</td>
<td>0.0425</td>
<td>0.122</td>
<td>0.35</td>
<td>0.727</td>
<td></td>
</tr>
<tr>
<td>$\tau_1$</td>
<td>-2.590</td>
<td>0.460</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\tau_2$</td>
<td>1.350</td>
<td>0.441</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Odds ratio for detective model. Table 19 shows the odds ratios for the third model (i.e., detective model). The perceived odds of detectives using crime analysis
efforts in organizational decision-making are 84% higher for departments that have a crime analysis unit, holding other variables constant.

Table 19

<table>
<thead>
<tr>
<th>Odds Ratios for Detective Model</th>
<th>Percent change for 1-unit increase</th>
<th>Percent change for 1-SD increase</th>
<th>SD of x</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crime analysis unit</td>
<td>84.0</td>
<td>32.8</td>
<td>0.465</td>
</tr>
<tr>
<td>Statistical analysis</td>
<td>58.4</td>
<td>58.9</td>
<td>1.007</td>
</tr>
<tr>
<td>Crime analysis</td>
<td>226.9</td>
<td>213.4</td>
<td>0.965</td>
</tr>
<tr>
<td>Intelligence analysis</td>
<td>64.7</td>
<td>58.9</td>
<td>0.928</td>
</tr>
</tbody>
</table>

*Note. Only relationships found statistically significant at p ≤ .05 are included in this table.*

For a standard deviation increase in the use of statistical analysis, the odds of respondents’ perceptions being higher versus lower regarding detectives’ use of crime analysis efforts in organizational decision-making are increased by 58.9%, holding other variables constant. For a standard deviation increase in the use of crime analysis, the odds of respondents’ perceptions being greater than smaller regarding detectives’ use of crime analysis efforts in organizational decision-making are increased by 213.4%, holding other variables constant. The odds of a higher rather than a lower perception of detectives using crime analysis efforts in organizational decision-making are 58.9% greater for every standard-deviation increase in the use of intelligence analysis functions.

As with the previous models (i.e., command model and patrol model), the findings for the third model (i.e., detectives) support the third hypothesis (i.e., *Hypothesis 3*) but not in a causal way. Rather, it is an association between the independent variables
(i.e., crime analysis unit, statistical analysis, crime analysis, and intelligence analysis) and
the dependent variable (i.e., detectives’ use of crime analysis efforts).

Summary

In this chapter, the findings of the analyses were presented in both text and tables. Descriptive statistics, bivariate associations, and multivariate results of the models were presented. The findings show that among the main independent variables, statistical analysis, crime analysis, and intelligence analysis are consistently associated with all of the dependent variables. However, survey analysis is significantly associated only with command-level managers’ decision-making, whereas patrol strategy analysis is significantly associated with both command-level managers’ and patrol officers’ decision-making within the organization. Having a crime analysis unit in the agency matters at all levels of organizational decision-making, whereas agency size is significantly and negatively associated only with patrol officers’ decision-making within the organization. The findings of the study support the hypotheses, in general, based on the odds ratios.
CHAPTER 6

DISCUSSION AND CONCLUSION

In this final chapter, a discussion regarding the findings of the analysis with their links to the literature and the study hypotheses is presented. Limitations of the study are discussed next, followed by policy implications and recommendations for future research.

The current study focused on the association of crime analysis functions with the organizational decision-making process at three ranks: command-level managers, patrol officers, and detectives. In addition, some internal (organizational) and external (environmental) determinants are controlled on the organizational decision-making process. Doing so allowed the researcher to partially test a new policing model, intelligence-led policing or, more specifically, Ratcliffe’s (2008) 3-i model. As mentioned previously, there are three components (i.e., crime analysis, decision-making, and criminal environment) and three processes in the 3-i model that all begin with the letter i (i.e., interpretation, influence, and impact). In this model, crime analysts are assumed to interpret data from the criminal environment and then influence the decision-makers, who are assumed to make decisions or policies that impact crime and prolific offenders in the environment (i.e., the criminal environment). The current study was a partial testing of the 3-i model because only the perceived relationship of crime analysis and the decision-making components are explored, whereas the rest of the model is not
studied because of insufficient proper data about criminal environment and criminals in that environment.

As indicated in earlier sections, although the findings in general seem to support the hypotheses, the findings indicate only an association based on the odds ratios between the variables—and not causality.

Almost all of the crime analysis types studied were found to be significant, as expected, with the relevant level of decision-making within the organization. Further, the findings provide the reader with a hierarchical picture of difference within the organizational decision-making process. Regarding the main explanatory variables, it is found that among the six crime analysis functions, the statistical analysis, crime analysis, and intelligence analysis functions were consistently associated with all of the dependent variables. Survey analysis is significantly associated only with command-level managers’ decision-making, whereas patrol strategy analysis is significantly associated with both command-level managers’ and patrol officers’ decision-making within the organization. Finally, displacement/diffusion analysis is not significantly associated with any of the dependent variables.

As indicated above, survey analysis is associated only with the highest level of decision-making within the organization. This latent variable was a factor loading for analyses of citizen surveys, environmental surveys, employee surveys, and victim surveys. Therefore, it makes sense that the highest level of ranking personnel within the organization would pay more attention to the results of such surveys. Put differently, what the citizens, for example, think about the organization would not matter to
detectives and patrol officers as much as it would to command-level managers. Secondly, patrol strategy analysis is associated with command-level and street-level decision-making but not with the detective level. Usually, command-level managers set the strategy for patrol based on the crime analysis output, and patrol officers adjust their patrol path and time accordingly. However, detectives who conduct investigation may not find the output of patrol strategy analysis to be relevant to or helpful for their investigations. Overall, these significant findings support the literature (Demir, 2009; Mamalian & LaVigne, 1999; Reinier et al., 1977).

Displacement/diffusion analysis was not significantly associated with any of the dependent variables. One of the explanations could be that this type of analysis might not be used widely and actively but only conceptually on paper. In other words, for a study in 2000, that type of crime analysis might not have been commonly or frequently used. Another explanation could be that this type of crime analysis might not be considered applicable or useable by police personnel. For instance, in policing, the “maps are only relevant when they are seen as valuable in use, needed for something” [italics added]. Metaphorically, databases and their links, the terminals, even computers, are really only ‘dumb pipes’ through which data flow. They represent capacity, future utility, but they must be implicated in some process to become useful” (Manning, 2001, p. 99).

The current study found that having a crime analysis unit within a law enforcement agency matters at all levels of organizational decision-making. Put differently, when an organization has a crime analysis unit, the command-level managers, patrol officers, and detectives are perceived to use crime analysis efforts in organizational
decision-making. This is the only control variable that is significantly associated with all of the dependent variables. This finding makes sense, as these customers (i.e., decision-makers) are the ones who may benefit by interacting with the crime analysis unit. However, this finding does not shed light on where in the organizational structure a crime analysis unit would be more effective.

Although there were significant findings and arguments about unions in the literature (Goldstein, 1979; Guyot, 1991; Kadlec, 2001; Mastrofski, 1990; Sadd & Grinc, 1996; Walker, 1992; Walker & Katz, 2005; Zhao & Truman, 1997), no significant relationship was observed in the current study. Similarly, police organizational literature (King, 1998; Langworthy, 1986; Maguire, 1997, 2003; Zhao, 1996) used agency size and/or hierarchy in various models as critical variables, where these variables were mostly found to be significant. In the current study, agency size was significantly and negatively associated only with patrol officers’ decision-making. Hierarchy, on the other hand, was not significantly associated with any of the dependent variables.

The authors of the crime analysis survey data set, O’Shea and Nicholls (2002, 2003) controlled for crime on the quality of crime analysis, which was not significant. Similarly, the researcher in the current study controlled for crime on the organizational decision-making variable, but crime was not significant. However, in one sense, because the main triggering event in the United States that led to the intelligence-led policing movement was an external terrorist attack (i.e., a crime), it was hoped that crime also would matter in the models studied. Finally, controlling for agency budget also made no significant difference in the models. The world is experiencing financially critical times,
where budget is expected to be associated with the dependent variables in the current study. In that regard, would the agency budget variable make any difference on organizational decision-making in Great Britain, where financial constraints in the United Kingdom was one of the main reasons for the development of intelligence-led policing?

Overall, the current study has contributed to the literature by doing a partial testing of one version of intelligence-led policing. First, the 3-i model has not been empirically tested before, even partially, although it was discussed in the literature and applied to policing in agencies such as the New Jersey State Police and the Australian Police Forces (Ratcliffe, 2002, 2003). The findings in this dissertation support the 3-i model of intelligence-led policing, which holds that there is an association between crime analysis and decision-making.

Because the current study used a nationwide data set for its research questions, the data set’s external validity (i.e., generalizability) is not an issue in the United States. Another contribution of the current study is that it enriches the literature about crime analysis and police decision-making among different rankings, as the literature is short in this area. Finally, use of crime analysis as part of the decision-making process was the reason for the creation of the Law Enforcement Assistance Administration with the goal of supporting and developing crime analysis function professionally in the United States three decades ago. In that regard, the findings of the current study support this attempt (i.e., creation of LEAA) and the importance of crime analysis in decision-making within law enforcement agencies.
Limitations

The current study suffers from the limitations of survey research (Bryman, 2005; Frankfort-Nachmias & Nachmias, 2000; O’Shea & Nicholls 2002, 2003). Although there might be a time difference in data collection, “respondents’ answers are treated as though they were collected at an identical point in time” (Bryman, 2005, p. 87). Another problem with surveys is that they “entail the collection of data on variables at a single juncture. Since notions of causality are usually taken to imply that a cause precedes an effect… survey researchers are faced with a problem, since data relating to their variables of interest are collected simultaneously” (pp. 96-97). Therefore, with cross-sectional data, most of the time it is not quite clear from which direction the causality arises. For instance, some dependent variables in this study were the independent variables in the original crime analysis study (O’Shea and Nicholls’ Crime Analysis Survey in 2000). Therefore, the current study is limited to a certain time and a certain place, both of which prevent the researcher from determining how organizational decision-making changes over time. Put differently, the change cannot be measured with cross-sectional data, as “longitudinal data are necessary to assess change” (Maguire & King, 2004, p. 31). Therefore, the other part of the 3-i model, which is the association between decision-making and criminal environment was not included in the current study. Furthermore, the data represent only the perception of one person within a given agency, even if that person (as indicated previously) is knowledgeable about crime analysis. The “researchers have no control over the respondent’s environment; hence they cannot be sure that the appropriate person completes the questionnaire” (Frankfort-Nachmias & Nachmias,
Another considerable drawback of the current study is that the data are old, although it is the most recent and most comprehensive nationwide data set available on crime analysis. As discussed in the methodology chapter, although there are not systematically influential missing data from the individual data sets used, the problem of missing data arose from the data-merging process and/or from running the full listwise model. Indeed, as McKnight et al. (2007, p. 1) argue, “missing data are virtually guaranteed in research studies,” and they might have unexpected effects on the outcomes, which in turn may threaten the internal validity and reliability of the study.

Given the limitations of the data, the way the decision-maker component was operationalized does not clearly show which policy practices and operations can be applied as a solution in the decision-making process. In other words, the dependent variables do not provide information of whether the decisions of command-level managers, police officers, and detectives are tactical, operational, or strategic. Additional and more concrete indicators of decisions and actions regarding resource allocation, personnel deployment, dealing with crime, and other subjects are needed. Therefore, more data on practices and operations related to the decision-making process that can directly, rather than by proxy, measure the variables are required.

Policy Implications and Future Research

This study is the beginning of further attempts and studies for the researcher, as it prompted him to ask more questions that need answers. One way or another, crime-
analysis components are associated with command-level managers’, patrol officers’, and detectives’ organizational decision-making. This means crime analysis applications, efforts, and outcomes do matter in organizational decision-making. For instance, the crime analysis unit was significantly associated with the dependent variables, but the data for the year of 2000 show that only 65% of the agencies have that specialized unit. This study implicates an important result to the rest of the departments that do not have a specialized unit. However, the question of what constitutes an effective crime analysis unit remains to be explored.

Statistical analysis, crime analysis, and intelligence analysis can be effective tools in the organizational decision-making process, regardless of the rank of the person making decisions. For instance, command-level managers can make decisions about operational planning, personnel deployment, resource allocation, shift hours, and the like based on the results of the three types of analysis (i.e., statistical, crime, and intelligence). Detectives, on the other hand, can strategically narrow the focus of their investigations rather approach them in a broader, more random way that may require more time and effort. For example, if the analysis results indicate a link between the suspect and a convenience store in a particular area with a pattern of criminal activity, detectives can focus more of their efforts on that area and operate more efficiently. Finally, patrol officers may be more alert in particular areas of the community, at particular times, and about particular individual profiles based on the analysis product, rather than randomly patrol their precinct. In that regard, the findings of the current study have implications for all three levels, or ranks, in the hierarchical structure of policing.
From a different vantage point, crime analysis may be related to the degree of decision-making; however, different crime analysis types and tools are perceived to have been associated with different decision-makers. In that sense, providing the appropriate crime analysis software and the hardware on which to run it and having personnel trained in its use is essential to the successful application of crime analysis in the police setting. Irrelevant and impractical crime analysis is no different than the absence of crime analysis. Therefore, a planned, goal-oriented, and useable version of crime analysis should be preferred in order to have it used in the organizational decision-making process.

As the current study showed, another issue is that if crime analysis is so important and necessary for law enforcement agencies, then “how can enough people with the appropriate blend of interests, basic research skills, and the appropriate computer skills be recruited for these positions, when—especially with regard to the computer skills—they are in such great demand in the more highly paid, private sector?” (Clark & Goldstein, 2003, p. 37). And yet, another question regarding crime analysis personnel comes to mind: Which crime analysts are more successful or better in terms of effectiveness and communication—civilian analysts or sworn analysts?

Technology also may be an important consideration in policing (Manning, 2001; Chu, 2001). For instance, radios and computers had great impact on policing (Walker, 1977, 1992). As Northrop, Kraemer, and King (1995, p. 271) found, “computers are now important weapons in the fight against crime.” However, absent a properly measured variable, technology was not controlled in this study. Technology is market-driven and
needs further exploration in crime analysis. It is important to note that, “due to the rapidly evolving marketplace, many hardware devices...will become, obsolete very quickly” (Chu, 2001, p. 150). However, it also should be noted that “the most advanced technology is pointless unless the police themselves understand its value and have the training to use it” (Williams, 2004, p. vi). For instance, are law enforcement agencies (except federal agencies) ready to handle cybercrime? How did new technology help police make decisions regarding cybercrime?

As indicated previously, because the current study only partially tested the 3-i model, the other part of the model still needs to be tested. The researcher tested the association of crime analysis functions with the decision-making component only. The criminal environment and its subjects should be studied and explored carefully with appropriate data and methodology in order to see the whole picture of 3-i model. It is hoped that this study will encourage scholars to conduct further studies that test the effectiveness and efficiency of this most recent and popular policing model. Moreover, further research is still required to determine how effective crime analysis functions and efforts are in terms of organizational decision-making, as the literature is lacking in this area.

Finally, the most comprehensive and relevant nationwide data about crime analysis and its applications were collected almost a decade ago (O’Shea & Nicholls, 2002, 2003). Even though the data included a comprehensive array of variables, in a century where technology and society are changing quickly, their data can be considered old. Therefore another nationwide survey, or at least an updated version of O’Shea and
Nicholls’, should be conducted among law enforcement agencies across the country. Another option could be reorganize the LEMAS survey by adding more variables for crime analysis and its applications. In addition, although decision-making is critical in policing, it is one of the most neglected concepts in policing data. Therefore, this phenomenon should be added to the study instruments to collect information on topics such as applications, operations, and analysis.

In order to better assess and understand the components and variables of intelligence-led policing, a complementary qualitative data set also is essential. For example, consider this statement from the intelligence section commander for the New Jersey State Police on how his department is applying the intelligence-led policing model:

The Intelligence Section is charged with employing the principles of Intelligence Led Policing to identify significant threats and combat crime. Collecting, extracting, summarizing, analyzing and disseminating criminal intelligence gathered from a variety of sources is critical to the Division’s Intelligence Led Policing Initiative. Effective analysis of intelligence is designed to provide decision-makers with relevant intelligence products which are utilized to prioritize the allocation of resources to detect crime through tactical and strategic operations. (Wilson, 2009)

Do the New Jersey State Police really implement intelligence-led policing? Can they really put the theoretical assumptions into practice? How do they know that it has been applied properly? What is their measure for success? If they are successful, how was that success achieved? In order to get answers to these and other questions, one should apply both qualitative and quantitative methodologies to the study of intelligence-led policing analysis in police agency.
In conclusion, any new policing model should be selected, applied, and implemented cautiously, patiently, and smartly. As Goldstein (1990) wrote: “Since the benefits of change [if any] are not immediately demonstrable, new approaches are vulnerable to attacks arising from ignorance of the complexity of policing, an intolerance of the unfamiliar, and a lack of patience” (p. 50). Therefore, the investment should be a smart choice that does not lead to inefficiency and ineffectiveness. The selected policing model should have at its center the analytical techniques and tools (i.e., crime analysis) that support the decision-making process in dealing with crime and criminals both proactively and reactively.
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