INTELLIGENCE - LED POLICING: HOW THE USE OF CRIME INTELLIGENCE ANALYSIS TRANSLATES IN TO THE DECISION-MAKING

İstihbarat-Destekli Polislik: Suç İstihbaratı Analizinin Karar Vermeye Etkisi

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Abstract

This study does a partial test of a new policing model, the 3-i model of intelligence-led policing (ILP). It is a business model and a managerial philosophy where data analysis is critical to the decision-making process when dealing with crime and criminals proactively and reactively. To explore the research questions, a comprehensive data set was constructed using four nationwide data sets in the U.S.A. The findings indicate that intelligence analysis, crime analysis, and statistical analysis functions are consistently associated with all of the organizational decision-making variables. In addition, having a crime analysis unit in a law enforcement agency matters in terms of decision-making.

Keywords: Intelligence-Led Policing (ILP), 3-i Model; Intelligence Analysis, Crime Analysis, Statistical Analysis.

Özet

Bu çalışma yeni bir polislik modeli olan İstihbarat-Destekli Polisliğin 3-i versiyonunu kısmi olarak test etmektedir. Bu yeni polislik, suç ve suçlularla proaktif ve reaktif olarak mücadelede kullanılan, karar verme sürecinde veri analizinin önemli olduğu, bir iş modeli ve yönetim felsefesidir. Araştırma soruları, ABD'de toplanan dört farklı ulusal veri setinin bir araya getirilmesiyle oluşturulan, kapsamlı bir veri bankasından araştırılarak yanıtlanmaktadır. Araştırma bulguları, istihbarat analizi, suç analizi ve istatistik analizi fonksiyonlarının tüm organizasyon seviyesindeki karar verme değişkenleriyle ilintili olduğunu ortaya koymuştur. Ayrıca, bir kolluk kuvveti müdürlüğünde suç analizi biriminin bulunmasının o müdürlüğün karar verme süresine etkisinin olduğu tespit edilmiştir.

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Anahtar Kelimeler: İstihbarat-Destekli Polislik (İDP), 3-i Modeli, İstihbarat Analizi, Suç Analizi, İstatistik Analizi.

Introduction

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 that seemed to have little connection to the innovations of the previous decade" (2009: 2). Now, it seems to be the time for the Intelligence-led policing (ILP) model of policing.

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. This study 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). In this study, only the association between analysis and decision-making dynamics 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 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 researchers 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: To what extent does crime analysis influence police decision-making? Do crime analysis functions influence command-level managers, detectives, and patrol officers equally?

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. 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, the 3-i model was tested partially.

1. Intelligence-Led Policing

1.1. 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" (p. 4). 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: 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, 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: 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: 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.

1.2. 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, 1994, 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: 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's (2008) approach and framing of intelligence-led policing is taken as the basis for this study 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)

The following section focuses the discussion on the main focus of this study: 3-i model of intelligence-led policing.

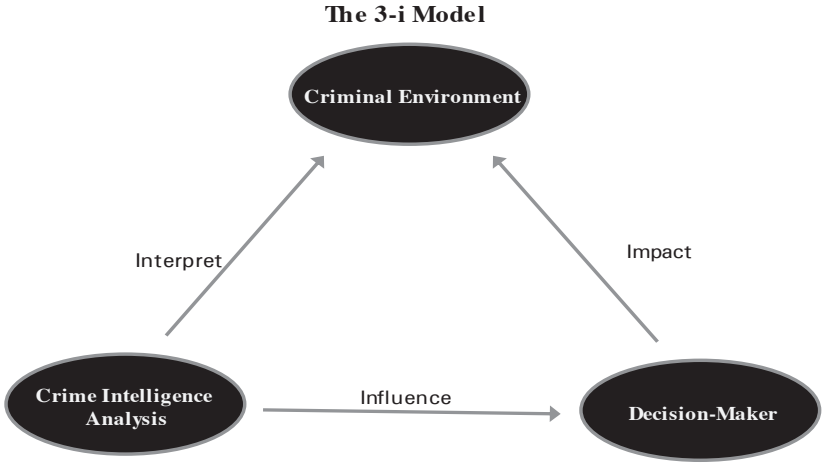
1.3. The 3-i Model

The 3-i model has three components (crime intelligence analysis, decision-making, and criminal environment) and three processes (interpret, influence, and impact) (Ratcliffe, 2008). It is assumed in this model that 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. It is a business model that seeks meld efficiency with a rational approach. Ratcliffe 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.

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



Note. Copied and adapted from Intelligence-Led Policing (p. 110) by J. H. Ratcliffe, 2008, Cullompton, Devon, UK: Willan Publishing.

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*. 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.

2. Method

2.1. Data

2.1.1. 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 in the U.S.A. The smallest department has 100 sworn officers, while the largest department has 13,271 sworn officers.

2.1.2. Data Sets[1]

The data used in this study were constructed by combining several comprehensive, secondary data-sets in order to create a richer and replicable data set for exploring the research questions. The following data sets were used:

- O'Shea and Nicholls' Crime Analysis Survey (CAS[2]) Data Set (2000)
- U.S. Bureau of Justice Statistics' Law Enforcement Management and Administration Statistics (LEMAS) (2000)
- U.S. Bureau of Justice Statistics' Law Enforcement Agency Identifiers Crosswalk (2000)
- Federal Bureau of Investigation Uniform Crime Reports (UCRs) (1999)

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.

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.

2.2. Variables

2.2.1. 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.

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1 *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-merging process was replicated three times in order to decrease potential mistakes and therefore increase the consistency of the merged data.*

2 *The name and abbreviation for the Crime Analysis Survey was determined and used by the authors, 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.*

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: 6). Put differently, the collected, collated, and analyzed data are disseminated "primarily to patrol officers, investigators, and command staff" (Osborne & Wernicke, 2003: 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[3], 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 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: 35, footnote).

2.2.2. 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 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

[3] *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).*

these crime analysis dimensions by making index variables; the authors 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.[4]

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.

[4] *SPSS version 16.0 software was used.*

Table 1. Exploratory Factor Analysis

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

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.

3. Statistical Analysis and Findings

3.1. Statistical Analysis

All of the processes regarding data merging and data analysis were done using two statistical software packages: Stata version SE10 and SPSS version 19.0. 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), but an ordered logistic regression

(OLR) model. This model is "estimated by a method called Maximum Likelihood Estimation (MLE)" (Aldrich & Nelson, 1984: 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[5] variable (Long & Freese, 2006). One assumption of the ordered response model is that an unmeasured (latent) variable, y^*, that ranges from $-\infty$ to $+\infty$ exists, and is "mapped to an observed variable y" (Long, 1997: 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: 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 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: 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 a model[6] 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: 199), and it evaluates "how the log likelihood of the ORM would change if the constraint…was removed" (Long, 1997: 143). The test results also showed that all three models in the current study are appropriate for the data.

3.2. Findings

3.2.1.Descriptive Statistics

The descriptive statistics of all variables (i.e., dependent, explanatory independent, and control) used in the models are presented in the Table 2.

[5] *In this section, the "latent" concept does not represent the same thing as it represented in the factor analysis section.*

[6] *This is not an official Stata command.*

Table 2. Descriptive Statistics for Dependent, Explanatory Independent, and Control Variables

Variable	N	Measure	Min.	Max.	Mean	SD
Dependent						
Command-level use CAa efforts 0 = not utilized 1 = utilized some 2 = highly utilized	519	Ordinal	0	2	1.28	0.621
Detectives use CAa efforts 0 = not utilized 1 = utilized some 2 = highly utilized	521	Ordinal	0	2	1.25	0.627
Patrol officers use CAa efforts 0 = not utilized 1 = utilized some 2 = highly utilized	518	Ordinal	0	2	1.05	0.607
Explanatory						
Factor 1: Statistical analysis	423	Continuous	-2.02	3.94	0	1
Factor 2: Crime analysis	423	Continuous	-2.29	3.3	0	1
Factor 3: Intelligence analysis	423	Continuous	-2.21	3.64	0	1
Factor 4: Survey analysis	423	Continuous	-1.94	4.21	0	1
Factor 5: Patrol strategy analysis	423	Continuous	-2.56	3.12	0	1
Factor 6: Displacement analysis	423	Continuous	-3.06	3.74	0	1
Control						
Crime analysis unit (yes = 1, no = 0)	517	Dummy	0	1	0.65	0.479
Unions in the agency (yes = 1, no = 0)	535	Dummy	0	1	0.61	0.489
Agency size (# of sworn x 1,000/population)	493	Continuous	0.09	6.32	1.637	0.983
Total operating budget (dollars in 12-month period)	535	Continuous	4,554	1,492,567	153,366	112,401
Organizational hierarchy b [(min - max salary)/min salary]	535	Continuous	0.19	4.65	1.33	0.627
Crime rates (# of crimes x 1,000/population)	500	Continuous	0	421.47	61.27	39.17

[a]CA = crime analysis.

[b]Unit in dollars.

3.2.2. Multivariate Analysis

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: 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: 218) in the dependent variable will be provided in this section.

3.2.2.1. Logit Coefficients of Command Model

According to the results shown in Table 3, all of the factor variables are positively associated with the dependent variable of the first (i.e., command) model.

Table 3. Logit Coefficients of Command Model with Dependent Variable Command-Level Managers' Use of Crime Analysis

Variable	B	*SE*	*z*	P > | *z* |
Crime rates	-0.002	0.004	-0.57	0.571
Agency size	0.275	0.180	1.52	0.128
Unions	-0.200	0.249	-0.80	0.421
Budget	-7.10e-07	1.39e-06	-0.51	0.610
Hierarchy	0.166	0.190	0.87	0.383
Crime analysis unit	0.636	0.275	2.31	0.021
Statistical analysis	0.417	0.121	3.43	0.001
Crime analysis	0.797	0.133	5.99	0.000
Intelligence analysis	0.363	0.127	2.86	0.004
Survey analysis	0.426	0.117	3.65	0.000
Patrol strategy analysis	0.641	0.124	5.16	0.000
Displacement analysis	0.177	0.121	1.47	0.142
τ_1	-2.217	0.456		
τ_2	1.503	0.448		

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.

3.2.2.2. Logit Coefficients of Patrol Model

According to the results shown in Table 4, 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 4. Logit Coefficients of Patrol Model with Dependant Variable Patrol Officers' Use of Crime Analysis

Variable	B	*SE*	*z*	P > | *z* |
Crime rates	0.002	0.004	0.46	0.644
Agency size	-0.520	0.173	-3.01	0.003
Unions	0.396	0.248	1.60	0.111
Budget	1.33e-06	1.34e-06	0.99	0.321
Hierarchy	0.111	0.189	0.59	0.557
Crime analysis unit	0.629	0.275	2.29	0.022
Statistical analysis	0.315	0.119	2.65	0.008
Crime analysis	1.060	0.139	7.62	0.000
Intelligence analysis	0.357	0.126	2.82	0.005
Survey analysis	0.059	0.109	0.54	0.592
Patrol strategy analysis	0.273	0.117	2.33	0.020
Displacement analysis	0.079	0.120	0.66	0.508
τ_1	-1.990	0.438		
τ_2	1.880	0.437		

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

3.2.2.3. Logit Coefficients of Detective Model

Table 5 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 5. Logit Coefficients of Detective Model with Dependent Variable Detectives' Use of Crime Analysis

Variable	B	*SE*	*z*	P > | *z* |
Crime rates	-0.003	0.004	-0.65	0.516
Agency size	-0.071	0.175	-0.41	0.683
Unions	0.425	0.252	1.69	0.092
Budget	-2.29e-08	1.36e-06	-0.02	0.987
Hierarchy	0.095	0.020	-0.50	0.618
Crime analysis unit	0.610	0.276	2.21	0.027
Statistical analysis	0.460	0.125	3.68	0.000
Crime analysis	1.184	0.147	8.05	0.000
Intelligence analysis	0.499	0.129	3.85	0.000
Survey analysis	0.211	0.114	1.84	0.065
Patrol strategy analysis	0.210	0.121	1.72	0.085
Displacement analysis	0.0425	0.122	0.35	0.727
τ_1	-2.590	0.460		
τ_2	1.350	0.441		

Note. N = 352. Approximate likelihood-ratio test of parallel regression assumption: $\chi 2$ (12 df) = 9.50, p = .6598.

4. Discussion and Conclusion

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 researchers 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 (crime analysis, decision-making, and criminal environment) and three processes in the 3-i model that all begin with the letter *i* (interpretation, influence, and impact). In this model, crime intelligence 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 intelligence 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: 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 consumers or clients (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; Kadleck, 2001; 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 researchers 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 study support the 3-i model of intelligence-led policing, which holds that there is an association between crime intelligence analysis and decision-making.

4.1. Policy Implications and Future Research

This study is the beginning of further attempts and studies for the researchers, as it prompted him to ask more questions that need answers. Intelligence analysis, crime analysis, and statistical 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., intelligence, crime, and statistical). 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.

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 researchers 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.

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 that support the decision-making process in dealing with crime and criminals both proactively and reactively.

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