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Police Organizational Performance In The State Of Florida:confirmatory Analysis Of The Relationship Of The Environment And Design Structure to Performance

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POLICE ORGANIZATIONAL PERFORMANCE IN THE STATE OF FLORIDA: CONFIRMATORY ANALYSIS OF THE RELATIONSHIP OF THE ENVIRONMENT AND DESIGN STRUCTURE TO PERFORMANCE

by

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ABSTRACT

To date, police organizations have not been rigorously analyzed by organizational scholars and most analysis of these organizations has been captured through a single construct. The purpose of this study is to develop confirmatory police organizational analysis by validating a multi-dimensional conceptual framework that explains the relationships among three constructs: environmental constraints, the design structures of police organizations, and organizational performance indicators. The modeling is deeply rooted in contingency theory, and the influence of isomorphism and institutional theory on the covariance structure model are investigated. One hundred and thirteen local police organizations from the State of Florida are included in this non-experimental, cross-sectional study to determine the direct effect of the environmental constraints on the performance of police organizations, the indirect effect of environmental constraints on the performance of police organizations via the organizational design structure of police organizations, and the direct affect of organizational design structure on performance of police organizations. For the first time, structural equation modeling and data envelopment analysis are used together to confirm the effects of the environment on police organization structure and performance. The results indicate that environmental social economic disparity indicators have a large positive effect on police resources and a medium effect on police efficiency. Propensity of crime indicators has a large negative effect on police resources, and population density has a small to medium negative effect on crime clearance. Structure has a much smaller effect on performance than the environment. The results of the efficiency analysis revealed unexpected findings. Three of the top five largest police organizations in the study scored maximum efficiency. The cause of this unexpected result is explained and confirmed in

the covariance model. The study methodology and results enhances the understanding of the relationship among the constructs while subjecting environmental and police organizational data to two comprehensive analytical techniques. The policy implications and practical contributions of the study provide new knowledge and information to organizational management of police organizations. Furthermore, the study establishes a new approach to police organizational analysis and police services management research called Police Services Management Research (PSMR) that encompasses a variety of disciplines with a primary responsibility of theory building and the selection of theoretical framework.

This project is dedicated to my beautiful wife, Elizabeth Ann Goltz. Over the past fifteen years she has fully supported my passionate efforts to achieve my professional and educational goals while raising our son Tyler. During the last four years of my doctoral studies, she has made unselfish commitments time after time while I continued my pursuit of a dream. We did this together and she realizes that this is just the beginning of a future where my personal life, my professional life, and our family life will be changed forever by this achievement. We hope to see many new places together as I hope to spread my new scientific police organizational knowledge across this great nation.

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I must also acknowledge the other professors who volunteered to serve on my dissertation committee: Dr. Bernard McCarthy, Dr. Jackie Zhang, and Dr. Ross Wolf. During my application process, Dr. McCarthy personally recommended my admission into this doctoral program and was a very valuable law enforcement resource for this study. No words can express the gratitude I have for the confidence he has demonstrated in me, and my studies throughout the past four years. Dr. Zhang has guided and directed me through much of the science required of this project, and was always available to answer all my methodology and statistical questions as I analyzed the modeling in this research. Dr. Wolf added a unique academic component to my research data collection based on his law enforcement experience, and has become a close professional friend over the last four years.

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LIST OF ACRONYMS/ABBREVIATIONS

DEA	Data Envelopment Analysis - a nonparametric mathematical programming technique that is used to analyze multiple inputs and output (performance) variables to determine the relative efficiency of the police organizations within the study.
PSMR	Police Services Management Research – a police organization research approach. Encompasses the disciplines of sociology, political science, public administration, governmental affairs, operations and organization research, statistics, and economics.
SEM	Structural Equation Modeling – confirmatory modeling that describes a set of statistical techniques for estimating the parameters of causal models with one or more latent, or unobserved variables.

CHAPTER ONE: INTRODUCTION

Police Service Delivery

The delivery of a good or service by government employees is defined as direct government. Direct government is deeply rooted in American history and a classic function of this concept involves police functions (Leman, 2002). Leman emphasizes that direct government is particularly appropriate in situations where performance cannot be easily left to chance and where no effective market exists. Moreover, direct government uses bureaucracy to mobilize and carry out decisions, does not have to create its own special administrative apparatus to produce its effects, forces individual or group behavior, structures and delegates formal authority, integrates around a culture and mission, sanctions personnel, secures and accounts for financial resources, and is quite visible. The visibility of direct government's installations and personnel are an important factor in its political viability. Undoubtedly, the delivery of police services meets all of the characteristics of direct government discussed by Leman. Police organizations use bureaucracy to mobilize and carry out decisions, secure and account for financial resources, and are labeled as the most visible form of government in today's society.

Assessing the success of direct government and its expected tasks can be accomplished through measures of efficiency and effectiveness. Efficiency is the ability to achieve a given level of benefit at a minimum cost, while effectiveness is the ability to reach a desired objective. Due to the growing concerns and frustrations with the cost and effectiveness of government programs, questions are being raised about the capabilities of public-sector institutions (Salamon, 2002). Moreover, Salamon emphasizes that efficiency has become a priority as governments search for operational methods that are cost-effective due to budget concerns and public scrutiny

of expenditures. Because of these factors, the public sector is constantly trying to improve efficiency and effectiveness of the services it provides (Nyhan, 2002).

Each year, police services become more expensive due to increases in salaries, personnel benefits, union demands, equipment, and technology. Therefore, the pressures to assess and measure governmental services in terms of efficiency and effectiveness are not just limited to maintenance issues any longer; it also includes the delivery of police services. Although no competing market currently exists for the delivery of police services, or is there likely to be any in the foreseeable future, police organizational performance must be comprehensively analyzed. Moore (2003) indicates that citizens, taxpayers, and elected representatives want and need to hold the police accountable. What is needed is some accurate ways of numerically summarizing the accomplishments of the police and the price that is paid to produce observed results: similar to the private sectors famed "bottom line."

Because of the burgeoning costs of policing, the rapid changes affecting police organizations, and the frustrations with the cost and effectiveness of government, management by tradition, guesswork, imitation and intuition in policing is no longer acceptable and must be supplanted by knowledge management that stimulates effective and efficient organizational police performance. Recently, a new paradigm in government, strategic governance, emphasizes a framework of innovation, system-wide information exchange, and knowledge transfer (Reddel, 2002). A component of strategic governance is the popular tool of organizational performance measurement.

Performance Measurement Strategy

Performance measurement is the regular collection and reporting of information about the efficiency, quality, and effectiveness of government programs or organizations and has a financial and managerial orientation. One of the most important goals of performance measurement is to make external stakeholders more knowledgeable about government programs and how they improve the lives of citizens (Kettner, Moroney, & Martin, 1999). Many governments have implemented some form of performance measures to analyze and improve their service delivery and its popularity has spread to all levels of government and service areas, to include police services. The main concern of performance measurement is the collection and reporting of performance data and information. What has allowed performance measures to evolve so quickly over the last few years is the technology necessary for comprehensive and thorough tracking and analysis of data (Walters, 2001).

Once performance measurement data are routinely collected and reported, the next logical step is to begin comparing and contrasting the performance of various government service providers of homogeneously related services (Nyhan & Martin, 1999a; 1999b). This concept, known as benchmarking, is a systematic process of searching for best practices, innovative ideas, and highly effective operating procedures that lead to superior performance (Cohen & Eimicke, 1998). Benchmarking has become an essential tool for the discovery of the best performing strategies and approaches, is an improvement methodology used in a multitude of fields (Dacosta-Claro & Lapierre, 2003), and can also alert an organization to fundamental changes in its industry and the environment (Cohen & Eimicke).

Although organizational performance measurement and benchmarking has become an important and necessary tool in government, including police service delivery, many of these efforts are simply comparative in nature and lack evidence-based knowledge that is derived from comprehensive scientific analysis. Job performance in street-level bureaucracies is extremely difficult to measure and the definition of adequate performance is highly politicized (Lipsky, 1980). Therefore, an evidence-based knowledge approach is derived from scientific replication and verification of facts and enables managers to improve organizational performance. It is a strategic, systematic thought process, beginning with a collection of observable facts and analyzing those facts to arrive at an adequate explanation of the phenomenon under study (Wan, 2002).

Study Problem

To date, police organizations have not been rigorously analyzed by organizational scholars and most analysis of these organizations has been captured through a single construct such as crime rates, the number of officers per population ratios, response time, or clearance rates. Conversely, public organizations are defined by a number of conceptual components (Maguire, 2003) and the dynamics and performance of organizations and their interface with the environment has become an important topic of investigation in organization theory literature (Keats & Hitt, 1988). What constitutes organizational performance or effectiveness has vexed public management scholars more than any other question (Selden & Sowa, 2004).

As early as 1969, three relevant constructs in the conceptual scheme for the empirical study of work organizations were discussed: contextual, structural, and performance variables

(Pugh, Hickson, Hinings &Turner, 1995). Nearly two decades later in 1985, Drazin and Van de Ven (1995) presented a similar multi-construct organizational approach. They stated that natural selection and managerial perspectives were surfacing and provided justification for viewing fit as a basic assumption underlying suitability between organizational context, structure, and process. In recent years, some scholars have placed their focus on advocating and developing more comprehensive and multi-dimensional frameworks for organizational performance, and it is emphasized that a concept as complex as organizational performance may be more appropriately captured through multi-dimensional framework than through a single construct (Selden & Sowa, 2004). Multi-dimensional models of organizational performance have gained prominence among public management scholars because of the argument that the nature of public organizations demands such frameworks to capture the organization's multiple dimensions.

Typical of any empirical organizational study, it is difficult to completely and accurately analyze the activities of the units under study (Carrington, Puthucheary, Rose & Yaisawarng, 1997) and performance inputs and outputs should be based on a relationship of exclusivity and exhaustiveness. Moreover, the identification of variables which are exogenous or environmental factors is important, and potential input and output variables should be identified by drawing from industry experience; those with experience in the organizations being assessed or familiar with the detail of their operations (Thanassoulis, 2001).

The underlying problem with current organizational performance analysis in policing is the absence of a research that accounts for the social, economic, design, and institutional factors that affect police organizational structure and performance. Also absent is a comprehensive modeling approach that incorporates exogenous and endogenous variables, or environmental, organizational, and performance inputs and outputs into a multi-dimensional framework. What is

needed in policing is a new generation of comprehensive and sophisticated organizational confirmatory analysis: analysis that utilizes contemporary public affairs informatics research techniques that accurately and effectively confirms the casual effects on organizational structures and performance, and identifies top performing police organizations and best practices.

Purpose of the Study and Research Questions

The purpose of this study is to develop confirmatory police organizational analysis by validating a multi-dimensional conceptual framework that explains the relationships among three constructs: environmental factors, the design structures of police organizations, and organizational performance indicators. Additionally, the relative technical efficiency of police organizations in the state of Florida is analyzed and top performers are identified. The study answers the following research questions:

1) What are the effects of the environment on the design structure and performance of police organizations?
2) What are the effects of design structure on police organizational performance?
3) What are characteristics of top performing police organizations in the state of Florida?

Study Approach: Police Services Management Research

In order to answer the research questions presented, and develop the next generation of police organizational analysis, this study adopts a comprehensive management research approach: Police Services Management Research (PSMR). PSMR is a research concept that

encompasses a variety of disciplines: sociology, political science, public administration, governmental affairs, operations and organization research, statistics, and economics, and is based on Wan's (2002) description of health services management research and the search for structure and influences on service delivery in health care. The responsibilities of PSMR include research and theory building, collection and analysis of service delivery information and statistics, evaluation of systems and processes, and policy analysis, and a component of PSMR is the phenomenon of police organizational performance. Police organizational performance is quite complex, and confirmatory analysis is needed to advance the policing industry beyond today's simplistic performance measurement approach. Therefore, it is the challenge of this study to advance specific confirmatory analysis and multivariate scientific methods, Structural Equation Modeling (SEM) and Data Envelopment Analysis (DEA), by utilizing a PSMR approach to determine the causal effects on police organizational structure and performance.

Theoretical Framework and Conceptual Model

A primary responsibility of PSMR is theory building and the selection of a theoretical framework. According to Wan (1995), the selection of a theoretical framework consists of five stages: conceptualization, model selection, critique of previous work in the field, review of evidence, and reformulation of the model. These stages are the basis of the theory and model selection for this study, and the modeling for this study is deeply rooted in contingency theory which dominates the police literature as an effective management concept within the industry.

The contingency theory states that an organization is shaped by its environment. Since the mid 1960's structural contingency theory has dominated the study of organizational design

and performance, and the key concept in the contingency proposition is fit (Drazin & Van de Ven, 1995), or a good fit between the environment encountered by the organization and the internal structure of the organization (Fyfe, Greene, Walsh, Wilson, & McLaren, 1997). Furthermore, contingency theory is defined by the open systems perspective. Police organizations operate in open systems which emphasizes the interactions of an organization with its environment to satisfy the ultimate objectives of their survival. They are not closed off from its operating environment, but rather open to and dependent on resources and information from the outside. Donaldson (1995) emphasizes that the contingency theory of organizations is rated as a success because a large body of research has produced evidence of validity of several major relationships between contingency and structure. Therefore, the conceptual modeling for this study is based on contingency theory and the relationships between three constructs: environment, structure, and performance. Figure 1 illustrates the conceptual model for this study.

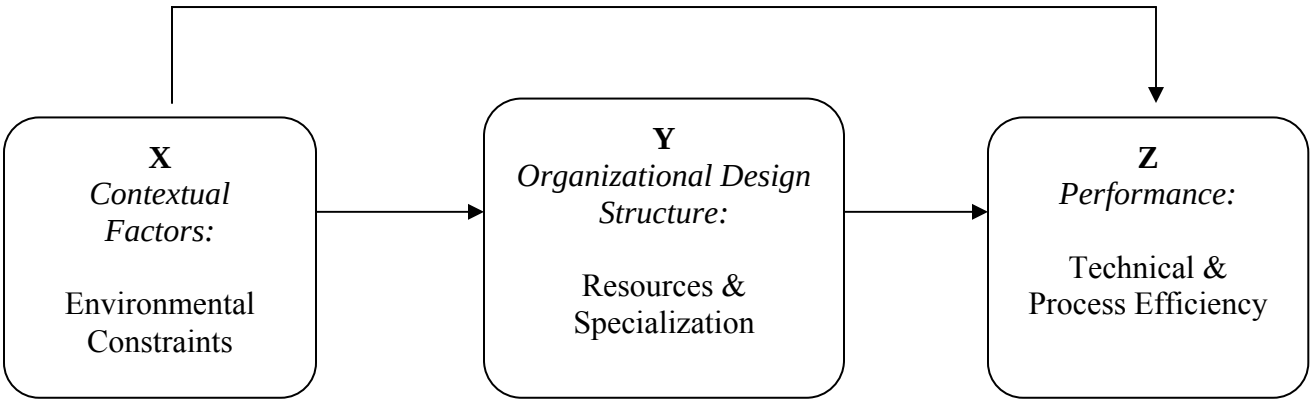


Figure 1: Conceptual Model of the Study

Study Hypotheses

Several propositions are formulated to test the hypothesized relationships among the three constructs identified in the conceptual model. The hypotheses developed for this study are as follows:

H_1: Environmental constraints exert influences on design structure and performance of police organizations.

H_{1a}: Environmental constraints directly affect the variation in design structure of police organizations.

H_{1b}: Environmental constraints directly affect the variation in performance of police organizations.

H_{1c}: Environmental constraints indirectly affect the variation in performance of police organizations via organizational design structure.

H_2: The design structure of police organizations has a significant direct effect on the variation in performance.

H_3: Small police organizations are more efficient than larger ones when holding all other factors constant.

Hypotheses H_1, H_{1a}, H_{1b}, and H_{1c} have been developed around the theoretical framework of contingency theory because of the hypothesized effect of the environment on the other constructs. Given that hypothesis H_2 states that design structure has a significant direct effect on the variation of performance, institutional theory and isomorphism may explain the path between these constructs.

Although police organizations operate and perform independently, the institution of policing is multifaceted, with durable social structures that are made up of symbolic elements, social activities, and material resources. The social structures involve strongly held rules supported by more entrenched resources (Scott, 2001). Therefore, police organizations are institutionalized because they tend to mimic their peers and isomorphic forces drive police institutionalism. In other words, H_2 may be explained by the coercive, mimetic, or normative isomorphism forces that may have more of an effect on organizational performance than the environment that the police organization operates in. Because it is hypothesized that the path from design structure to performance will be significant, institutional theory and isomorphism is further investigated in this study.

Study Methodology

This non-experimental study is a cross-sectional study of local (municipal and county) Florida police organizations. The study uses a causal model approach to examine the underlying theoretical causal relations among exogenous environmental factors, endogenous latent design structures of police organizations, and an endogenous organizational performance construct. The covariance structure model determines and confirms causation, direction, and the strength of relationships between the constructs.

The unit of analysis is local Florida police organizations: police organizations that participate in the recently created Florida Benchmarking Consortium (FBC), and Florida police organizations that do not. The FBC was created in June of 2004, and has solicited the assistance of the University of Central Florida's Institute of Government and Center for Community

Partnerships for guidance, access to local governments, and data analysis. The sampling frame for Florida police organizations that do not participate in the FBC is the 2005 National Directory of Law Enforcement Administrators. This directory, which lists the executive administrator and address for every police organization in the United States, is a publication of the National Public Safety Information Bureau. There are 342 municipal and county police organizations in the state of Florida.

The archival data collected for this study consists of Fiscal Year 2004/2005 or Calendar Year 2005 organizational performance data. Additionally, retrospective data needed for additional organizational performance indicators, crime indicators, and environmental variables were obtained from the following sources: 2005 Florida Department of Law Enforcement Criminal Justice Agency Profile, Total Index Crime for Florida by County (Jurisdiction and Offense, 2005) released from the Florida Department of Law Enforcement, the United States Census Bureau, and the University of Florida's Bureau of Economic and Business Research (BEBR). Data analysis in this study consists of two different analytical methods: SEM and DEA. SEM is used to build measurement models for each construct. After the assessment of goodness of fit statistics of the measurement models, the hypothesized causal relationships between the constructs are examined. DEA is used to analyze multiple inputs and output (performance) variables to determine the relative efficiency of the police organizations within the study. Additionally, DEA generates an IOTA (efficiency) score for each organization which is used as an indictor in the performance construct.

Significance of the Study

Maguire (2003) acknowledges that the goal for those who study police organizations might be envisioned as a model in which the structure is endogenous to a variety of contextual forces (such as environment), all of which can be used together to predict or explain organizational performance. Since previous studies have not adopted a comprehensive perspective on organizational performance, this study meets Maguire's goal and makes a theoretical contribution to a systems model of context – design – performance. The contextual factors, or environment, affect the design factors of organizations (resources, resource deployment, and specialization) and the internal and external pressures for organizational performance. For the first time, the three components are studied together to appraise the systems of police organizations. This study methodology enhances the understanding of the relationship among the three constructs while subjecting police organizational performance data to two comprehensive analytical techniques. Furthermore, the study contributes to the literature on the relationships between police organizations and their performance in terms of technical efficiency and process efficiency, and introduces a valid and reliable causal modeling for policing in the state of Florida.

The study also makes a methodological contribution on police organizational performance, and a practical contribution to organization management and policy implications in policing. Because of the perceived absence and inability of evidence-based analysis of organizational performance, the policy implications and practical contributions of this study provide new knowledge and information to organizational management of police organizations. Results of this study can assist and improve budget and resource allocation decisions and policy

on the micro level to optimize police organizations as the industry moves towards a business model that emphasizes improved efficiency and effectiveness of service delivery.

Organization of the Study

Chapter 1 has provided an overview of the status of police organizational analysis, and has covered the importance of a Police Services Management Research approach in the study of police organizational performance because of the complexity of the environments that affect these public organizations. Furthermore, this chapter has presented the purpose of the study, research questions, theoretical framework, conceptual model, hypotheses, methodology, significance of the study, and the methodological contributions to police organizational analysis.

Chapter 2 is a literature review of the conceptual model and theoretical framework selected for this study, the exogenous construct of environmental constraints, the endogenous constructs of organizational design structure and performance, and prior police organizational studies that have utilized the analytical techniques selected for this study. This chapter also summarizes and critiques the research literature and discusses the contribution this study will make to the police organization literature.

Chapter 3 provides a detailed description of the study methodology. This chapter includes the research design, unit of analysis, study sample, data sources, data collection and instrumentation, study variables, statistical analysis, and modeling of the study.

Chapter 4 reports the findings and results of the analysis. DEA is used to generate an efficiency score for each police organization in the study. Univariate, multivariate, and correlation analysis are used to present the descriptive results. The validity of the measurement

models of the theoretical constructs is tested and the results presented. Finally, the overall model fit and the research hypotheses are tested and confirmed with structural equation modeling and path analysis.

Chapter 5 is a conclusion of the study and the lessons of what can be learned from the findings. Additionally, the study's strengths, weaknesses, limitations, and alternative explanations for the findings are presented. This chapter ends with a discussion of the practical, scholarly, and theoretical implications of the study, and recommendations for future research and policy implications in police organizational performance as a result of the study and its findings.

CHAPTER TWO: LITERATURE REVIEW

Introduction

The purposes of this chapter are to discuss the historical overview and research literature of the conceptual modeling and theories selected for this study, the exogenous construct of environmental constraints, the endogenous constructs of design structure and performance, prior police organization studies, and the contributions this study will make to the literature.

Overview of Conceptual Model

Organizations are defined by a number of conceptual components (Maguire, 2003), and Selden and Sowa (2004) report that organizational theory has produced a plethora of models exploring organizational performance, The dynamics and performance of organizations coupled with their interface with the environment has become an important topic of investigation in organization theory literature (Keats & Hitt, 1988). As early as 1969, three relevant constructs in the conceptual scheme for the empirical study of work organizations were discussed: contextual, structural, and performance variables (Pugh et al., 1995). Nearly two decades later in 1985, Drazin and Van de Ven (1995) discussed a multi-construct organizational approach and they state that natural selection and managerial perspectives were surfacing and provided justification for viewing fit as a basic assumption underlying suitability between organizational context, structure, and process.

In recent years, some scholars have placed their focus on advocating and developing more comprehensive and multi-dimensional frameworks for organizational performance, and it is emphasized that a concept as complex as organizational performance may be more appropriately captured through multi-dimensional framework than through a single construct. Multi-dimensional models of organizational performance have gained prominence among public management scholars because of the argument that the nature of public organizations demands such frameworks to capture the organization's multiple dimensions (Selden & Sowa, 2004). Today's strategy researchers focus on the relationships among organizational environments, strategy process, and organizational performance. According to Boyne and Walker (2004), strategy content can be conceptualized as a general approach that describes the organization's position and how it interacts with its environment to maintain or improve its performance.

In police organizational research, determinates of the structure construct in large municipal police agencies were first examined by Robert Langworthy in his dissertation work in 1983 (Maguire, 2003). Since then, Langworthy has followed up with several articles on police organizational structure. Because the majority of police studies have focused on police officers and their work, not on the organization itself, Maguire credits Langworthy for forging a "new road" in the study of police. Maguire continued research in this area by examining the relevant features of a police organization's context. He developed a new theory that attributes the formal structures of large police agencies to the context in which they are embedded, but Maguire emphasizes that the distant goal for those who study police organizations would be a model in which the structure is endogenous to a variety of contextual forces (such as size, technology, and environment), all of which can be used together to predict or explain organizational performance.

Based on the multi-dimensional framework discussion and to enhance previous organizational research in policing, this study's conceptual model (Figure 1) has been developed from several sources from the health care and government strategy literature: Donabedian's triadic health care model, the components of a health care system by Wan (1995), the general system model of environment-organization interface in Keats and Hitt (1988), the theoretical and empirical relationships among conceptual areas of strategic planning described by Hendrick (2003), and the multi-dimensional model in Selden and Sowa (2004).

Over 30 years ago, Donabedian (2003) suggested three approaches to assessing the quality of health care that have gained widespread acceptance: structure → process → outcome. Donabedian's linear relation is a simplified version of a much more complex reality. Selden and Sowa (2004) utilize this model of organizational performance in their assessment in human service organizations that provide early care and educational services in the health care industry. In a similar triad, Wan (1995) identifies three components of a health care service delivery system: contextual factors → design factors → performance measures. In this model, Wan believes that a key component of a health care system is the environment, or the specific surroundings of a system, which are identified as contextual factors. The contextual factors affect the design factors of organizations (an organization's design includes the forms and structures of management) and the internal and external pressures for organizational performance.

Similar to the model presented by Wan (1995), Keats and Hitt (1988) describe three constructs that make up the general systems model of environment-organization interface: environment → organization → performance. The environment construct includes munificence (availability of environmental resources to support growth), instability, and complexity. Keats and Hitt believe that these dimensions reflect a rich history of theory and research on

environment. Their model's organization construct includes diversification, size, and divisionalization, and operating and market dimensions are included in the performance construct. Finally, Hendrick (2003) lists a combination of previously discussed constructs in her intervening and direct effects of strategic planning: context → process → performance. Hendrick states that context directly affects the planning process, which directly affects performance.

Much of the research on planning and management of public organizations is descriptive and there is little agreement on what variables are important among the three dimensions of environment, process, and performance, or on how these constructs are related (Hendrick, 2003). Environmental pressures on tasks and resources now shape the thoughts about the effective organization and management of policing, and much has changed over the last several decades because environmental pressures on police organizations have caused reform (Fyfe et al., 1997). The police industry now realizes that there is no best way to structure organizations, and the most effective organizations are structured to fit the environments in which they operate (Lawrence & Lorcsh, 1967).

Undoubtedly, the external operating environment affects the design and performance of police organizations and a contingency approach allows an organization to effectively adapt to the demands of the environment. Developed from the health care literature, this study's proven and accepted conceptual model is rooted in contingency theory and may explain the relation and causal effects of the environment on police organizational structure and performance, thus providing a new perspective to the discussion, research, and literature in this area.

Contingency Theory and Open Systems

Several decades ago, the early closed systems approach focused on internal elements of an organization. Conversely, today's open systems approach, which began its popularity in the 1960's, emphasizes the importance of the environment in shaping an organization's structures and processes (Maguire, 2003). A natural open systems model suggests that an organization's structure is based on the requirements, or contingencies, of its environment, and Fyfe et al. (1997) suggest that an open system places great emphasis on the environment as both a source of input to the organization and a consumer of the organization's outputs. Moreover, in open systems, an organization's interaction with its environment affects its performance (Wan, 1995).

Rather than focusing primarily on internal operations as suggested by closed systems, a critical component of the managerial challenge in policing emphasizes dealing with actors and contingencies in the broader environment (Nicholson-Crotty & O'Toole, 2004). Police departments, which operate in open systems, confront ever-shifting and changing environments, and the role of the organizational administrators is to adjust the organization to the environmental change (Fyfe et al., 1997). Environmental uncertainty is closely linked to the organizational design and administration of police departments, and the approach used to meet environmental challenges is contingency management. Contingency management states that an organization is shaped by its environment, and is appropriate when an organization's tasks are unpredictable (Donaldson, 1995).

Since the mid 1960's structural contingency theory has dominated the study of organizational design and performance, and the key concept in the contingency proposition is fit (Drazin & Van de Ven, 1995). Contingency management seeks to develop a good fit between the environment encountered by the organization and the internal structure of the organization (Fyfe

et al., 1997), and the greater the fit between the organization's environment and structure, the better its performance (Hendrick, 2003). With respect to organizing, managing, leading, and motivating, the contingency management approach assumes that there is no best way to go about these activities in an organization (Swanson, Territo & Taylor, 2001). The contingency theory of organizations is rated as a success because a large body of research has produced evidence of validity of several major relationships between contingency and structure (Donaldson, 1995).

According to the literature, contingency theory explains the interaction and relationships between the environment and structure, and the environment and performance. Therefore, if environmental constraints significantly affects the variation in design structure and performance of police organizations the contingency theory explains the following research hypotheses:

H_1: Environmental constraints exert influences on design structure and performance of police organizations.

H_{1a}: Environmental constraints directly affect the variation in design structure of police organizations.

H_{1b}: Environmental constraints directly affect the variation in performance of police organizations.

H_{1c}: Environmental constraints indirectly affect the variation in performance of police organizations via organizational design structure.

If the environment has an *insignificant* direct relationship with the structure and performance of police organizations, and structure has a *significant* relationship with performance, the investigation of an alternative theory, institutional theory and isomorphism, should be explored.

Institutional Theory and Isomorphism

There are two dimensions to an organization's environment: one institutional and one technical (Mastrofski, 1998). The first, the institutional dimension was first used by police theorists and researchers in the 1990's, and one of the important developments in policy theory and research is the recognition of the institutional contexts in which police organizations operate (Crank, 2003). Institutional theory assumes that organizations are deeply embedded in a particular social context. Furthermore, organizational structural arrangements are significantly influenced by distinctive cultural and political elements and these foundations have a lasting legacy (Meyer & Rowan, 1977; Meyer & Scott, 1983).

There are varying levels of analysis when applying institutional theory (Scott, 2001). The levels, from a macro to micro level, differ greatly in terms of the phenomena under study. In the interest of studying police organizations, three of the levels are widely recognizable: organizational field, organizational population, and organization. Figure 2 illustrates the order of organizational levels of the police environment.

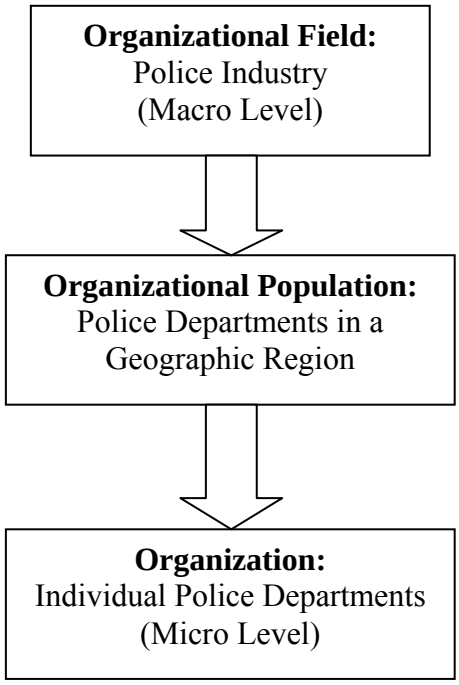


Figure 2: Organizational Levels of the Police Environment

Organizational fields constitute a recognized area of institutional life, organizational populations are a collection of organizations that are relatively homogenous in terms of environmental vulnerability, and an organization is the individual collection of actors and resources. These concepts build in the conventional concept of industry: a population of organizations that operate in the same domain as indicated by similar service delivery (Scott, 2001). Although police organizations operate and perform independently, Figure 2 indicates that there are multi-level institutional influences on these organizations. Institutions are multifaceted, durable social structures that are made up of symbolic elements, social activities, and material

resources. They are social structures that involve strongly held rules supported by more entrenched resources (Scott).

According to Frumkin and Galaskiewicz (2004), government organizations are more vulnerable to institutional forces than other organizations and new institutionalism in organizational analysis has shifted from why organizations are so heterogeneous to the explanation of why organizations are so similar. Organizations are structured by phenomena in their environments and tend to become isomorphic with them. Once organizational leaders mimic their peers and perceptions about their activities are accepted by the public, an organization becomes institutionalized. Institutional isomorphism promotes the success and survival of organizations (Meyer & Rowan, 1983).

Three isomorphic forces drive institutionalism: coercive isomorphism, mimetic isomorphism, and normative isomorphism. Coercive isomorphism is linked to the environment surrounding the organizational field. Organizations adopt structures that are either overtly or covertly mandated by organizations that they are dependent upon, and it stems from the political influence and the need for legitimacy. Mimetic isomorphism results from standard responses to uncertainty. Organizational leaders operate in a state of uncertainty and mimic their peers because they do not know what else to do. Normative isomorphism is associated with professionalism and results from the dissemination of ideas through social networks (DiMaggio & Powell, 1983; Mizruchi & Fein, 1999). When organizations are subjected to outside coercive scrutiny, evaluation, and regulation, they react defensively and gravitate towards isomorphism transformation, and the three isomorphic mechanisms can overlap and intermingle (Frumkin & Galaskiewicz, 2004).

Meyer and Rowan (1983) believe that isomorphism has some crucial consequences for organizations because they incorporate elements that are legitimated externally, rather than in terms of efficiency. Furthermore, Mastrofski (1998) emphasizes that the most noticeable environmental feature of many organizations is not the demand to be efficient but rather the demand to respond to widely held beliefs about what an organization should be and do. Police organizations institutionalize structures and processes that have come to be accepted as right, true, and correct, even though they have not been validated in a technical sense. Therefore, the literature indicates that institutional theory and isomorphism may explain the following research hypothesis:

H_2: The design structure of police organizations has a significant direct effect on the variation of performance.

To explain the causal paths in the conceptual model and the research hypotheses, two theories have been proposed. Next, the exogenous and endogenous constructs of the model are discussed in detail from the literature to strengthen the theoretical specification of the modeling.

Exogenous Construct: Environmental Constraints

The unpredictable nature of volatile environments presents increased risk for organizations, and environmental complexity exerts its primary influence on organizational structure (Keats & Hitt, 1988). Wan (1995) indicates that environmental characteristics are referred to as contextual variables, and the first step in specifying the environment is to delineate

the community characteristic of socioeconomics, demographics, and other environmental conditions that shape the demand for service. Moreover, shifts in environmental conditions over time strongly influence organizational change. In the late 1970's and early 1980's, the idea that organizations are deeply and essentially embedded in wider institutional environments became widely and favorably accepted (Scott & Meyer, 1994).

Dominant perspectives in organization theory changed to emphasize environment over technology as the central determinant of organizational structure (Meyer & Scott, 1983). Organizations are immersed or interpenetrated in their environments which constitute organizational identities, structures, and activities (Scott & Meyer, 1994). Furthermore, organizations are viewed as structured in ways to copy the environment, adapt to the environment, or ward off the environment (Meyer & Scott), and the most effective organizations are structured to fit the environments in which they operate.

Societal contexts shape policing and the contextual approach is a reminder on how multidimensional this industry is and how it is affected by a variety of forces (Bartollas & Hahn, 1999). Since the 1970's, the forces of informal social control, families, schools, neighborhoods, and school groups have become less effective in crime control, and interest has been revived in formal controls (Shepard, 2001). Clearly, the delivery of police service is the preferred method for resolving social disorder (Gowri, 2003), and the police are the public's protector.

To understanding policing, it is important to consider the various contexts in which policing takes place. The police officer is not a scientist working in a sterile laboratory. An officer's laboratory is an entire community of people and all of their needs. Undoubtedly, the variable of crime is one of the leading environmental factors that affects police design structure and is currently used to measure their performance. Crime is the core business of policing, and it

reflects the character of society. The elemental origins of crime are heredity and environment, interaction of individual and society, and the totality of human nature and experience (Clark, 1970).

Crime is not spread evenly over the nation or a state. It is heavily concentrated in small geographic areas of inner cities and pockets of rural poverty, and the cost of police per capita per square mile is much higher in these areas than police costs elsewhere. Most crime is born in environments saturated in poverty, poor education, and high unemployment (Clark, 1970). Crime rates tend to be higher in big cities than in small towns (Ammons, 2001). In a study of 6,100 cities in the United States, Zhao, Scheider, and Thurman (2002) reports that the percentage of minority residents, the unemployment rate, single-parent households, and population mobility are all positively correlated with violent crime rates.

Crime experts generally believe that the best predictors of crime are employment status, income, education levels, gender, age, ethnicity, and family composition (Bayley, 1994). Because we are a diverse and varied people with differing local traditions and history, Clark (1970) emphasizes that police coverage or function should not be precisely the same everywhere. Once a relatively simple task, today's law enforcement requires a greater bundle of professional skills for effective performance.

Nationally, crime statistics are collected by the Federal Bureau of Investigation in the Uniform Crime Reports (UCR). Critics of the use of UCR crime rates for the evaluation of police department caution that a host of community factors other than police performance contribute to a community's crime rate, and the FBI itself warns against simplistic analysis that merely compares crime index figures for one community with those of another. Unless cities are

carefully matched, or composite statistics take region and community size into consideration, many other factors could explain crime rate difference (Ammons, 2001).

As the literature indicates, many environmental characteristics affect the structure and performance of police organizations. Several demographic, social, economic, and crime indicators make up the exogenous environmental constraints construct of this study and are listed and defined in the next chapter.

Endogenous Construct: Organizational Design Structure

The structure of an organization is closely related to the context within which it functions (Pugh et al., 1995). During the 1970's, dominant perspectives in organization theory began to emphasize environment as the central determinant of organizational structure (Scott, 1983). Institutionalized organizations, to include police organizations, tend to mirror the complexity of their environments and fragmentation contributes to the expansion of organizational complexity (Crank, 2003), and many modern organizations contain numerous components beyond those once considered essential (Scott & Meyer, 1994). Goldstein (1987) indicates that the functions of police inevitably involve more than enforcing the law, and some non-law enforcement functions are extremely important for the effect on the quality of life in the community.

Scott (1992) believes that organizational structure is the formal apparatus through which organizations accomplish two primary core activities: the division of labor and the coordination of work, but organizations are expected to perform a number of functions and pursue a variety of goals (Zhao, He, & Lovrich , 2003). Organizational theorists and empirical researchers have identified dozens of structural variables. Some have achieved broad consensus among scholars as

core elements and many have not, but nearly all of them relate to how an organization divides, controls, coordinates, organizes, and structures its workers and work. Moreover, Olmstead (2002) defines the structure of organizations as the formal distribution of problem-solving, decision-making, action functions, and assignments of authority and responsibilities.

According to Maguire, Shin, Zhoa, and Hassell (2003), there are four types of labor division or structural "differentiation" in policing: functional, occupational, spatial, and vertical. Succinctly, functional differentiation (or specialization) measures differentiation of tasks or divisions within an organization, occupational differentiation measures occupational distinction within the staff or job titles, spatial differentiation (resource deployment) is the extent to which an organization is spread geographically, and vertical differentiation focuses on the hierarchical nature of an organization's command structure (Langworthy, 1986; Bayley, 1992; Maguire, 2003). Moreover, Keats and Hitt (1988) list three important measures of organizational characteristics of functional differentiation: divisionalization, size, and diversification. Divisionalization allows development of specialized knowledge to deal with the environment and creates decentralized decision-making authority for action (Williamson, 1975), while diversification is a response to unstable environments and decreases uncertainty.

Undoubtedly, there are many structural characteristics of a police organization, and this study will focus on three: resources, resource deployment, and the specialization. Most importantly, the way in which police forces are organized is important in determining how they perform (Maguire, 2003), and this confirmatory study will determine the causal relationship of the structure of police organizations to their performance. The structural indicators used in the endogenous organizational design structure construct of this study are listed and defined in the next chapter.

Endogenous Construct: Organizational Performance

Police performance has been a topic of discussion since the late 1800's. Early attempts to arrange policemen and patrol beats were based on guesswork, and police chiefs at the turn of the last century took the brunt of taxpayers' demands when they wanted to know what they were getting for their money. By the 1920's, Berkeley (CA) Police Chief August Vollmer had his patrolmen keep records of the type of duties they performed and the amount of time it took for each particular job. In the 1930's, Wichita (KS) Police Chief O.W. Wilson devised a plan for determining patrol districts based on the number of complaints, arrests, and property losses due to crime. By the 1970's, the conscientious study of police performance measures and their impact on police organizations were a new phenomenon (Young, 1978).

Since the 1980's governments at all levels have been focused on performance to make government more productive, and responsive (Hendrick, 2003). Operating performance provides an evaluative reference and indication of past and present adaptation of an organization. The investments made in the police must be examined in relation not only to its population and the territory served, but also to the unique responsibilities of this service industry, especially the numbers of crimes and to citizen calls for service (Bayley, 1994).

The performance of the police should be judged in terms of effectiveness and efficiency: the benefits and costs of police activities. Measures that directly address the efficiency and quality of police services can be of considerable value in the search for top performers and standards of performance (Ammons, 2001). A logical step after collecting and reporting performance data is to begin comparing and contrasting the performance of various government

service providers (Nyhan & Martin, 1999a). The rationale for deriving input-oriented efficiency measures is to identify inefficiency and sets out benchmarks that management can utilize to help poor performance (Cook & Zhu, 2003). According to Dacosta-Claro and Lapierre (2003) benchmarking has become an essential tool for the discovery of the best performing strategies and approaches, and it is an improvement methodology used in a multitude of fields. When benchmarking is used properly, it can improve the efficiency, quality, and effectiveness of all government service providers.

Two key performance dimensions make up the performance construct in this study: technical efficiency and process efficiency. The work and process methods performed by an organization defines an organization's technology. According to Pugh et al. (1995), technology is defined as the sequence of physical techniques used upon the workflow of the organization. Organizational scholars define technology more broadly to include social technologies. Social technologies in policing are the result of strategic decisions about how police work should be accomplished, and the core technology of the police centers on encounters with citizens (Maguire, 2003). Furthermore, this technology is described as the sum of the ways the police handle or respond to these encounters, and the enduring core technology of policing, basic patrol and investigation services, has only evolved slightly over the past half of century (Brodeur, 1998).

Organizational researchers have regularly employed measures of technology in models of organization structure and process, and technology has been measured in a variety of ways by researchers (Maguire, 2003). Moreover, technology has become increasingly important as a determinant of organizational structure and function (Pugh et al., 1995). In policing, technical efficiency is an appropriate measure of core organizational performance. Technical efficiency is

a combination of multiple inputs and outputs and is a comprehensive measure of performance. The core technology of policing has not changed much over time, but its measurement has now intrigued many government officials and the public, and it is quite complex.

What has allowed performance measures and benchmarking of technical efficiency to evolve so quickly over the last few years is the technology necessary for comprehensive and thorough tracking and analysis of data (Walters, 2001). Within the performance construct of this study, DEA and the generation of an IOTA score for each organization will be used as an indicator of relative technical performance. Furthermore, DEA provides a reference set, or benchmarking component for less than efficient organizations. A detailed description of DEA is in the next chapter, and the DEA findings along with reference sets are listed in Chapter Four: Results.

As mentioned, process efficiency is another performance dimension in this study. As police agencies matured, a generally accepted accounting practice became enshrined as one of the key measures to evaluate police performance: clearance rates (Alpert & Moore, 1993). A clearance rate is a result of the process of the investigation of crime, and the FBI defines a crime as cleared when an offender is identified, there is sufficient evidence to charge the offender, and when the arrest of the offender is made or there is some element beyond police control that precludes taking an offender into custody (Walker & Katz, 2002). As indicated in Table 2, clearance rates have been used as a police service indicator in many studies and have been selected as a key process efficiency indicator in this study.

Police Service Studies

The analysis of production relationships in the police service industry dates back to the early 1970's by Votey and Phillips, and has burgeoned since the mid 1990's. As the trend to study police service has evolved over the past few decades, a number of studies in the police literature have assessed efficiency, many utilizing DEA. Similar to this study, most of the studies summarized in Table 1 examined police efficiency at the organizational level and many of the scholars make a strong argument for the assessment of police efficiency by incorporating the environment and/or common police performance variables into their analysis.

Although the studies from Maguire (2003) and Xu, Fielder and Flaming (2005) are listed in Table 1 to illustrate the use of SEM in the police industry, the common theme of all other studies is the evaluation of efficiency in policing. Furthermore, most of the studies discuss and define key measures and indicators of police performance analysis and there appears to be a significant agreement of the use of widely accepted measurement variables among police researchers as indicated in Table 2: Police Service Research Variables. Clearly, the variables and indicators selected for inclusion in this study, as listed and defined in the next chapter, are deeply rooted in prior research. Most importantly, the eighteen studies listed in Table 1 were selected for review and illustration to enhance the specification of the methods, modeling, and latent performance construct in this study.

Table 1: Police Service and Related Studies

Study	Study Purpose	Analytical Method	Sample	Relevant Findings
Votey & Phillips (1972)	Develop and test a framework for the analysis of production relationships in law enforcement.	Regression	1952-1967 UCR crime data for U.S. cities of populations over 2,500.	A Utility theory and Production theory approach holds a precise analysis of efficiency. The deterioration in police effectiveness is a result of resource allocation.
Gyimah-Brempong (1987)	Estimation of scale economies in police production in the state of Florida.	Chi-Square	256 municipal police departments	The inputs of labor (sworn and civilian) and outputs of total arrests showed that large cities were a major source of scale diseconomies.

Study	Study Purpose	Analytical Method	Sample	Relevant Findings
Thanassoulis (1995)	Assessed police performance in England and Wales.	DEA	43 police forces	13 police forces identified as efficient based on three three performance variables: number of crimes, case clearance, and staffing.
Carrington, et al. (1997)	Assessed police performance of the New South Wales Police Service.	DEA Regression	163 police patrols	Patrols could reduce input usage by 13.5% through better management, and by 6 % through restructured patrols. Additionally, the results indicate that differences in operating environments did not have a significant influence on the efficiency of police patrols.

Study	Study Purpose	Analytical Method	Sample	Relevant Findings
Nyhan & Martin (1999a)	Exploratory study of the assessment of the performance of municipal police services in the U.S.	DEA	20 police departments	Concluded that DEA is a valuable tool for police performance measures: relative efficient and relatively inefficient municipal police services.
Nyhan & Martin (1999b)	Discussion of comparative performance measurement: simple ratio analysis, regression analysis, and DEA.	DEA	N/A	DEA represents a powerful analytical technique capable of identifying best practices among a large number of providers.
Drake & Simper (2000)	Assessed the relative efficiency and productivity of English and Welsh police forces.	DEA	44 police forces	Smallest and largest forces produced higher pure technical efficiency scores than intermediate size forces based on four input categories.

Study	Study Purpose	Analytical Method	Sample	Relevant Findings
Drake & Simper (2001)	Advance an economic model to assess police force scale and technical efficiency under a hybrid methodology in UK policing.	DEA ANOVA	39 police forces	The hybrid approach utilized data from responsive/reactive and proactive/preventive methodologies. Large English and Welsh forces exhibited substantial diseconomies of scale, and high inefficiency levels indicate that the improvement of resource utilization was needed.
Houpis, Littlechild, & Gifford (2001)	Assessed the allocation of funds to England and Wales police forces based on a formula constructed to capture four key police activities: crime, call, and traffic management, and public order.	Formula based	43 police authorities	The formula approach was problematic because it was not statistically based and did not account for socio-economic drivers and data drift.

Study	Study Purpose	Analytical Method	Sample	Relevant Findings
Drake & Simper (2002)	Examine the relative efficiency of English and Welsh police forces using both nonparametric and parametric techniques.	DEA	43 police forces	Both methodologies provided evidence that policing in the UK is subject to unusual scale effects, the largest police groups displayed significant diseconomies of scale.
Nyhan (2002)	Explore the use of DEA to compare technical efficiency among juvenile justice facilities in the state of Florida.	DEA	35 halfway houses	A DEA application can be used to determine budget targets, a basis for contract renewal or termination, and assist in developing strategies for improving efficiency.

Study	Study Purpose	Analytical Method	Sample	Relevant Findings
Sun (2002)	Measured the relative efficiency of police precincts in Taipei City, Taiwan, and analyzed the operating environment on efficiency.	DEA Regression	14 precincts	The overall performance of the precincts was assessed by setting the inputs of staffing and crime levels against clearance rates. Differences in operating environments did not have a significant influence on efficiency.
Drake & Simper (2003)	Discussion of the problems associated with measuring relative police force efficiency because of the vast amount of input and output indicators.	DEA Regression	N/A	The selection of an appropriate set of inputs and outputs is not a straightforward matter. Environmental and sociological factors should be incorporated in efficiency analysis.

Study	Study Purpose	Analytical Method	Sample	Relevant Findings
Maguire (2003)	Studied organizational structure of large U.S. municipal police departments	SEM	432 police departments	SEM revealed that the environment did not have a significant effect on organizational structure.
Drake & Simper (2004)	One of the first attempts to provide a complete analysis of the cost efficiency of English and Welsh police forces.	DEA	41 police forces	On average, the smallest police forces exhibited the highest levels of efficiency. Police force efficiency can be best enhanced by downsizing mid to large size forces into smaller, more economical units.

Study	Study Purpose	Analytical Method	Sample	Relevant Findings
Drake & Simper (2005a)	Demonstrate that analysis of police force performance could result in policy and resource decisions based on inconsistent rankings of forces, especially when resource usage/costs and environmental factors are excluded from the analysis.	DEA Regression	41police forces	The incorporation of environmental factors is of crucial importance for any robust analysis of police force efficiency.
Drake & Simper (2005b)	Estimate and compare two techniques, parametric frontier distance function and non-parametric distance function, to assess relative efficiency in English police forces.	DEA Stochastic Frontier	38 police forces	It is unwise to rely exclusively on one of the techniques in isolation. The DEA efficiency results reveal a powerful non-linear relationship between the level of crime and the clearance of crime.

Study	Study Purpose	Analytical Method	Sample	Relevant Findings
Xu, et al. (2005)	Compare traditional and community policing paradigms on three dimensions: goal, measurement of outcome, and approach to crime. 14 latent variables were measured by 34 indicators in a structural model.	SEM	710 citizens	The study provides evidence that physical and moral decay of a community leads to increase criminality, and citizen satisfaction with the police is dependent on the perceived quality of life in the community.

Table 2: Police Service Research Variables

Study	Indicators
Votey & Phillips (1972)	Expenditures, crimes cleared, crime offenses, change in technology
Gyimah-Brempong (1987)	Inputs – police and civilian labor, capital Outputs - total arrests of FBI index crimes
Thanassoulis (1995)	Number of crimes (violent, burglary, other), number of crimes cleared, manpower
Carrington, et al. (1997)	Inputs – police officers, civilian employees, capital equipment (police cars) Outputs – arrests, recorded offenses, summons, car accidents, kilometers traveled by police cars
Nyhan & Martin (1999a)	Inputs – department costs, total staff (sworn and civilian) Outputs – crimes, response time, crimes cleared
Drake & Simper (2000, 2002)	Inputs – employment costs, operating expenses, capital Outputs - clearance rates, traffic offenses
Drake & Simper (2001)	Inputs – employment costs, capital Outputs – beat patrol time, clearance rates, calls for service, response times

Study	Indicators
Houpis, et al. (2001)	Number of crimes, number of incidents, traffic duties
Sun (2002)	Inputs – number of officers, recorded crimes Outputs – number of crimes cleared
Drake & Simper (2004)	Inputs – staff costs per member, transport costs, capital costs Outputs – crimes solved, emergency calls
Drake & Simper (2005a)	Inputs – number of crimes, budget revenue Outputs – offenses cleared, sick days lost
Drake & Simper (2005b)	Inputs – number of crimes Outputs – offenses cleared

Discussion of Studies

In one of the earliest studies of productivity in policing, Votey and Phillips (1972) conceptualized the problem in their research with a production-function approach that incorporated crimes cleared by arrests, the number of crimes, primary inputs, and the effect of a change in the technology of dealing with crime. Their empirical results using crime data from U.S. cities with populations larger than 2,500 for the years 1952 through 1967 provided strong statistical evidence that a long-term decline in police effectiveness, as measured by crime

clearance ratios, was a consequence of society's failure to allocate sufficient resources to crime. In the late 1980's, Gyimah-Brempong (1987) introduced estimates in scale economies in police production. In this state level research, Gyimah-Brempong observed data from police departments in the state of Florida with populations of 5,000 or more for the two-year period of 1982 and 1983 and discovered that large cities were the major source of scale diseconomies observed in his sample. Moreover, this study emphasized the necessity to employ multiple inputs and outputs in police efficiency analysis.

By the mid 1990's police efficiency research gained widespread popularity, and DEA provided the scientific analysis of multiple inputs and outputs in police organizational research. Most DEA studies of police efficiency over the past decade have been conducted in England and Wales. As an example, Thanassoulis (1995) assessed 43 police forces from England and Wales with DEA by setting their crime clearance levels against crime and staffing levels. In one of the first studies to analyze external factors or operating environments to explain the variation in technical efficiencies across police patrols, Carrington et al. (1997) assessed 163 police patrols in New South Wales using a two-stage procedure: DEA and regression. Their results indicated that differences in operating environments, such as location and socioeconomics, did not have a significant influence upon the efficiency of police patrols in Wales. Similar to the results in the Carrington et al. (1997) study, Sun (2002) assessed 14 police precincts in Taipei City, Taiwan, using DEA and regression and discovered that differences in the operating environments, such as resident population and location factors, did not have a significant influence on the efficiency of the precincts.

The first police efficiency study utilizing DEA in the United States was introduced by Nyhan and Martin (1999a). This exploratory study assessed the performance of municipal police

services of 20 police departments. The input variables in the study included total department costs and total FTE's (full time equivalent employees), and the output or performance variables were total Uniform Crime Report (UCR) Part 1 crimes per 1,000 population, average response times to calls, and percent of UCR Part 1 crimes cleared. Similar to the study conducted by Carrington et al. (1997), Nyhan and Martin included uncontrollable input variables in their DEA analysis: population, median income, and geography (square miles of city). Nyhan and Martin concluded that DEA was able to assess the relative performance of municipal police services using multiple input and performance variables, derive optimum weights for all input and output performance variables without relying on the priori assignment of weights, identify benchmarking opportunities for inefficient police department is the study, and estimate potential cost savings. That same year, Nyhan and Martin (1999b) also published a qualitative article that discussed the significance of DEA as a powerful analytical tool capable of identifying best practices in the public sector.

From 2000 to 2005, Drake and Simper have published at least six DEA studies from their research in the United Kingdom and one qualitative article that discussed the evaluation in the choice of inputs and outputs in the efficiency measurement of police forces. Undoubtedly, they appear to be the leaders in police efficiency research using DEA due to their extensive focus and research efforts: optimal size and structure of police forces (2000), advancement of a hybrid model that utilizes data from reactive and preventive methodologies (2001), police force efficiency analysis using parametric and nonparametric techniques to determine X-efficiency and scale economies (2002), use of DEA to analyze allocative efficiency as well as technical efficiency (2004), a nonparametric modeling strategy can to demonstrate that environmental factors can have a significant impact on the efficiency of individual police forces (2005a), and

relative efficiency measurement in the context of a pure production approach relating the inputs of crime to the corresponding outputs of clearance of crime.

Unlike the DEA studies discussed, Maguire (2003) used SEM to test a theoretical model of police organizational structure. In his study, six structural variables were analyzed: vertical, spatial, and functional differentiation, and centralization, formalization, and administrative intensity. A sampling of 423 large U.S. municipal police departments indicated that spatial differentiation, or the extent to which an organization is spread geographically, is driven more by internal features of police organizations than the external features of the environment. Furthermore, Maguire discovered that environmental capacity and environmental complexity did not have a statistically significant effect on any element of organizational structure. Maguire acknowledges that "the distant goal for those who study police organizations might be envisioned as a model in which the structure is endogenous to a variety of contextual forces (such as size, technology, and environment), all of which can be used together to predict or explain organizational performance" (pg. 41).

Like Maguire (2003), Xu et al. (2005) recently employed SEM techniques to demonstrate the structure, mechanisms, and efficacy of Community Policing. SEM allowed the researchers to test multiple relationships among 14 latent exogenous and endogenous variables as well as between endogenous variables at the same time, and present a more complete picture of how community policing works. Although there is a paucity of research in policing that utilizes SEM, the studies by Maguire and Xu indicate that SEM is very useful and may become a promising technique in police organizational analysis.

Contributions to the Literature

This study makes contributions to the police literature in several ways: introduction of PSMR, theoretical contribution to a systems model, methodological contribution to police organizational measurement, and a practical contribution to organization management and policy implications in policing. First, PSMR is a newly developed concept with its roots in health care research and this study introduces its importance into the police literature. As discussed earlier, it encompasses a variety of disciplines and it behooves the industry to investigate and incorporate many disciplines together in the pursuit of police service improvement.

Secondly, although contingency theory dominates the police organization literature, no studies have analyzed the impact the environment has on the two endogenous constructs discussed for this study: police organizational structure and performance. Furthermore, no studies have confirmed the institutional or isomorphic effects on police organizations and performance. Therefore, this study makes a significant contribution to a systems model of context – design – performance in policing. The findings confirm the causal effects that the contextual factors, or environment, have on the design structure of police organizations (resources and specialization) and on organizational performance (technical and process efficiency). Additionally, the study confirms the causal effects of design structure on organizational performance. For the first time, the three constructs are studied together in a comprehensive model to appraise the systems of police organizations.

Third, this study also makes a methodological contribution to the literature by illustrating the relationships among the three constructs while subjecting police organizational performance data and environmental data to two comprehensive analytical techniques: DEA and SEM. In terms of research methodology, this is the first time that DEA and SEM have been used together

in police organizational research. Because the police industry is void of a comprehensive empirical model or method that incorporates numerous environmental factors, organizational design structure characteristics, and core policing performance variables, DEA and SEM have been utilized because these techniques are very robust and allow researchers to analyze numerous variables and indicators at the same time in one model. Moreover, this study introduces a confirmatory causal model for police organizational analysis in the state of Florida: one of the few statewide regional designs of police organizational research in the nation.

Lastly, because of the perceived absence and inability of evidence-based analysis of police organizational performance, the policy implications and practical contributions this study makes to the literature provides new knowledge and information to the organizational management of police organizations. Results of this study can assist and improve budget and resource allocation decisions and policy as the police industry moves towards a business model that emphasizes improved efficiency and effectiveness of service delivery, rather than continue with deeply entrenched isomorphic decision-making, policies, and practices.

Chapter Summary

This chapter develops a multi-construct conceptual model from several sources in the health care and government strategy literature to investigate the effects of the environment on the design structure and performance of police organizations, and the effect structure has on performance. Cleary, the literature supports the contingency theory framework of the conceptual model because police organizations operate in open systems and confront ever-shifting and changing environments. Environmental uncertainty is closely linked to the organizational design

and administration of police departments, and the contingency approach is used to meet environmental challenges. Conversely, prior studies (Carrington, et al., 1997; Sun, 2002; Maguire, 2003) have indicated that the operating environment had little effect on police efficiency or the structure of police organizations. Therefore, it is argued that institutional theory and isomorphism requires further investigation. Undoubtedly, the confirmatory methodology utilized in this study explains the hypotheses presented and determines which theory best describes the causal effects on police organizational performance.

To enhance specification of the methods, modeling, and latent performance construct in this study, numerous studies have been reviewed and discussed in this chapter. As indicated in Table 2, a highlight of the prior research is the use and agreement on inputs, outputs, performance variables, and indicators that have been incorporated in the assessment of police efficiency. To be consistent with prior studies, many of the same inputs, outputs, and indicators are used in this research are listed in the next chapter. Finally, this study makes substantive and methodological contributions to police organizational research and should provide new knowledge and information to the organizational management of police organizations through the newly coined PSMR approach presented in this study.

CHAPTER THREE: METHODOLOGY

This chapter explains the analytical methods used for the study of the confirmatory analysis of the relationship of the environment and design structure to performance of police organizations in the state of Florida. The research design, unit of analysis, study sample, data sources, data collection and instrumentation, study variables, and modeling are described. Additionally, the statistical methods of DEA and SEM are explained in detail.

Research Design

The purpose of the study is to develop and test a model for explaining the structural relationships among environmental constraints, design structure, and performance of police organizations. The covariance structure model determines causation, direction, and the strength of relationships between the constructs. In particular, the modeling determines 1) the direct effect of the environmental constraints on the performance of police organizations, 2) the indirect effect of environmental constraints on the performance of police organizations via the organizational design structure of police organizations, and 3) the direct affect of organizational design structure on performance of police organizations. Developing measurement models for the constructs, determining the causal relationship between the constructs through the structural equation model, and identifying the profiles of top performing police organizations in the state of Florida are the principal interests of this study.

The study uses a non-experimental, cross-sectional design. The data are collected at one point in time and non-probability, purposive sampling is used to select the sample because of the study purpose: police organizational performance in the state of Florida. The unit of analysis is

police organizations and the sampling frame is inclusive of police organizations from the state of Florida. Four data sources are used for the selection of variables. The study employs SEM to analyze the hypothesized relationships previously discussed. SEM is viewed as confirmatory, rather than exploratory (Kline, 2005), and is a powerful analytical tool to validate the theoretically assumed structure of the exogenous and endogenous variables in the study (Wan, 2002).

Unit of Analysis and Study Sample

The unit of analysis is local (municipal and county) police organizations in the state of Florida. The study sample came from two sources: the Florida Benchmarking Consortium (FBC) and the 2005 National Directory of Law Enforcement Administrators. The first source, the FBC, was created in June of 2004 and solicited the assistance of the University of Central Florida's Institute of Government and Center for Community Partnerships for guidance, access to local governments, and data analysis. The purpose of this consortium is the development of performance measurement and benchmarking services for local governments in the state of Florida, and police service delivery is one of the seven core government service areas included in the consortium's efforts. Sixteen out of 30 local governments that participate in the FBC provided police organizational data for this study.

The second source, the 2005 National Directory of Law Enforcement Administrators, was used as a sampling frame for the selection of the majority of the study sample. This directory, which lists the executive administrator and address for every police organization in the United States, is a publication of the National Public Safety Information Bureau and lists 342

local police organizations in the state of Florida. All police organizations that do not participate in the FBC were mailed a data collection template for this study. A total of 113 local Florida police organizations are included in this study.

Data Sources

Multiple data sources are used for the selection of variables in this study. The environmental indicators come from three sources: the University of Florida's Bureau of Economic and Business Research (BEBR), the 2000 U.S. Census, and the 2005 Florida Department of Law Enforcement Total Crime Index. BEBR is used because they posted the most up to date population statistics for all local and county government jurisdictions in the state of Florida in April 2005. The detailed characteristics of demographics, age, social, economic, and education of each jurisdiction's population were obtained from the 2000 U.S. Census, and crime data come from the Total Index Crime for Florida by County, Jurisdiction and Offense, 2005, released by Florida Department of Law Enforcement. These three data sources provide the most accurate and reliable environmental information needed for this study. The organizational structure and performance data come from the data collection instrument and the 2005 Florida Department of Law Enforcement Criminal Justice Agency Profile.

Variable Identification

The variables selected in this study are conceptualized and classified in three ways: 1) exogenous environmental constraint variables, 2) endogenous design structure variables, and 3) endogenous performance variables. In the previous chapter, the three constructs were discussed

conceptually. The following section lists, defines, and discusses the theoretical specification of each study variable as supported in the literature. The dimensions of environmental constraints and design structure are formulated with a multi-dimensional framework with multiple observable indicators, while the performance dimension is formulated with two indicators. Table 3 lists all of the proposed variables for this study.

Table 3: Definitions of Variables and Data Sources

Variable	Label	Description	Source
Exogenous Variables: Environmental Constraints			
Population Density (ξ_1)			
Population Served	POP	Residential population served by police agency	BEBR
Square Miles of Jurisdiction	MILES	Square miles served by police agency	U.S. Census
Population Density	POPDEN	Persons per square mile	BEBR U.S. Census
Propensity of Crime (ξ_2)			
Population Age 15-24	AGE	Percent of population that is age 15-24	U.S. Census
Population Age 25 or Higher With no High School Education or Higher	EDUC	Percent of the population that is age 25 or higher with no high school education or higher	U.S. Census
Minority Population	MINORITY	Percent of the population that is minority (African-American, Hispanic, Asian, or other)	U.S. Census
Crime Rate per 100,000	CRIME	Crime index is composed of the rate per 100,000 population of common crimes (murder, assault, robbery, rape, burglary, larceny, auto theft)	FDLE
Social Economic Disparity (ξ_3)			
Population Under the Poverty Level	POVERTY	Percent of population under the poverty level	U.S. Census
Unemployment Rate	UNEMP	Percent of population that is unemployed	U.S. Census

Variable	Label	Description	Source
Renter-Occupied Rate	RENT	Percent of population that rents, not owns, their residence	U.S. Census
Endogenous Variables: Design Structure			
Resourcefulness (η_1)			
Officer Ratio per 1,000	RATIO	Number of sworn officer per 1,000 population	FDLE
Size	SIZE	Ratio of sworn and civilian employees per 1,000 population	Police Agency
Police Vehicles	VEHICLES	Ratio of police vehicles (marked, unmarked, special purpose) per 1,000 population	Police Agency
Mobile Computers	MOBCOM	Ratio of mobile computers deployed in the field per 1,000 population	Police Agency
Specialization (η_2)			
Officers Assigned to Patrol	PATROL	Percent of budgeted sworn staffing that is assigned to Patrol	Police Agency
% of Sworn Officers Assigned to Criminal Investigations	INVEST	Percent of budgeted sworn staffing that is assigned to Criminal Investigations	Police Agency
% of Sworn Officers Assigned to Other Specialized Units	SPEC	Percent of budgeted sworn staffing that is assigned to specialty units (not patrol or criminal investigations)	Police Agency
Endogenous Variables: Performance (η_3)			
Technical Efficiency			
DEA IOTA Score	IOTA	Inputs: 1. Total police budget Outputs: 1. Calls requiring police service 2. Total index crimes 3. Total arrests 4. Total traffic citations	 Police Agency Police Agency FDLE Police Agency Police Agency
Process Efficiency			
Crime Clearance Rate	CLEAR	Percent of crimes cleared by the police agency as reported to the FDLE	FDLE

Environmental Constraints

The operating environment has a significant influence on police service delivery. The exogenous latent construct of environmental constraints in this study reflects the complexity of the specific physical, cultural, social, and economic surroundings that shape the demand for

police services. Crime experts generally believe that some of the best predictors of crime are employment status, income, education levels, age, and ethnicity (Bayley, 1994). Although the police have been given most of the responsibility for crime problems, significant long-term reductions in crime can only be achieved by changing the social conditions that breed crime (Fyfe et al., 1997). Therefore, a multi-dimensional framework of three measurement models makes up the environmental constraints construct in this study: population density, social economic disparity, and propensity of crime. The exogenous observable indicators selected for this construct are deeply rooted in the police and social literature as influential environmental factors on the demands for police services.

Population Density

The costs for police per square mile in densely populated areas are significantly higher than the costs elsewhere (Clark 1970). Population growth, as experienced throughout the state of Florida, contributes to high population density. Large, dense jurisdictions are more complex and the more dispersed the population the more elaborate the requirements for formal structure. Furthermore, organizations in widely dispersed environments will be less centralized (Maguire, 2003). In this study, population served (POP), square miles of the jurisdiction served (MILES), and population density (POPDEN) are the proposed indicators to formulate the measurement model of Population Density.

Social Economic Disparity

A theoretical approach in establishing a framework for thinking about an individual's involvement in crime is the investment in human capital and earning power: both achieved through education and the experience of working for income (Phillips, 1993). Unemployment rates are tied to educational status (Mooney, Knox & Schacht, 2002). Most crime in this country is born in environments saturated in poverty, where the unemployment is highest, and where the education is poorest. Crime is heavily concentrated in the small geographic areas of inner cities, pockets of rural poverty (Clark, 1970), and Phillips notes that a higher intelligence quotient significantly decreases the probability of arrest. Moreover, crime is more prevalent in poorer neighborhoods and low-income citizens are the heaviest users of police services (Walker, 1992).

Housing costs represent a major burden for the poor in the United States. The lack of affordable housing has produced a housing crisis that increasingly affects the poor. In the late 1990's, rents rose about as twice as much the consumer price index and the increases in rent now exceed inflation everywhere in the country. In 1999, more than 4 million households received some form of public housing assistance. The concentration of poor families that live in federal rent subsidized housing, or Section 8 housing, remain in low income areas where crime is higher. Moreover, the Center for Budget Policy Priorities reports that the number of low-income renters has increased by 70 percent in the past 25 years (Mooney et al., 2002).

Supported by the literature, the indicators of the percentage of the population under the poverty level (POVERTY), the unemployment rate (UNEMP), and the renter-occupied housing rate (RENT) are proposed to formulate the measurement model of Social Economic Disparity.

Propensity of Crime

When observing general crime patterns, it is evident that youth involvement in criminal activity is a serious matter. While some teenagers are labeled deviant for a while, they usually mature out of it (Pope, 1993). Weis, Crutchfield, and Bridges (1996) report that many studies have indicated that involvement in crime increases throughout the teen years, peaks at about age 17, and drops dramatically thereafter. Statistics indicate that young people are arrested at a disproportionate rate to their numbers in the population. Youths 17 and under make up about 10 percent of the population in the U.S., but account for 27 percent of the index crime arrests and 17 percent of the arrests for all crimes. Conversely, adults 50 and over make up 32 percent of the population, but only account for about 10 percent of arrests (Siegel, Welsh & Senna, 2006). Undoubtedly, criminal activity is more prevalent among younger persons and the highest arrest rates are for individuals under the age of 25 (Mooney et al., 2002).

Dropping out of high school is positively associated with later criminal activity because criminal behavior increases in the year following a drop-out from school, and it has a positive long-term effect on criminal behavior (Thornberry, Moore, and Christenson, 1996). According to the National Center for Education Statistics in the year 2000, 11 percent of 16-24 year-olds were high school dropouts. Compared to those that complete high school, dropouts are more likely to be unemployed and engage in criminal activity (Mooney et al., 2002).

In addition to age and educational indicators, the literature indicates that ethnicity of a community affects crime rates and the impact on police services. At the aggregate level, a disproportionate number of African-Americans and Hispanics are imprisoned in the United States (Mooney, et al., 2002, Phillips, 1993). In agreement, Hawkins (1993) believes that one of the most pervasive facts in America in the late twentieth-century is the disproportionate

representation of African-Americans, Native Americans, and Latinos that are arrested, convicted, and punished for crimes. Although evidence of racial bias exists in the justice system, Siegel et al. (2006) believe that it is also possible that African-American youths are arrested at a disproportionately high rate because they are currently committing more crime. Similarly, Hawkins states that the most consistently reported findings have been the high rate of crime found among African-Americans. Although African-Americans represent about 12 percent of the population, they account for 33 percent of the crime index total (Mooney et al.). In their research, Cernovich, Giordano, and Rudolph (2000) report that African Americans are more likely to be unemployed, have lower incomes than their white counterparts, report lower levels of economic satisfaction, and report higher levels of income-generating crime.

Official statistics are used to measure crime. As the prior chapter indicates, crime statistics are collected by the Federal Bureau of Investigation in the Uniform Crime Reports (UCR). The UCR, and it associated *crime index* is the most well known source of information used to measure police agency productivity. The crime index is composed of the rate per 100,000 population of common crimes, and is only based on each jurisdiction's residential population (Fyfe et al., 1997). Crimes exemplified in the UCR Crime Index are murder, assault, robbery, rape, burglary, larceny, and auto theft (Swanson et al., 2001). Not only does the UCR list crime rates based on the crimes committed per population, it also lists the actual number of crimes and the percentage change over time (Mooney et al., 2002). Crime rates tend to be higher in big cities, or in urban areas, than in small towns or suburban and rural areas, and in 1999, both violent and property crimes were highest in southern states (Ammons, 2001, Mooney et al).

To capture the complexities of the Propensity of Crime, the indicators of the percentage of the population age 15-24 (AGE), the percentage of the population age 25 and older with no

high school education or higher (EDUC), the percentage of the population that is minority (MINORITY), and crime index per 100,000 (CRIME) are proposed to formulate this measurement model.

Design Structure

Organizational structures are multi-dimensional (Maguire, 2003). As discussed in the previous chapter, organizational structure includes the formal apparatus through which organizations accomplish two core activities: the division of labor and the coordination of work (Scott, 1992). Furthermore, Keats and Hitt (1988) discuss the measures of size and divisionalization as organizational characteristics. Size, or the number of employees, is an element of structure (Maguire) and divisionalization allows the development of specialized knowledge to deal with the environment (Williamson, 1975). Moreover, the size of an organization and the type of technology are factors that influence the degree of specialization (Fyfe et al., 1997). Larger police organizations tend to have a number of specialized units that handle technical and special operational tasks (Bartollas & Hahn, 1999).

The endogenous latent construct of design structure in this study consists of a multi-dimensional framework to reflect specific resources and specialization of police organizations. The measurement models of resourcefulness and specialization make up the design structure construct. As indicated in the literature, resources influence the specialization of police organizations. Therefore, the direct causal effect (path) from resourcefulness to specialization is incorporated in the design structure construct.

Resourcefulness

According to Walker and Katz (2002) the police-population ratio is the traditional measure of the level of police protection in a community. According to the FBI, in 2004 the United States had 429,630 municipal law enforcement officers with an average of 2.3 officers for every 1,000 people, and 246,104 county law enforcement officers with an average of 2.7 officers for every 1,000 people. In the state of Florida in 2004, the Florida Department of Law Enforcement reports 16,663 municipal law enforcement officers with an average of 2.42 officers for every 1,000 people, and 17,945 county law enforcement officers with an average of 1.67 officers for every 1,000 people. Undoubtedly, the population served is a primary determinate in the size of a police organization. According to Maguire (2003) the most widely used and ideal measure of size for human service bureaucracies and other personnel-intensive organizations like the police is the number of employees. Total employees, sworn and civilian, is the measure used for organizational size in this study.

Although the number of personnel is a very significant police resource, material assets contribute to the levels of police service delivery in all communities. The material technologies like the automobile and computers are a vital aspect of modern policing (Maguire, 2003) and motorized patrol has been established as the principal police operational tactic (Fyfe et al., 1997). A police car is a rolling office, complete with mobile computers and multiple ways of contacting the central office or dispatch center (Maguire). A vehicle is the most expensive hardware in any police operation and new policies to support the increasing demands for police services has brought about significant changes in police resource allocations, in particular, the assigned patrol vehicle program (Zhang & Benson, 1997).

As early as 1968, the Indianapolis Police Department initiated the "take home" patrol vehicle program. This program was found to increase police visibility because officers drove their assigned patrol vehicles both on and off duty. In studies conducted around the country, Zhang and Benson (1997) report that police assigned vehicle programs are found to be cost-effective, reduce police related accidents, reduce vehicle repair costs, increase officer morale, increase flexibility in deployment, and decrease response times to calls for service. According to the Florida Department of Law Enforcement's 2004 Criminal Justice Agency Profile, seventy-seven percent of the local police organizations in the state of Florida have implemented a take home vehicle plan.

To enhance the efficiency and effectiveness of police operations, most police departments have installed computers in patrol cars. In the mid 1980's, the first digital data were transmitted from police headquarters to a police car (Peak, 2001). Computer terminals allow officers to obtain information efficiently (Walker & Katz, 2002), and simple computer-driven information systems assist with incoming calls for service and the deployment and tracking of personnel (Alpert & Dunham, 1997; Alpert, Dunham & Stroshine, 2006). According to the U.S. Department of Justice, Bureau of Justice Statistics 2003 Law Enforcement Management and Administrative Statistics, eighty-three percent of local police officers and eighty-one percent of local sheriff's officers worked for an agency that used computers or terminals in the field. Nationally, this is over a fifty percent increase since 1990. In the state of Florida, the Florida Department of Law Enforcement's 2004 Criminal Justice Agency Profile reports that seventy-four percent of the local police organizations in the state of Florida have mobile digital computer terminals deployed in the field.

Law enforcement is a labor-intensive service industry and police personnel costs make up 80 to 90 percent of a police budget (Fyfe et al., 1997; Thibault, Lynch & McBride, 2001). Furthermore, as indicated in the Florida Department of Law Enforcement's Criminal Justice Agency Profile, there appears to be a widespread commitment by local Florida police agencies to the material resources of vehicles and mobile computers. Therefore, the indicators of the sworn officer ratio per 1,000 (RATIO), employees per 1,000 (SIZE), total police vehicles per 1,000 (VEHICLES), and total mobile computers per 1,000 (MOBCOM) are proposed to formulate the measurement model of Resourcefulness.

Specialization

Specialization refers to the range of tasks the employees of the organization performs (Fyfe et al., 1997). Another term for specialization is functional differentiation. Maguire (2003) describes functional differentiation as the degree to which an organization divides and assigns tasks into functionally distinct units. Fyfe et al. indicate specialization is low when employees perform many tasks, and specialization is high when employees perform a few tasks. Peak (2001) notes that the larger the police agency, the greater the need for specialization, and specialization is crucial to effectiveness and efficiency in large organizations. There is little agreement about the optimal degree of specialization in modern organizations, including those of the police, and it is clear that modern organizations have become increasingly specialized (Fyfe et al.).

The activity for which the police was created is patrol (Fyfe et al., 1997). Patrol is the "backbone" and the center of police activity (Bartollas & Hahn, 1999; Peak, 2001; Walker &

Katz, 2002). It is the largest and most visible police component, and requires the most personnel, money, resources, and equipment (Bartollas & Hahn). The majority of police officers are assigned to patrol, and patrol delivers the bulk of police services (Walker & Katz). According to the U.S. Department of Justice, Bureau of Justice Statistics 2000 Law Enforcement Management and Administrative Statistics, local police agencies with one hundred or more officers assigned 61 percent of their uniform officers to response to calls for service. Because the patrol function is the major law enforcement responsibility within a police organization (Peak) and is the most important aspect of policing (Walker & Katz), it has been selected as a primary indicator in police organizational specialization.

Investigative activities are the secondary operational activities within a police organization (Peak, 2001). Investigations is the police activity concerned with the apprehension of criminals by gathering evidence that leads to arrests, and the collection and presentation of evidence for the purpose of obtaining convictions (Thibault et al., 2001). Except in small police departments, criminal investigation is a separate unit of the organization and Walker & Katz (2002) report that nationally, about 12 percent of all sworn officers are assigned to investigative units. Historically, criminal investigations have ranked second, behind patrol, as an important specialization activity in policing, therefore it is another primary indicator of police organizational specialization.

The rapid growth in the size of many police agencies has resulted in a corresponding growth in specialization in policing (Swanson et al., 2001). Outside of patrol and criminal investigations, police organizations have a number of specialized units that handle technical or specialized operational tasks (Bartollas & Hahn, 1999), and the degree of specialization in a police department depends on the size of the community, the nature of its problems, and the size

of the department itself (Walker, 1992). Succinctly, the sworn personnel outside of patrol and criminal investigations in each police organization account for the specialization indicator in this study.

Because the purpose of this study is the analysis of police organizational performance, it is important to note that students of organizational behavior recognize that specialization can produce efficiencies as well as increased effectiveness (Fyfe et al., 1997). In agreement, Swanson et al. (2001) believe that specialization appears to be a sure path to operational effectiveness. Therefore, the indicators of the percentage of sworn officers assigned to patrol (PATROL), the percentage of sworn members assigned to criminal investigations (INVEST), and the percentage of sworn officers assigned to other specialized units (SPEC) are proposed to formulate the measurement model of Specialization.

Performance

Performance measurement is the scientific assessment of work-related tasks and it involves the measurement of the activities of individuals and groups (Fyfe et al., 1997). As discussed in detail in the previous chapter, two key performance dimensions make up the performance construct that are used to measure police organizational performance in this study: technical efficiency and process efficiency.

Technical Efficiency

Technical efficiency is a combination of multiple inputs and outputs, and a DEA IOTA score provides a comprehensive measure of performance. Several police service studies listed in

Table 1 utilized DEA, and the police service research variables listed in Table 2 provide specification for the selection of the technical efficiency variables used in this study. A technical efficiency indicator, or DEA IOTA score (IOTA), for each police organization in this study was generated from the following variables:

Inputs – total police budget

Outputs – calls requiring police response, total index crimes, total arrests, total traffic citations

Process Efficiency

Police organizations are also judged on process efficiency. As previously indicated in prior studies and the literature, a crime clearance rate (CLEAR) is commonly reported in policing and is used as a performance indicator in this study.

Statistical Analysis

First, DEA is used to analyze multiple inputs and output (performance) variables to generate an IOTA score for each police organization in the study. Second, to assess the basic descriptive characteristics and the relationships among the variables, univariate and correlation analysis is performed on the study variables. Third, multivariate analysis is used to analyze the measurement models and the covariance structure model (Figure 3) formulated in this study to validate the conceptual framework.

Univariate and Correlation Analysis

The univariate analysis consists of descriptive statistics for each variable. Because the multivariate analysis assumes a normal distribution of the variables, the descriptive statistics for each variable include the frequency, mean, standard deviation, and normality tests. Two statistics, skewness and kurtosis, are the attributes of the normality of variables. Therefore, the Kolmogorov-Smirnov analytical procedure is used to assess the normality of each variable. Highly skewed variables are transformed, using log transformation, to meet normality assumptions.

Correlation analysis measures the linear association between the variables. A range in the correlation coefficient statistic from -1 to +1 indicates the linear correlation between study variables. A correlation coefficient closer to 0 indicates weak association between variables. The statistical program SPSS is used for the univariate analysis of all variables.

DEA

DEA has a long history in the private sector and is becoming an increasingly valuable tool for the comparative performance of government operations. DEA is particularly appropriate for the public sector where performance data are widely available and there is no single bottom line to determine efficiency (Nyhan, 2002). The main forces behind the wide range of applications and the rapid development of DEA are mathematics, economics, operations research, and management science (Quanling, 2001). DEA has been successfully employed for assessing relative performance and comparative efficiency of a set of decision making units (DMU), or homogenous operating units, that use a variety of identical inputs to produce a variety

of identical outputs (Ramanathan, 2003; Thanassoulis, 2001). DEA estimates relative efficiency of a DMU and can tell you how good you are doing compared to your peers. It does not measure absolute efficiency or compare DMUs to a theoretical maximum. As Table 1 indicates, DEA has been used extensively in the analysis of police organizational performance.

DEA is a nonparametric mathematical programming technique that has practical applications for measuring the performance of similar units. The essential characteristics of DEA was originally formulated and proposed by Charnes, Cooper, and Rhodes in 1978 (Thanassoulis, 2001; Quanling, 2001; Nyhan & Martin, 1999a; Nyhan & Martin, 1999b; Sengupta, 1995). Charnes et al. (1978) were concerned with developing measures of "decision making efficiency" with special reference to the evaluation of public programs, and they wanted to relate their ideas to development in economics, efficiency measurement, and relative efficiency (reference to suitably arranged rankings of the observed results of decision making by various DMUs in the same program). Charnes et al. described their intent of measure for every DMU with resources assigned to it in simplistic golfing terminology: it is a measure of *distance* rather than *direction* with respect to what has been accomplished and might be accomplished.

DEA is similar to ratio analysis because it uses paired input and performance variables and rank orders service providers based on their relative performance (Nyhan & Martin, 1999b), and uses linear programming to determine the DMUs with the highest combination of input to output ratios (Nyhan, 2002). The strength of DEA is its optimal weighting characteristics. Rather than requiring the subjective and controversial task of assigning weights to the ratios by policy makers or administrators, DEA assigns mathematically optimal weights to all input and performance (output) variables. The decision criteria used assigns more weight to variables on which a DMU compares favorably to other providers in the study, and less weight to those

variables on which a DMU compares less favorably (Nyhan, 2002; Nyhan & Martin, 1999a, Nyhan & Martin, 1999b).

DEA produces a single aggregate score, between 0 and 1, that measures relative efficiency for each organizational unit (Lee & Wan, 2003). DMUs obtaining a score of 1 are defined as maximum efficient or achieve 100% efficiency (Dacosta-Claro & Lapierre, 2003; Husain, Abdullah & Kuman, 2000). Scores of lower than 1 are classified as inefficient. DMUs under 1, even in the most advantageous situation, do not have a group of multipliers that would allow them to achieve a maximum performance score (Dacosta & Lapierre). This simple individual efficiency score is an easily interpretable scalar measure of performance (Nyhan & Martin, 1999b).

DEA is a body of concepts and methodologies that have been incorporated into a collection of models (Charnes, Cooper, Lewin & Seiford, 1994). The two most common DEA models, CCR and BCC, are based on differing returns to scale (Nyhan & Martin, 1999b). The CCR model assumes "constant returns to scale," while the BCC model assumes "variable returns to scale." In the CCR model, it is assumed that all providers, large or small, will produce the same amount of output for a given amount of input: one unit of input results in one unit of output. The BCC model assumes that an agency's size is important. For a given amount of input, it is assumed that large providers will produce more output than smaller providers (Nyhan & Martin, 1999b; Martin, 2002). One other aspect of modeling in DEA is measures of input and output efficiency. DEA is able to provide both measures depending on whether inputs or outputs are controllable. At the outset of any analysis, because the orientation in which technical efficiency is measured can impact the results obtained, discretion over input or output orientation must be determined: decreasing inputs or resources to make an organization more efficient based

on current output levels, or increasing outputs with the current level of inputs to increase efficiency. Because police agency size is important and inputs are controllable, this study employs BCC-Input modeling to generate the DEA IOTA score for each police organization. DEA IOTA scores were generated from the computer program DEA Solver.

Multivariate Analysis

The multivariate analysis was performed using a linear structural relationship (LISREL) technique, including measurement models to validate how the observed indicators measure the latent variables: population density, social economic disparity, propensity of crime, resourcefulness, and specialization. A covariance structure model is used to specify the hypothesized causal relationships among environmental constraints, design structure, and performance. The covariance structure model overcomes weaknesses of factor analysis and structural equation models by merging them into a single model (Wan 2002). The proposed covariance structure model is presented in Figure 3.

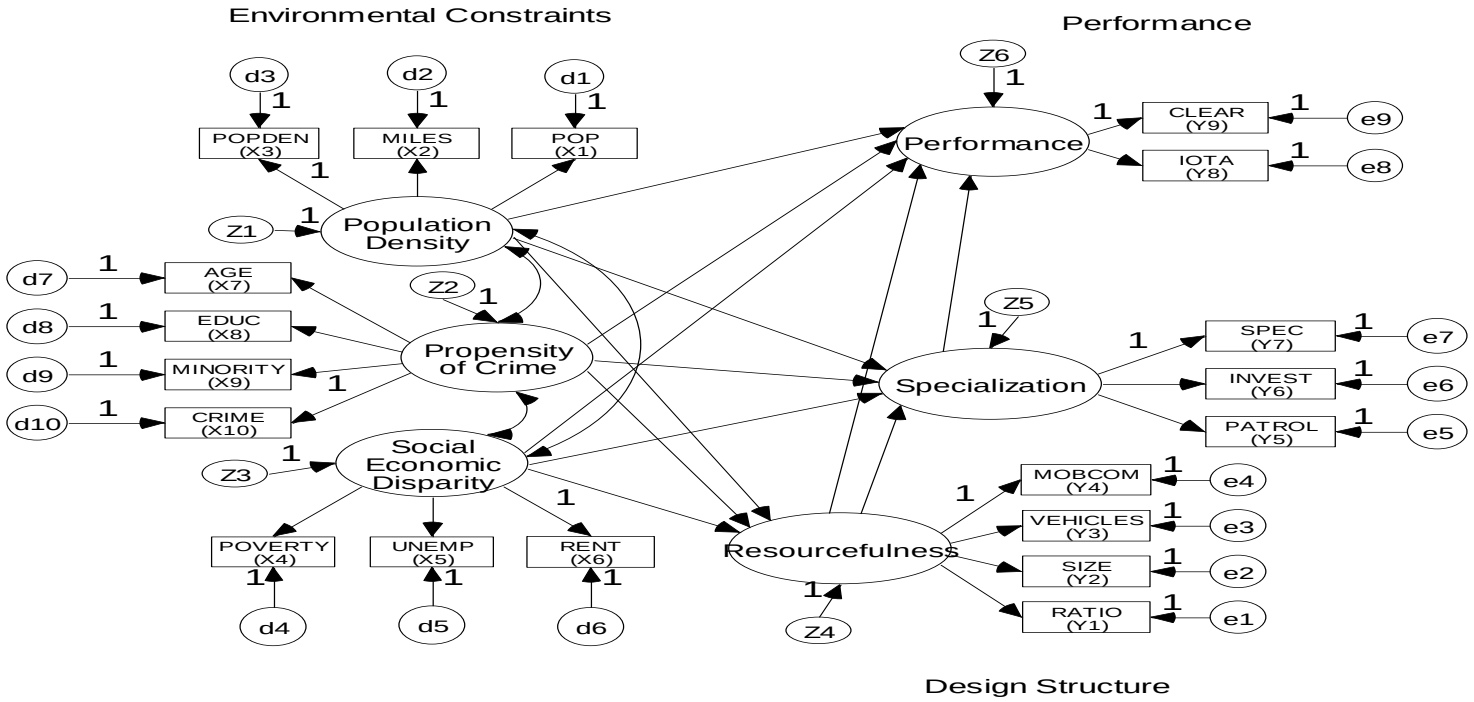


Figure 3: Proposed Covariance Structure Model

Structural Equation Model

A multivariate statistical technique is essential to demonstrate the structural relationship among multiple indicators of performance (Wan, 1995). Latent variables consist of organizational concepts that are used as endogenous variables of performance. A structural equation model is a confirmatory approach that specifies the causal relationships among latent exogenous and endogenous variables that have been identified from the observed variables through a measurement model. SEM defines the causal links among the latent variables and the effects of the exogenous variables factored in the measurement model.

According to Wan (2002), in structural equation models, the latent variable model is expressed by the equation:

$$\eta = B\,\eta + \Gamma\,\xi + \zeta$$

where

η is the latent endogenous variable or theoretical construct

B is the causal effect of an endogenous variable on another endogenous variable

Γ is the causal effect of an exogenous variable on an endogenous variable

ξ is the latent exogenous variable or theoretical construct

ζ is the residual term, or error, of the structural equation

A component of the structural model, the measurement model, is written as (Wan, 2002):

$$y = \Lambda_y\,\eta + \epsilon$$

$$x = \Lambda_x\,\xi + \delta$$

where

y is the endogenous observable variable/indicator

x is the exogenous observable variable/indicator

Λ is the factor loading or correlation between and indicator and is theoretical construct/latent variable

η is the latent endogenous variable or theoretical construct

ξ is the latent exogenous variable or theoretical construct

ϵ the measurement error of y

δ the measurement error of x

After the identification of the measurement model and structure equation model, overall model fit was assessed. Model fit identifies the degree to which the model fits the data and is determined through the following goodness of fit statistics:

Chi-Square (X^2)	$p > .05$
X^2/df	Smaller than 4
NFI	Greater than .90
CFI	Greater than .90
RMSEA	Less than .08 is acceptable, .05 or less is a good fit
HOELTER's Critical N	

A model with poor goodness of fit statistics was modified and improved by eliminating parameters that were not statistically significant.

The computer program, AMOS (Analysis of Moment Structures) 5.0, was used to create the models in this study that are precisely confirmed. AMOS is a Microsoft Windows program made up of two modules: AMOS Graphics and AMOS Basic. Models are drawn, modified, and aligned using AMOS Graphics.

Summary

This chapter explains the research design, unit of analysis, study sample, data sources, data collection and instrumentation, study variables, statistical analysis, and modeling of this study. The confirmatory approach of this study which utilizes the analytical methods of SEM and DEA is easily adapted to the analysis of police organizational performance because there are multiple indicators that effect organizational performance in policing. This integrated perspective incorporates community and environmental attributes with a police organization's structural characteristics. Furthermore, the use of structural equation models tests the full multivariate theory of police organizational performance and it allows the analyst to customize the model in many ways (Maguire, 2003).

Undoubtedly, this methodology strengthens the argument to utilize the PSMR approach discussed in Chapter 1. The variables and indicators selected for this study encompass the disciplines of sociology, political science, public administration, governmental affairs, operations and organization research, statistics, and economics, thus creating a broader and robust analysis of the affects on police organizational performance.

CHAPTER FOUR: RESULTS

This chapter presents the results of the data analysis. The data analysis methods include non-parametric efficiency analysis, descriptive analysis, confirmatory factor analysis, structural equation analysis, and path analysis. First, DEA is used to generate an efficiency score for each police organization in the study. Second, univariate, multivariate, and correlation analysis are used to present the descriptive results. Third, the validity of the measurement models of the theoretical constructs is tested and the results presented. Finally, the overall model fit and the research hypotheses are tested and confirmed with structural equation modeling and path analysis.

As indicated in the last chapter, a sample of 113 local Florida police organizations is included in this study. According to the 2005 Florida Department of Law Enforcement's Criminal Justice Agency Profile, there are 342 local (municipal and county) police organizations in the state. One hundred thirty two, or 39%, have less than 20 sworn officers. Over fifty percent of the police organizations in Florida with 20 or more sworn officers are included in this study. Table 4 lists general characteristics and frequency distributions of the study police organizations. Although 48.7% of the sample organizations are located in the central or southeast, all geographic regions in Florida are represented. Nearly two-thirds of the organizations are municipal police departments, and nearly half of the sample consists of police organizations with 20 – 99 sworn members.

Table 4: Characteristics of the Study Police Organizations

Characteristic	**Frequency (n = 113)**	**%**
Municipal Police Organizations	84	74.3
County Police Organizations	29	25.7
Number of Sworn Officers:		
Over 1,000	5	4.4
500-999	5	4.4
200-499	22	19.5
100-199	22	19.5
50-99	24	21.2
20-49	31	27.5
Under 20	4	3.5
Geographic Region in Florida:		
Northwest	13	11.5
Northeast	7	6.2
West Central Coastal	18	15.9
Central	28	24.8
East Central Coastal	14	12.4
Southwest	6	5.3
Southeast	27	23.9

Efficiency Analysis

Before descriptive and univariate analysis of the study variables was competed, the relative efficiency variable, or IOTA score was generated. Due to the inclusion of municipal and county police agencies in this study, generating a valid efficiency score for each police organization proved challenging. In the state of Florida, most county police agencies are responsible for many duties outside of routine law enforcement: corrections, court security, detention, etc… The budget input used to generate the IOTA was verified and/or revised, if needed, to ensure that is was law enforcement specific and did not include any non-policing dollars. Table 5 lists the study police organizations from largest budget (Miami-Dade Co.) to the smallest budget (Kenneth City). Additionally, the input and outputs used to generate the efficiency scores for each organization are listed in Table 5. As discussed in the methodology, the nonparametric technique, DEA BCC-Input modeling, was used to generate the IOTA score for each police organization.

According to Tables 5 and 6, the DEA scores range from very inefficient, .24, to maximum efficiency, 1.0., and the mean score is .74. Twenty three police organizations scored maximum efficiency, 1.0. The first (Miami-Dade Co.), third (Jacksonville-Duval Co.), and fifth (Miami) largest organizations in the study scored maximum efficiency. The other 20 organizations that scored maximum efficiency are significantly smaller with much smaller budgets (inputs). These efficiency findings are further discussed in relation to the relevant hypothesis (H_3) later in this chapter.

Table 5: DEA Efficiency Scores by Police Organization

Police Organization	Budget	Calls	Index Crimes	Arrests	Traffic Citations	IOTA
Miami-Dade Co.	$445,550,000	446,893	59,471	67,140	116,826	1.00
Hillsborough Co.	$283,734,896	329,423	33,080	36,742	31,241	0.42
Jacksonville-Duval Co.	$180,704,700	1,125,064	50,177	52,266	208,578	1.00
Orange Co.	$138,213,089	301,548	35,100	24,075	82,000	0.90
Miami	$112,029,171	363,983	29,455	39,113	92,698	1.00
Pinellas Co.	$106,773,271	165,008	8,773	23,524	48,591	0.57
Orlando	$92,246,093	181,229	22,027	18,785	66,332	0.83
Collier Co.	$90,034,400	302,475	6,721	20,819	56,056	0.65
Fort Lauderdale	$85,000,000	195,646	12,719	10,911	21,921	0.49
Brevard Co.	$78,300,000	385,395	5,832	18,679	42,117	0.73
St. Petersburg	$76,203,000	157,472	20,260	13,767	45,381	0.91
Lee Co.	$71,424,323	351,951	12,851	21,080	44,203	0.84
Volusia Co.	$59,035,394	64,934	5,838	19,415	38,096	0.81
Miami Beach	$54,477,639	144,119	9,294	10,611	44,285	0.65
Seminole Co.	$51,871,639	296,977	4,438	13,742	10,651	0.79
Sarasota Co.	$45,581,266	111,837	8,132	16,332	31,884	0.87
West Palm Beach	$43,594,803	129,592	8,403	6,621	20,304	0.59

Police Organization	Budget	Calls	Index Crimes	Arrests	Traffic Citations	IOTA
Tallahassee	$40,937,974	113,460	10,165	7,347	21,443	0.79
Pasco Co.	$40,822,518	110,325	12,089	18,137	22,150	1.00
Osceola Co.	$38,700,000	95,855	6,201	9,144	20,843	0.57
Charlotte Co.	$36,786,235	142,324	5,192	6,688	7,054	0.47
Clearwater	$33,243,510	158,680	6,070	9,136	24,784	0.76
Coral Springs	$32,662,770	117,446	2,866	2,917	15,553	0.37
Martin Co.	$31,737,672	230,622	3,127	6,883	7,054	0.71
Coral Gables	$31,510,169	28,286	2,360	939	17,282	0.35
Plantation	$29,960,200	55,490	3,734	2,228	24,392	0.58
Marion Co.	$29,112,042	104,752	6,332	14,726	13,907	1.00
Boca Raton	$28,126,600	58,345	3,085	2,531	31,922	0.85
Okaloosa Co.	$27,539,335	173,923	3,947	9,636	14,709	0.89
Gainesville	$27,185,348	67,473	5,843	7,718	27,928	0.82
Clay Co.	$27,135,295	317,275	4,336	6,574	14,890	1.00
Daytona Beach	$25,906,488	57,914	5,906	9,637	26,523	0.98
Sunrise	$25,383,851	78,497	3,529	2,670	14,432	0.43
St. Johns Co.	$25,229,700	133,570	3,487	9,506	18,270	0.91
Lakeland	$25,041,437,	102,301	5,482	5,898	21,248	0.70
Santa Rosa Co.	$24,678,510	129,062	2,017	7,062	5,479	0.69

Police Organization	Budget	Calls	Index Crimes	Arrests	Traffic Citations	IOTA
Cape Coral	$24,622,299	79,570	4,261	3,552	17,872	0.55
St. Lucie Co.	$23,953,336	153,176	2,364	6,976	24,106	0.89
Delray Beach	$22,979,244	24,495	3,865	2,406	11,867	0.44
Leon Co.	$22,946,536	149,921	2,085	2,922	8,731	0.53
Citrus Co.	$25,415,871	70,863	2,487	5,277	7,733	0.44
Fort Myers	$20,785,000	76,099	4,023	7,914	19,894	0.93
Melbourne	$19,000,000	67,395	4,341	5,562	24,575	0.96
Ocala	$17,666,952	59,719	4,003	4,771	7,899	0.63
Palm Bay	$16,600,000	141,455	3,751	2,483	12,105	0.79
Largo	$16,407,700	96,520	2,905	3,001	20,750	0.88
Pensacola	$15,300,000	101,628	2,872	4,582	11,409	0.79
Jupiter	$13,917,238	37,956	1,514	2,270	5,765	0.34
North Miami	$13,780,328	42,640	4,778	2,318	20,448	1.00
Palm Beach	$13,700,386	40,642	195	2,323	5,658	0.36
Nassau Co.	$13,443,826	56,000	1,826	1,397	3,087	0.35
Hallandale Beach	$13,100,000	44,000	1,839	1,244	10,000	0.47
Coconut Creek	$12,000,000	22,001	1,270	1,141	6,867	0.34
Lake Worth	$11,779,025	57,050	3,623	4,575	16,415	1.00
Winter Park	$11,579,483	91,013	888	823	13,800	0.78

Police Organization	Budget	Calls	Index Crimes	Arrests	Traffic Citations	IOTA
Pinellas Park	$11,333,817	59,821	3,080	4,283	16,161	1.00
Fort Pierce	$11,156,146	60,758	3,613	3,115	12,159	0.89
Bradenton	$10,276,802	88,003	3,150	2,851	8,329	0.80
Port Orange	$10,238,515	32,945	1,119	2,002	8,800	0.48
Flagler Co.	$9,941,100	58,902	1,578	5,017	2,910	0.98
Sanford	$9,000,000	106,000	3,917	3,367	6,816	1.00
Naples	$8,948,950	61,898	772	1,504	8,597	0.59
Altamonte Springs	$8,800,000	47,868	2,007	2,052	14,754	1.00
North Port	$7,743,308	19,701	1,246	1,824	8,467	0.59
Tamarac	$7,536,567	46,198	1,423	1,115	11,864	0.88
Lake Mary	$7,489,412	10,523	294	531	5,056	0.24
Pinecrest	$7,389,310	21,839	726	426	11,960	0.88
Apopka	$7,356,103	60,000	2,064	2,060	6,561	0.74
Jacksonville Beach	$7,377,139	55,496	1,426	3,337	6,716	0.99
Titusville	$7,239,002	58,175	1,858	1,378	5,553	0.68
Venice	$6,931,150	23,986	512	701	4,383	0.30
Cocoa	$6,901,999	29,046	1,554	2,479	11,533	1.00
Deland	$6,390,078	20,508	1,652	1,859	6,072	0.72
Stuart	$6,332,550	27,021	850	974	6,664	0.51

Police Organization	Budget	Calls	Index Crimes	Arrests	Traffic Citations	IOTA
Casselberry	$6,299,871	37,344	1,107	989	6,589	0.59
Temple Terrace	$6,100,000	21,216	1,020	1,045	3,581	0.45
Bartow	$5,200,000	11,569	1,269	816	3,296	0.61
Franklin Co.	$5,200,000	12,757	107	1,138	638	0.37
Winter Springs	$5,195,745	73,640	697	954	9,236	1.00
St. Augustine	$4,871,250	41,164	1,050	1,227	3,941	0.70
St. Cloud	$4,686,455	34,575	1,299	1,133	6,373	0.85
Winter Garden	$4,561,468	16,173	1,224	1,961	8,215	1.00
Daytona Beach Shores	$4,500,000	14,455	317	2,137	7,810	1.00
Clermont	$4,100,000	48,459	646	454	2,824	0.88
Miami Springs	$4,093,024	15,853	584	334	2,824	0.73
St. Pete Beach	$4,045,705	24,661	638	414	1,856	0.54
Key Biscayne	$4,030,712	11,406	306	19	426	0.34
Sebastian	$4,009,539	35,765	526	853	2,670	0.71
Haines City	$3,839,675	14,678	1,108	2,108	3,775	0.95
Maitland	$3,804,476	25,922	481	517	5,089	0.60
North Bay Village	$3,740,000	4,655	259	359	2,562	0.32
Gulfport	$3,668,630	17,046	645	557	2,211	0.52
Longwood	$3,627,503	42,968	687	527	5,150	0.91

Police Organization	Budget	Calls	Index Crimes	Arrests	Traffic Citations	IOTA
Lantana	$3,600,000	12,200	636	270	1,360	0.50
Zephyrhills	$3,546,796	30,840	728	604	3,003	0.72
Jackson Co.	$3,516,316	18,250	775	404	1,753	0.59
West Melbourne	$3,412,565	18,928	664	729	8,224	1.00
New Port Richey	$3,400,000	27,545	1,041	912	3,679	0.83
Mount Dora	$3,376,900	21,766	524	676	4,337	0.61
Palatka	$3,058,099	30,070	1,337	1,990	1,987	1.00
South Daytona	$2,897,596	16,215	482	799	3,833	0.64
Gilchrist Co.	$2,628,510	13,800	262	1,000	639	0.67
Taylor Co.	$2,600,279	28,841	274	852	593	0.93
Holly Hill	$2,446,200	20,975	838	1,549	2,129	1.00
Neptune Beach	$2,328,457	21,070	225	344	4,724	0.80
Avon Park	$2,300,000	13,000	401	1,120	3,600	0.90
Orange Park	$1,959,687	19,710	279	860	5,811	1.00
Alachua	$1,860,500	5,496	362	272	3,108	0.74
Indian Creek Village	$1,847,288	211	0	0	18	0.55
Crystal River	$1,700,000	20,110	363	492	3,856	1.00
Milton	$1,674,842	17,865	440	418	3,183	1.00
Fort Meade	$1,170,000	6,300	253	556	1,460	1.00

Police Organization	Budget	Calls	Index Crimes	Arrests	Traffic Citations	IOTA
Kenneth City	$1,012,471	1,205	205	63	2,892	1.00

Descriptive Analysis

Descriptive statistics of the proposed study variables are presented in Table 6. For the measurement of the environment, ten exogenous variables were proposed in three environmental constraints latent constructs: POP, MILES, POPDEN, POVERTY, UNEMP, RENT, AGE, EDUC, MINORITY, and CRIME. For the measurement of organizational design structure, seven endogenous variables were proposed: RATIO, SIZE, VEHICLES, and MOBCOM in the resourcefulness latent construct, PATROL, INVEST, and SPEC in the specialization latent construct. Lastly, organizational performance is measured by two endogenous variables: IOTA and CLEAR.

Table 6: Descriptive Statistics for Study Variables

Variable	Label	Minimum	Maximum	Mean	Standard Deviation
Population Density Construct:					
Population Served	POP	3,710	2,422,075	143,203.54	299,542.53
Square Miles of Jurisdiction	MILES	.30	2,025	233.97	425.25
Population Density	POPDEN	19.94	21,660	2,728.96	2,887.08
Social Economic Disparity Construct:					
Population Under the Poverty Level	POVERTY	2.5	33.1	12.46	6.14
Unemployment Rate	UNEMP	.60	9.5	3.16	1.35

Variable	Label	Minimum	Maximum	Mean	Standard Deviation
Renter-Occupied Rate	RENT	12.2	70.9	32.3	12.21
Propensity of Crime Construct:					
Population Age 15-24	AGE	2.7	32.6	11.89	4.34
Population of Age 25 or Higher With No High School Education or Higher	EDUC	4.3	47.3	18.28	8.09
Minority Population	MINORITY	1.9	65.2	19.56	12.51
Crime Rate per 1,000 Population	CRIME	1,515.4	11,986.7	4,771.56	2,262.9
Resourcefulness Construct:					
Officer Ratio per 1,000 Population	RATIO	.95	7.81	2.35	1.0
Size (Sworn and Civilian Employees) per 1,000 Population	SIZE	.78	267.86	5.84	25.50
Police Vehicles per 1,000 population	VEHICLES	.77	160.71	4.05	15.26
Mobile Computers per 1,000 population	MOBCOM	.43	35.71	2.05	3.39

Variable	Label	Minimum	Maximum	Mean	Standard Deviation
Specialization Construct:					
Officers Assigned to Patrol	PATROL	.26	.84	.57	.12
% of Officers Assigned to Criminal Investigations	INVEST	.03	.33	.13	.05
% of Officers Assigned to Other Specialized Units	SPEC	.01	.66	.29	.13
Combined variables of INVEST and SPEC	INVSPEC*	.00	.74	.42	.13
Performance Indicators:					
DEA IOTA Score	IOTA	.24	1.0	.74	.22
Clearance Rates	CLEAR	8.5	54.1	24.97	8.85

* INVSPEC is the combined variables of INVEST and SPEC for observation of organizational specialization in the study

After completing analysis on an initial covariance structure model, it was determined that the three resource variables of SIZE, VEHICLES, and MOBCOM needed to be changed from a reported number of each resource to a ratio. Each variable was divided by the population served by the police organization and multiplied by 1,000 to reflect the resource per 1,000 population.

This ratio conversion corrected problems to the covariance structure modeling. The statistics for the converted resource variables are listed in Table 6 and 7.

Univariate Analysis

Structural equation modeling assumes that data have a normal distribution. The violation of the normality assumption may bias the statistics. The skewness statistic, kurtosis statistic, and Shapiro-Wilk Test were used to assess the normality of the distribution of each variable. A skewness ratio with a value near zero indicates no skewness in the distribution of the variable, and a kurtosis ratio less than three is acceptable. Furthermore, a Shapiro-Wilk p-value of .05 or higher indicates a normal distribution. Table 7 lists the skewness, kurtosis, and normality test statistics for the study variables. As indicated, most study variables, with the exception of PATROL, SPEC, and IOTA are not normally distributed. Consequently, the variables of POP, MILES, POPDEN, POVERTY, UNEMP, RENT, AGE, EDUC, MINORITY, CRIME, RATIO, SIZE, VEHICLES, MOBCOM, INVEST, and CLEAR were transformed using the method listed in Table 7. The normality statistics for the transformed variables are also listed.

Table 7: Skewness, Kurtosis, and Normality Test for Study Variables

	Skewness			Kurtosis			Shapiro-Wilk		Transformation
Variable	**Statistic**	**Std. Error**	**Ratio**	**Statistic**	**Std. Error**	**Ratio**	**Statistic**	**Sig.**	**Method**
POP	4.965	.228	21.78	31.602	.453	69.76	.460	.000	Log10
POP (Log10)	.452	.228	1.98	-.381	.453	-.84	.975	.033	
MILES	2.184	.228	9.42	4.788	.453	10.57	.610	.000	Log10
MILES (Log10)	.465	.228	.20	-.847	.453	-1.87	.918	.000	
POPDEN	3.366	.228	14.76	17.46	.453	38.54	.715	.000	Log10
POPDEN (Log 10)	-1.192	.228	-5.22	1.508	.453	3.33	.902	.000	
POVERTY	1.115	.228	4.89	1.094	.453	2.42	.916	.000	Log10
POVERTY (Log10)	-.164	.228	-.72	.242	.453	.53	.987	.333	
UNEMP	1.523	.228	6.68	4.365	.453	9.64	.904	.000	Log10
UNEMP (Log10)	-.430	.228	-1.89	1.746	.453	3.85	.975	.034	
RENT	.788	.228	3.46	.482	.453	1.06	.953	.001	Log10

	Skewness			Kurtosis			Shapiro-Wilk		Transformation
Variable	**Statistic**	**Std. Error**	**Ratio**	**Statistic**	**Std. Error**	**Ratio**	**Statistic**	**Sig.**	**Method**
RENT (Log10)	-.095	.228	-.42	-.466	.453	-1.03	.990	.555	
AGE	2.013	.228	8.83	8.596	.453	18.98	.837	.000	Log10
AGE (Log10)	-.780	.228	-3.42	3.857	.453	8.51	.908	.000	
EDUC	.968	.228	4.23	1.329	.453	2.93	.944	.000	Log10
EDUC (Log10)	-.429	.228	-1.88	.311	.453	.69	.981	.123	
MINORITY	.971	.228	4.26	.696	.453	1.54	.925	.000	Log10
MINORITY (Log10)	-.473	.228	2.07	-.058	.453	-.13	.979	.079	
CRIME	.816	.228	3.58	.176	.453	.39	.938	.015	Log10
CRIME (Log10)	-.055	.228	-.24	-.822	.453	-1.81	.983	.160	
RATIO	2.357	.234	10.07	9.874	.463	21.33	.826	.000	Log10
RATIO (Log10)	.243	.234	1.04	.931	.463	2.01	.980	.101	
SIZE	10.33	.233	44.33	107.07	.461	232.26	.103	.000	Log10

	Skewness			Kurtosis			Shapiro-Wilk		Transformation
Variable	**Statistic**	**Std. Error**	**Ratio**	**Statistic**	**Std. Error**	**Ratio**	**Statistic**	**Sig.**	**Method**
SIZE (Log10)	3.404	.233	14.61	24.648	.461	53.47	.747	.000	
VEHICLES	10.31	.233	44.25	106.86	.461	231.80	.109	.000	Log10
VEHICLES (Log10)	3.663	.233	15.72	26.182	.461	56.79	.748	.000	
MOBCOM	9.328	.233	40.03	93.15	.461	202.60	.251	.000	Log10
MOBCOM (Log10)	.919	.233	3.94	5.143	.461	11.16	.931	.000	
PATROL	.036	.234	.15	-.410	.463	-.89	.990	.639	
INVEST	1.111	.234	4.75	2.297	.463	4.96	.934	.000	Log10
INVEST (Log10)	-.446	.234	-1.91	1.160	.463	2.51	.975	.039	
SPEC	.113	.234	.48	-.085	,463	-.18	.990	.600	
INVSPEC*	-.333	.227	-1.467	.240	.451	.532	.990	.539	
IOTA	-.427	.234	-1.87	-1.009	.453	2.23	.918	.000	
CLEAR	.914	.234	4.01	1.231	.453	2.72	.950	.000	Log10

	Skewness			Kurtosis			Shapiro-Wilk		Transformation
Variable	**Statistic**	**Std. Error**	**Ratio**	**Statistic**	**Std. Error**	**Ratio**	**Statistic**	**Sig.**	**Method**
CLEAR (Log10)	-.202	.234	-.89	.214	.453	.47	.991	.670	

* INVSPEC is the combined variables of INVEST and SPEC for observation of organizational specialization in the study

Correlation Analysis

Pearson correlation coefficients and p-values of the study variables were computed with the transformed data. Resourcefulness is measured by RATIO, SIZE, VEH, and MOB. RATIO has a high correlation with SIZE (r = .910), VEH (r = .820), and MOB (r = .614). As stated earlier, the variables of SIZE, VEH, and MOB were converted to reflect the ratio of these resources per population. The predominance of high correlations with other indicators of Resourcefulness suggests that RATIO (sworn officers per 1,000 population) duplicates other indicators, therefore it was eliminated from the Resourcefulness measurement model.

Specialization is measured by PAT, INV, and SPEC. Table 8 indicates that all three indicators have negative correlations: PAT to INV (r = -0.134), PAT to SPEC (r = -0.919), and INV to SPEC (r = -0.246). The negative correlations support theoretical specification that more officers assigned to patrol (PAT) result in less officers assigned to investigations (INV) and specialized positions (SPEC). Moreover, more officers assigned to investigations (INV) result in less specialization (SPEC). Because of the negative correlations of all indicators in this construct, INV and SPEC were combined to become an observed variable labeled INVSPEC to represent organizational specialization in the study. PAT to the observed variable of INVSPEC has a perfect negative correlation (r = -1.000). Subsequently, PAT was eliminated from the modeling. Lastly, the Performance indicators of IOTA and CLEAR had a low positive correlation (r = 0.096). Table 8 lists the correlation coefficients and p-values of the study variables.

Table 8: Correlation Matrix of Study Variables [Pearson Correlation (P-value)]

	POP	MILES	POPDEN	POV	UNEMP	RENT	AGE	EDUC	MIN	CRIME	RATIO	SIZE	VEH	MOB	PAT	INV	SPEC	IOTA	CLEAR
POP	1.000																		
MILES	0.777	1.000																	
POPDEN	-0.094	-0.700	1.000																
POV	0.050	0.095	-0.093	1.000															
UNEMP	0.149	0.000	0.159	0.616*	1.000														
RENT	0.069	-0.269	0.504	0.550*	0.652*	1.000													
AGE	0.250	0.220*	-0.064	0.457*	0.761*	0.530*	1.000												
EDUC	0.137	0.186*	-0.138	0.707	0.369	0.257	0.310	1.000											
MIN	0.192*	0.112	0.024	0.711	0.692	0.596	0.680	0.525	1.000										
CRIME	-0.137	-0.400	0.502	0.521	0.456	0.692	0.258	0.400	0.475	1.000									
RATIO	-0.636	-0.515	0.092	0.208*	0.072	0.208*	-0.193*	-0.196*	0.108	0.504	1.000								
SIZE	-0.700	-0.578	0.120	0.179	-0.039	0.155	0.238*	-0.166	0.008	0.456	0.910	1.000							
VEH	-0.549	-0.404	0.016	0.219*	0.105	0.176	-0.106	-0.172	0.091	0.363	0.820	0.889	1.000						
MOB	-0.551	-0.444	0.074	0.162	0.132	0.195*	0.013	-0.093	0.196*	0.384	0.614	0.703	0.776	1.000					
PAT	-0.513	-0.453	0.134	-0.122	-0.166	-0.097	-0.324	-0.159	-0.265	0.076	0.427	0.406	0.237*	0.337	1.000				
INV	0.311	0.103	0.162	0.179	0.195*	0.258	0.148	0.008	0.165	0.139	-0.060	-0.135	-0.038	-0.181	-0.134	1.000			
SPEC	0.361	0.390	-0.207	0.081	0.098	-0.018	0.247	0.167	0.204*	-0.122	-0.347	-0.302	-0.176	-0.232*	-0.919	-0.246	1.000		
IOTA	0.076	0.052	0.004	0.255	0.317	0.219*	0.267	0.313	0.280	0.334	-0.081	-0.131	-0.153	0.020	-0.099	-0.124	0.164	1.000	
CLEAR	-0.030	0.144	-0.265	-0.074	-0.132	-0.189*	-0.081	-0.015	-0.068	-0.150	-0.086	-0.166	-0.154	-0.053	-0.050	-0.026	-0.038	0.096	1.000

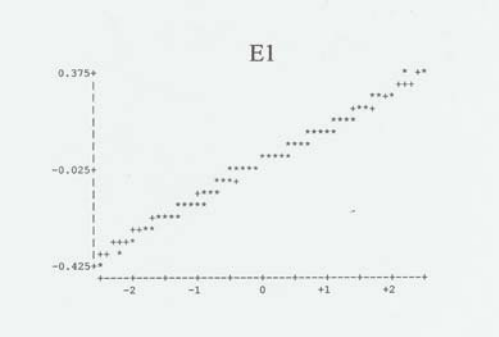
POP: population; MILES: square miles of jurisdiction; POPDEN: population density; POV: population under poverty level; UNEMP: unemployment rate; RENT: renter-occupied rate; AGE: population age 15-24; EDUC: population age 25 or higher with no high school education or higher; MIN: minority population; CRIME: crime rate per 100,000; RATIO: officer ratio per 1,000; SIZE: sworn and civilian employees; VEH: police vehicles; MOB: mobile computers; PAT: officers assigned to patrol; INV: officers assigned to criminal investigations; SPEC: officers assigned to specialized units; IOTA: DEA score; CLEAR: crime clearance rate
* Correlation is significant at the 0.05 level (2-tailed)

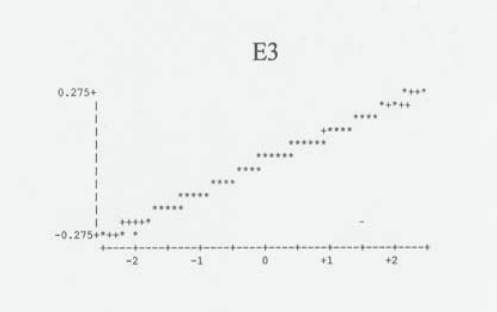
As stated, revisions to the endogenous variables have been made because of the results of the correlation analysis: 1) the RATIO variable was eliminated from the Resourcefulness construct, 2) the PATROL variable was eliminated from the Specialization construct, and 3) the INVSPEC variable was created to measure and represent organizational specialization. The INVSPEC variable is the sum of the percentages of sworn officers assigned to criminal investigations and other specialized units within the police organization. The descriptive and normality results of the INVSPEC variable have been added to Tables 6 and 7. Although nine endogenous variables were proposed, the modeling has been reduced to six: SIZE (Y_1), VEHICLES (Y_2), MOBCOM (Y_3), INVSPEC (Y_4), IOTA (Y_5), and CLEAR (Y_6).

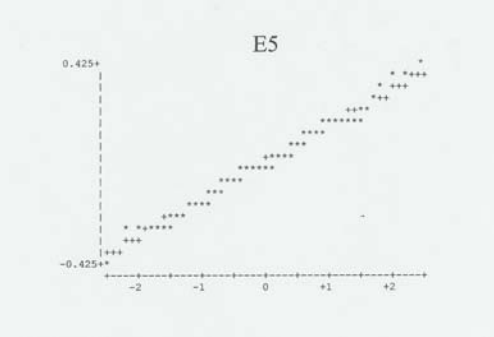
Multivariate Analysis

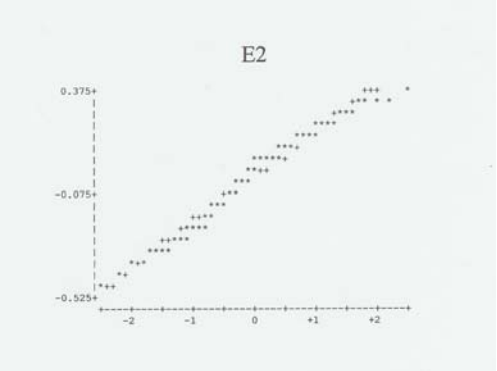
Although log transformation was used on most of the variables to improve normality distribution, the transformed variables of POPDEN, AGE, SIZE, VEHICLES, and MOBCOM have remained skewed. Further normality testing is needed to ensure that the study variables meet the requirements of structural equation modeling. Multivariate analysis is the next level of analysis used in this study to confirm the normality distribution of the study variables. The Statistical Analysis Software (SAS) 9.1 was used for multivariate analysis of the endogenous study variables: CLEAR (E1), IOTA (E2), INVSPEC (E3), SIZE (E4), VEHICLES (E5), MOBCOM (E6). To meet the assumption of multivariate regression, the residuals must be normally distributed. Several normality tests and statistics of the residuals were completed, to include: skewness and kurtosis statistics, Shapiro-Wilk, stem leaf, and normal probability plot. The normal probability plot, also called the chi-square plot, is a scatter plot that should exhibit an

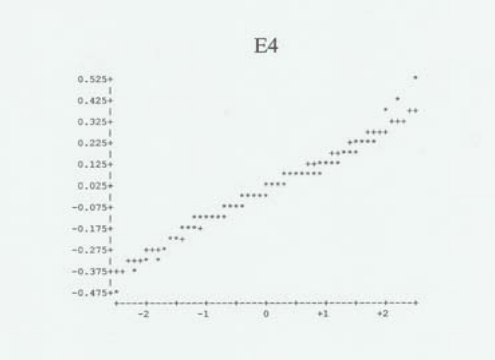
overall pattern that is nearly elliptical. The plot should resemble a straight line through the origin, and a systematic curved pattern suggests lack of normality (Johnson & Wichern, 1998). The normal probability plots for each residual are illustrated in Figure 4.











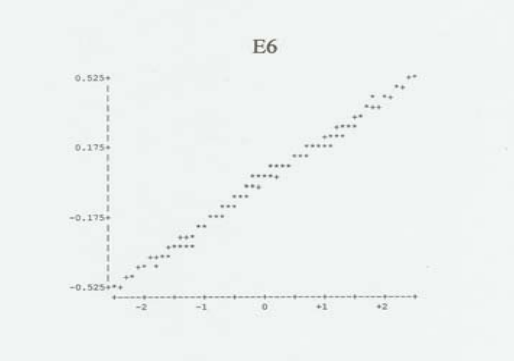


Figure 4: Normal Probability Plots

Clearly, all plots in Figure 4 appear normal. Furthermore, the SAS results indicate that 57.94% of the observations fall into 50% of the ellipse, an acceptable result. The acceptable statistics of the residuals listed in Table 9 also confirm normality.

Table 9: Normality Statistics for Residuals

	Skewness	**Kurtosis**	**Shapiro-Wilk**	**p Value**
Residual E1	-0.169	0.281	0.992	0.754
Residual E2	-0.360	-0.738	0.970	0.015
Residual E3	-0.011	-0.020	0.992	0.816
Residual E4	0.067	1.963	0.969	0.013
Residual E5	0.114	0.200	0.992	0.759
Residual E6	-0.153	-0.156	0.987	0.374

Covariance Structure Analysis

Confirmatory Factor Analysis

Before testing the hypothesized effects of the environment on structure, environment on performance, and structure on performance, measurement models of the latent constructs were evaluated. As illustrated in Figure 3 (Proposed Covariance Structure Model), three measurement models were proposed for the exogenous latent constructs and two measurement models were proposed for the endogenous latent constructs: Population Density, Propensity of Crime, Social

Economic Disparity, Resourcefulness, and Specialization. After correlation analysis, the measurement model of Specialization was eliminated by removing the PATROL variable from the study and combining the variables of INVEST and SPEC (INVSPEC).

The measurement models of Population Density, Social Economic Disparity, and Resourcefulness are "just identified" models. According to Kline (2005), a just identified model has an equal number of parameters and observations and the formula for the number of observations is v (v + 1) / 2: where v = the number of observed variables. A parameter is a path in the model and observations are the number of variances and covariances among the observed variables. Therefore, the number of observations in Population Density, Social Economic Disparity, and Resourcefulness is six, equaling the number of parameters. In a just identified model, a chi-square statistic and other goodness of fit statistics are not generated. Lambda coefficients, the linkages between the indicators and their latent constructs (Wan, 2002), and the applicable statistics for each measurement model are presented.

Measurement Model for Population Density

The proposed measurement model for Population Density included three indicators: population served (POP), miles served by police jurisdiction (MILES), and population density (POPDEN), and is a "just identified" model. The results of this model were unidentifiable. According to Kline (2005), the failure to identify a model may occur when estimates of key parameters are close to zero or equal one another.

A problem was discovered with the Population Density measurement model as proposed. POP has a large negative correlation to the resource variables of SIZE, VEHICLES, and

MOBCOM. Conversely, POPDEN has a low correlation to the Resourcefulness variables. POPDEN, or population density, is a combination of population and miles served. Therefore, POP and MILES were removed from the model and POPDEN was retained as an exogenous control variable to overcome multi-collinearity problems in the covariance model.

Measurement Model for Propensity of Crime

The measurement model of Propensity of Crime consist of four indicators: the percent of the population that is age 15-24 (AGE), the percent of the population that is age 25 or higher with no high school education or higher (EDUC), the percent of the population that is minority (MINORITY), and the crime rate per 100,000 population (CRIME). Table 10 and Table 11 list the statistics for the measurement model.

Table 10: Indicator Statistics for the Measurement Model of Propensity of Crime

Indicator	**Critical Ratio**	**Std. Regression Weights**	**Squared Multiple Correlations**
AGE ← Propensity of Crime	4.969*****	.68	.47
EDUC ← Propensity of Crime	4.354*****	.53	.29
MINORITY ← Propensity of Crime	5.733*****	1.000	1.000
CRIME ← Propensity of Crime	*****	.48	.23

***** Path parameter is significant at the .05 level

Table 10 indicates that the correlations between the four indicators and the Propensity of Crime construct are medium to very substantial. The lambda coefficients show that MINORITY is the strongest (1.000) and CRIME is the weakest (.48) indicator of propensity of crime. Furthermore, all indicators have a positive relationship with the latent variable.

Table 11: Goodness of Fit Statistics for Measurement Model of Propensity of Crime

Statistic	
Chi-square	6.364
Degrees of Freedom (df)	3
P value	0.096
Likelihood Ratio (Chi-Square/df)	2.115
Normed Fit Index (NFI)	.997
Comparative Fit Index (CFI)	.998
RMSEA	.100
HOELTER (.05)	138

The overall model fit indices in Table 11 show a good fit of the measurement model and the data. The chi-square value and likelihood ratio are low, and the fit indexes (NFI and CFI) are at least .90. The results listed in Tables 10 and 11 indicate that the theoretical specification of the Propensity of Crime measurement model is appropriate.

Measurement Model for Social Economic Disparity

The measurement model for Social Economic Disparity includes three indicators: percent of the population under the poverty level (POVERTY), percent of the population that is unemployed (UNEMP), and percent of the population that rents their residence (RENT). Social Economic Disparity is a "just identified" model, thus no goodness of fit statistics are generated for this model. The lambda scores for this measurement model are listed in Table 12.

Table 12: Indicator Statistics for the Measurement Model of Social Economic Disparity

Indicator	**Critical Ratio**	**Std. Regression Weights**	**Squared Multiple Correlations**
POVERTY ← Soc.Econ. Disparity	6.966*****	.74	.52
UNEMP← Soc. Econ. Disparity	7.200*****	.81	.72
RENT ← Soc. Econ. Disparity	*****	.80	.58

***** Path parameter is significant at the .05 level

As Table 12 indicates, the correlations between the three indicators and the Social Economic Disparity construct are significant. The lambda coefficients show that UNEMP is the strongest (.81), and RENT (.80) and POVERTY (.74) are nearly equally as significant. Furthermore, all have a positive relationship with the latent variable and are appropriate indicators of social economic disparity.

Measurement Model for Resourcefulness

The measurement model for Resourcefulness includes three indicators: SIZE, VEHICLES, and MOBCOM. Resourcefulness is a "just identified" model. The indicator statistics for this measurement model are listed in Table 13.

Table 13: Indicator Statistics for the Measurement Model of Resourcefulness

Indicator	**Critical Ratio**	**Std. Regression Weights**	**Squared Multiple Correlations**
SIZE ← Resourcefulness	10.867*****	.91	.80
VEHICLES ← Resourcefulness	11.349*****	.98	.99
MOBCOM ← Resourcefulness	*****	.79	.60

***** Path parameter is significant at the .05 level

As Table 13 indicates, the correlations between the three indicators and the Resourcefulness construct are very significant. The lambda coefficients show that all indicators are very strong: VEHICLES (.98), SIZE (.91), and MOBCOM (.79). Furthermore, all have a positive relationship with the latent variable and are appropriate indicators of police organizational resourcefulness.

Structural Equation Modeling

Structural equation modeling examined and confirmed the causal relationships between the exogenous and endogenous variables. The analysis investigated the effect and influence of environmental constraints (population, propensity of crime, and social economic disparity) on: 1) the design structure (resourcefulness and specialization) of police organizations, and 2) the performance (technical efficiency and crime clearance) of police organizations. The analysis also investigated the direct relationship between design structure and performance of police organizations. Five hypotheses representing these relationships were tested in the study.

In structural equation modeling, two sub-models were tested to develop a logical sequence for the development of the final covariance structure model. The two sub-models, the IOTA covariance structure model (Figure 5) and the CLEAR covariance structure model (Figure 6), tested the structural relationship between the environmental constraints and design structure to each performance indicator (IOTA and CLEAR), individually. Insignificant path parameters (gamma, causal effect of exogenous variable on an endogenous variable) for each sub-model were removed. The revised sub-models are illustrated, and the model statistics are presented in the next section.

Sub-Model: IOTA Covariance Structure Model

This sub-model (Figure 5) evaluates the structural relationship between the environmental constraints and design structure to the IOTA performance indicator. The results of this sub-model are presented in Table 14. Six path parameters were insignificant, did not have substantial significance to the hypothesis testing, and were removed from the model: POPDEN

→ Resourcefulness (CR = -1.455, P = .146), POPDEN → INVSPEC (CR = -1.374, P = .169), POPDEN → IOTA (CR = -1.388, P = .165), Propensity of Crime → INVSPEC (CR = 1.156, P = .247), Propensity of Crime → IOTA (CR = -.822, P = .411), and Social Economic Disparity → INVSPEC (CR = .110, P = 912). The goodness of fit statistics for the IOTA model is presented in Table 14. The statistics indicate a poor model fit with the data and this is further discussed in the next chapter, Strengths and Weaknesses section.

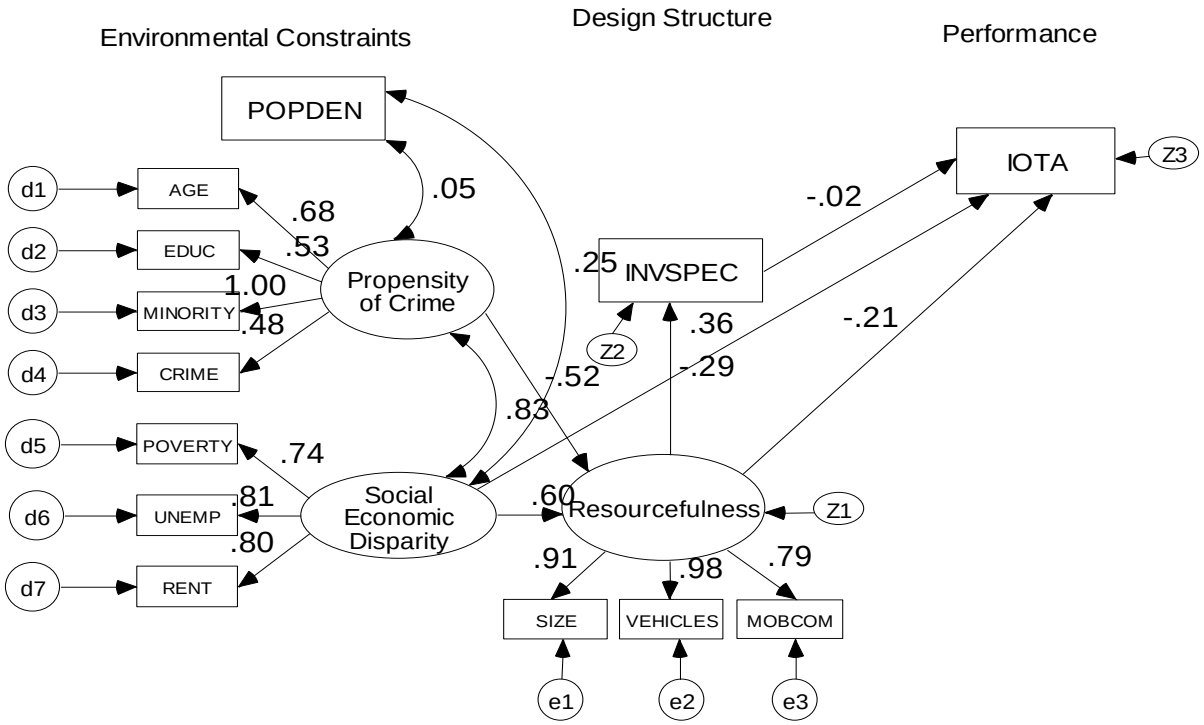


Figure 5: IOTA Covariance Structure Model

Table 14: Goodness of Fit Statistics for IOTA Covariance Structure Model

Statistic	
Chi-square	420.085
Degrees of Freedom (df)	60
P value	0.000
Likelihood Ratio (Chi-Square/df)	7.001
Normed Fit Index (NFI)	.613
Comparative Fit Index (CFI)	.638
RMSEA	.231
HOELTER (.05)	22

Sub-Model: CLEAR Covariance Structure Model

This sub-model (Figure 6) evaluates the structural relationship between the environmental constraints and design structure to the CLEAR performance indicator. The results of this sub-model are presented in Table 15. Six path parameters were insignificant, did not have substantial significance to the hypothesis testing, and were removed from the model: POPDEN → Resourcefulness (CR = -1.377, P = .168), POPDEN → INVSPEC (CR = -1.382, P = .167), Propensity of Crime → INVSPEC (CR = 1.105, P = .269), Propensity of Crime → CLEAR (CR = .464, P = .643), Social Economic Disparity → INVSPEC (CR = .171, P = .864), and Social Economic Disparity → CLEAR (CR = -.613, P = .540).

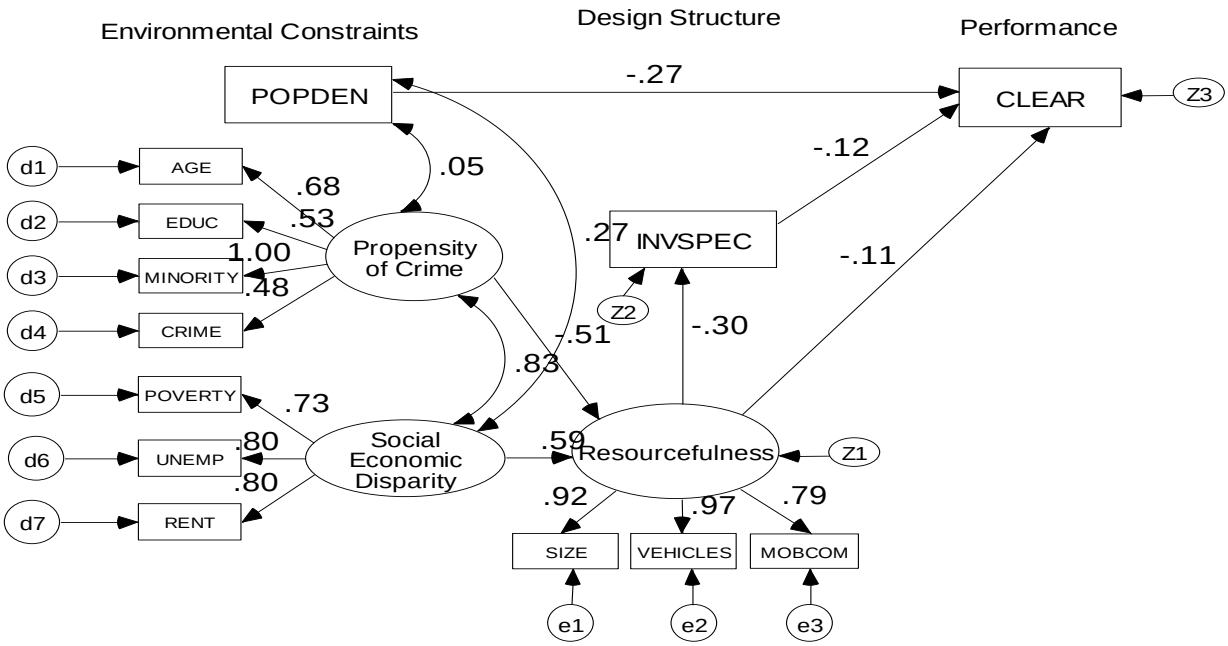


Figure 6: CLEAR Covariance Structure Model

Table 15: Goodness of Fit Statistics for CLEAR Covariance Structure Model

Statistic	
Chi-square	404.832
Degrees of Freedom (df)	60
P value	0.000
Likelihood Ratio (Chi-Square/df)	6.747
Normed Fit Index (NFI)	.620
Comparative Fit Index (CFI)	.646
RMSEA	.227
HOELTER (.05)	22

The goodness of fit statistics for the CLEAR model in Table 15 indicates a poor model fit with the data. This is further discussed in the next chapter, Strengths and Weaknesses section.

Final Covariance Structure Model

The final covariance structure model (Figure 7) combines both sub-models. This model tests five of the study hypotheses and the results confirm the causal relationships between the exogenous and endogenous variables through path analysis. Table 16 and Table 17 list the final model statistics.

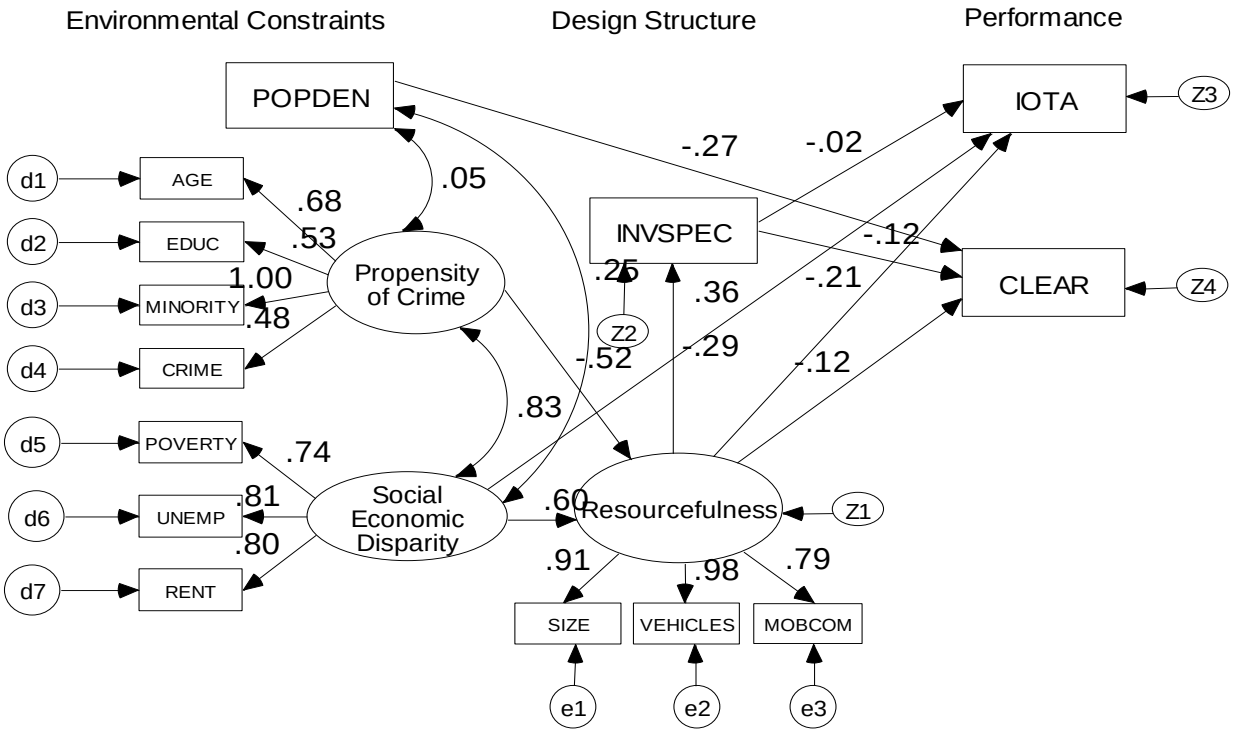


Figure 7: Final Covariance Structure Model

Table 16: Final Covariance Structure Model Path Parameter Statistics

Path Parameter	Critical Ratio	P	Std. Regression Weights
POPDEN → CLEAR	-2.977	.003	-.27
Propensity of Crime → Resourcefulness	-2.280	.023	-.52
Soc. Econ. Disparity → Resourcefulness	2.649	.008	.60
Soc. Econ. Disparity → IOTA	3.632	***	.36
Resourcefulness → INVSPEC	-3.044	.002	-.29
Resourcefulness → IOTA	-2.173	.030	-.21
Resourcefulness → CLEAR*	-1.195	.232	-.12
INVSPEC → IOTA*	-.182	.855	-.02
INVSPEC → CLEAR*	-1.298	.194	-.12
			Correlation
POPDEN ↔ Propensity of Crime	.545	.585	.05
POPDEN ↔ Soc. Econ. Disparity	2.356	.018	.25
Propensity of Crime ↔ Soc. Econ. Disparity	4.102	***	.83

* Although path parameter is not significant, it was not removed from final model because of hypotheses testing

Table 17: Goodness of Fit Statistics for Final Covariance Structure Model

Statistic	
Chi-square	425.780
Degrees of Freedom (df)	70
P value	0.000
Likelihood Ratio (Chi-Square/df)	6.083
Normed Fit Index (NFI)	.614
Comparative Fit Index (CFI)	.643
RMSEA	.213
HOELTER (.05)	24

Similar to the IOTA and CLEAR sub-models, the goodness of fit statistics for the final model indicates a poor model fit with the data. Possibilities for this result are further discussed in the next chapter, Strengths and Weaknesses section.

Hypotheses Testing

Path analysis is used to explain five of the proposed hypotheses (H_1, H_{1a}, H_{1b}, H_{1c}, H_2), and DEA was used to explain the efficiency hypothesis (H_3). Through the calculation of path coefficients, path analysis uses structural equations that represent the causal processes of the model to estimate the linkage between endogenous and exogenous variables. A path coefficient is the standardized regression coefficient and can be interpreted as the net change in the dependent variable affected by a one standard deviation change in a predetermined variable (Wan, 2002). An advantage of path analysis is the examination of the direct and indirect effects

of variables on each other. The next section of this chapter lists the path analysis results and if the results confirm the proposed hypotheses.

H1: Relationship of Environmental Constraints on Design Structure and Performance

H_1: Environmental constraints exert influences on design structure and performance of police organizations.

Hypothesis 1 confirms the influence of environmental constraints (population density, propensity of crime, and social economic disparity) on two characteristics of police organizations: design structure (resources and specialization) and performance (IOTA efficiency score and crime clearance). This hypothesis is tested through three separate hypotheses: H_{1a}, H_{1b}, and H_{1c}. The path analysis results for these hypotheses are listed in Table 18.

Table 18: Path Analysis Results for Hypotheses 1a-c

Path	**Equation**	**Result**
H_{1a}		
Propensity of Crime → Resourcefulness	N/A	-.52
Social Economic Disparity → Resourcefulness	N/A	.60
H_{1b}		
POPDEN → CLEAR	N/A	-.27
Social Economic Disparity → IOTA	N/A	.36

Path	Equation	Result
H_{1c}		
Propensity of Crime → Resourcefulness →		
IOTA	-.52 x -.21	.11
Propensity of Crime → Resourcefulness →		
CLEAR	-.52 x -.12	.17
Propensity of Crime → Resourcefulness →		
INVSPEC → IOTA	-.52 x -.29 x -.02	.00
Propensity of Crime → Resourcefulness →		
INVSPEC → CLEAR	-.52 x -.29 x -.12	-.02
Social Economic Disparity → Resourcefulness →		
IOTA	.60 x -.21	-.13
Social Economic Disparity → Resourcefulness →		
CLEAR	.60 x -.12	-.07
Social Economic Disparity → Resourcefulness →		
INVSPEC → IOTA	.60 x -.29 x -.02	.00
Social Economic Disparity → Resourcefulness →		
INVSPEC → CLEAR	.60 x -.29 x -.12	.02

H_{1a}: Environmental constraints directly affect the variation in design structure of police organizations.

Two significant paths have been analyzed to determine the direct effect environmental constraints have on the design structure, Resourcefulness and specialization (INVSPEC), of police organizations. The results in Table 18 indicate that Propensity of Crime has a significant negative direct effect on the Resourcefulness (size or employees, vehicle, and mobile computers) of a police organization (Γ = -.52) and Social Economic Disparity has a large direct effect on Resourcefulness (Γ = .60). Clearly, the gamma (Γ) results indicate that the Propensity of Crime and Social Economic Disparity directly affect police resources. The path results support and confirm the hypothesis (H_{1a}). These findings are discussed in detail in the next chapter, Theoretical Discussion of the Findings.

H_{1b}: Environmental constraints directly affect the variation in performance of police organizations.

Two significant paths have been analyzed to determine the direct effect environmental constraints have on the performance, efficiency (IOTA) and crime clearance (CLEAR), of police organizations. POPDEN has a negative medium direct effect on CLEAR (Γ = -.27), and Social Economic Disparity has a medium direct effect on IOTA (Γ = .36). The path results confirm and support this hypothesis (H_{1b}). These findings are discussed in detail in the next chapter, Theoretical Discussion of the Findings.

H_{1c}: Environmental constraints indirectly affect the variation in performance of police organizations via organizational design structure.

Eight indirect compound paths were analyzed, and path equations were completed to determine the indirect affect of environmental constraints on police organizational performance through organizational design structure. As Table 18 indicates, all eight indirect paths have a small effect or no effect. Through organizational design structure (resources and specialization), Propensity of Crime and Social Economic Disparity has a small effect on each performance indicator: technical efficiency or IOTA (.11 + .00 + -.13 + .00 = -.02) and crime clearance or CLEAR (.17 + -.02 + -.07 + .02 = .10). The sum of the indirect compound paths concludes that this hypothesis is insignificant. These findings are discussed in detail in the next chapter, Theoretical Discussion of the Findings.

H2: The Relationship of Design Structure on Performance

Table 19: Path Analysis Results for Hypotheses 2

Path	**Equation**	**Result**
Resourcefulness → IOTA	N/A	-.21
Resourcefulness → CLEAR	N/A	-.12
Resourcefulness → INVSPEC → IOTA	-.29 x -.02	.00
Resourcefulness → INVSPEC → CLEAR	-.29 x -.12	.04
INVSPEC → IOTA	N/A	-.02
INVSPEC → CLEAR	N/A	-.12

H_2: The design structure of police organizations has a significant direct effect on the variation in performance.

As Table 19 lists, four direct paths and two indirect compound paths were analyzed to determine the effect of design structure on performance. Resourcefulness has a small negative direct effect on both performance indicators. Conversely, INVSPEC had little to no effect on the performance indicators, even when combined with Resourcefulness. This hypothesis was not confirmed because all four paths were insignificant with little or no effect. These findings are discussed in detail in the next chapter, Theoretical Discussion of the Findings.

Total Causal Effect of Environmental Constraints on Performance

The total causal effects of Environmental Constraints on the performance indicators are determined by adding the gammas (causal effect of an exogenous variable on an endogenous variable), betas (causal effect of an endogenous variable on another endogenous variable), and results of several path equations together. For IOTA, the following paths and compound paths determine the total causal effects:

Propensity of Crime → Resourcefulness → IOTA	.11
Propensity of Crime → Resourcefulness →INVSPEC → IOTA	.00
Social Economic Disparity → IOTA	.36
Social Economic Disparity → Resourcefulness → IOTA	-.13
Social Economic Disparity → Resourcefulness → INVSPEC → IOTA	.00

After adding the listed paths and compound paths together, this study indicates that the total causal effect of Environmental Constraints on the technical efficiency (IOTA) of police organizations through design structure is moderate (.34).

To determine the total causal effects of Environmental Constraints on crime clearance (CLEAR), the following paths and equations are added together:

POPDEN → CLEAR	-.27
Propensity of Crime → Resourcefulness → CLEAR	.17
Propensity of Crime → Resourcefulness →INVSPEC → CLEAR	-.02
Social Economic Disparity → Resourcefulness → CLEAR	-.07
Social Economic Disparity → Resourcefulness → INVSPEC → CLEAR	.02

After adding the listed paths and compound paths together, this study indicates that the total causal effect of Environmental Constraints on the crime clearance (CLEAR) of police organizations through design structure is small (-.17). In summary, the results of the multi-construct modeling indicates that the total causal effects of the environment, directly and indirectly through design structure, are medium on police organizational technical efficiency (IOTA) and small on the process efficiency of crime clearance (CLEAR).

H3: Small Police Organizations Are More Efficient Than Large Police Organizations

H_3: Small police organizations are more efficient than larger ones when holding all other factors constant.

This study hypothesized that small police organizations are more efficient than larger ones when holding all other factors constant. The results of the DEA analysis in Table 5 indicate unexpected findings that contradict the efficiency hypothesis (H_3). Surprisingly, three of the top five largest police organizations in the study scored maximum efficiency (1.0). Table 20 lists the organizations that scored maximum efficiency and the profile characteristics of size and population.

Table 20: Maximum Efficient Police Organizations

Organization	**Budget**	**Size (Sworn/Civilian)**	**Population Served**
Miami-Dade Co.	$445,550,000	4,970	2,422,075
Jacksonville-Duval Co.	$180,704,700	2,284	861,150
Miami	$112,029,171	1,372	386,882
Pasco Co.	$40,822,518	618	406,898
Marion Co.	$29,112,042	553	304,926
Clay Co.	$27,135,295	429	169,623
North Miami	$13,780,328	172	60,312
Lake Worth	$11,779,025	136	36,040
Pinellas Park	$11,333,817	132	48,403
Sanford	$9,000,000	138	49,252
Altamonte Springs	$8,800,000	128	42,616
Cocoa	$6,901,999	93	17,606

Organization	Budget	Size (Sworn/Civilian)	Population Served
Winter Springs	$5,195,745	88	33,321
Winter Garden	$4,561,468	74	24,610
Daytona Beach Shores	$4,500,000	45	4,661
West Melbourne	$3,412,565	34	15,059
Palatka	$3,058,099	61	11,154
Holly Hill	$2,446,200	36	12,620
Orange Park	$1,959,687	29	9,130
Crystal River	$1,700,000	21	3,710
Milton	$1,674,842	29	7,519
Fort Meade	$1,170,000	27	5,833
Kenneth City	$1,012,471	19.5	4,544

Although most of the police organizations listed in Table 20 are small and support the hypotheses, the top three organizations (Miami-Dade Co., Jacksonville-Duval Co., Miami) in the table have large budgets, a large number of employees, and deliver police services to significantly large populations, thus refuting the hypotheses. This unexpected result is explained and confirmed in the covariance models. First, the Propensity of Crime is significantly correlated to Social Economic Disparity ($\Phi = .83$). The Social Economic Disparity indicators of higher poverty, higher unemployment, and higher rental rates are highly correlated to the Propensity of Crime (age, education, minority population rate, and crime index). Second, the exogenous construct of Social Economic Disparity has a medium positive effect on IOTA ($\Gamma = .36$). In other words, an increase in Social Economic Disparity, which is highly correlated to Propensity of

Crime, leads to an increase in police technical efficiency because of increased demands on police service and more outputs (calls requiring police response, crime, arrests), thus explaining a perfect IOTA score for three large police organizations in this study that are located in urban areas with high demands for police services. It appears that Miami-Dade Co., Jacksonville-Duval Co., Miami, and the smaller organizations in the study that scored 1.0 in the efficiency analysis have optimum budgets, relative to other organizations in the study, that are an appropriate reflection of core police business of calls for service, crime, arrests, and traffic citations.

Summary

This chapter presented the results of the data analysis. For the first time, a study utilized DEA and SEM for comprehensive police organizational analysis. DEA was used to generate an efficiency score for each police organization in the study and SEM was used to confirm the causal relationships between the constructs in the study. Several steps were taken to test the modeling and study hypotheses.

First, after efficiency scores for each police organization was generated using DEA, descriptive statistics were presented for all study variables. Variables that were not normally distributed were transformed to improve skewness. Additionally, the resource variables of SIZE, VEHICLES, and MOBCOM were changed from a reported number to a ratio (the resource per 1,000 population) to correct problems with the covariance model, and the design structure variables of INVEST and SPEC were combined to fit the specification of the model.

Second, correlation analysis, a very important consideration SEM, was completed which lead to construct revisions and the elimination of some study variables. The correlation analysis

revealed that RATIO was highly correlated to the resource variables of SIZE, VEHICLES, and MOBCOM; POP was highly correlated to the resource variables of SIZE, VEHICLES, and MOBCOM; and PATROL was negatively correlated to the other indicators in Specialization and this construct was revised by combining INVSET and SPEC. Therefore, the indicators of RATIO, POP, MILES, and PATROL were removed from the study.

Third, to meet the assumption of multivariate regression after several endogenous variables remained skewed after transformation, multivariate analysis was used to confirm the normality distribution of the residuals of the endogenous study variables. To meet the assumption of multivariate regression, several normality tests and statistics of the residuals were completed to meet this assumption. The results of the multivariate analysis indicated that 57.94% of the observations fell into 50% of the ellipse, and the normal probability plots were normal.

Fourth, measurement models and the covariance structure models were analyzed. By this step, three out of the five proposed measurement models remained in the covariance modeling. Two of the measurement models, Social Economic Disparity and Resourcefulness, were just identified (equal number of parameters and observations), and the analysis of the Propensity of Crime measurement model indicated acceptable goodness of fit statistics. Two covariance structure sub-models, one for each performance indicator, were then tested to develop a logical sequence for the development of the final covariance structure model. Adjustments for correlations were made and insignificant paths that were not relevant to the hypotheses testing were removed from the sub-models. The final model confirmed the causal relationships between the exogenous and endogenous variables.

Last, path analysis confirmed the causal processes of the model by analyzing the direct, indirect, and compound paths. Although the results indicate a problem with the overall model fit

and the data, several significant paths either confirmed or discredited the proposed hypotheses. Undoubtedly, the statistical methods used in this study introduce new knowledge and science in police organizational analysis. The next, and final chapter (Conclusion), further discusses the results of this chapter, the importance of the results, and the theoretical implications of the results.

CHAPTER FIVE: CONCLUSION

The theme of this evidence-based study is "core" policing, and the purpose is two-fold: 1) to develop confirmatory police organizational analysis by validating a multi-dimensional conceptual framework that explains the relationships among environmental constraints, the design structures of police organizations, and organizational performance, and 2) analyze the relative technical efficiency of police organizations in the state of Florida and identify top performers. Structural Equation Modeling evaluated and confirmed the relationships in the modeling, and Data Envelopment Analysis evaluated the efficiency of each police organization in the study. This chapter summarizes and discusses the results and theory, the contributions of the study, strengths and weaknesses of the study, implications for police services management, scholarly implications, and recommendations for future research.

Theoretical Discussion of the Findings

The conceptual modeling is based on contingency theory and the relationships between the three constructs of the environment, structure, and performance. Conversely, isomorphic forces influence police organizations and the investigation of institutional theory was proposed. The results of the analytical methods presented in the previous chapter confirm or discredit the hypotheses, confirm the theories presented in the study, and answer the research questions:

1) What are the effects of the environment on the design structure and performance of police organizations?
2) What are the effects of design structure on police organizational performance?

3) What are characteristics of top performing police organizations in the state of Florida?

To answer research question #1, four hypotheses were proposed and twelve paths were analyzed (Table 18). The results indicate that the Social Economic Disparity indicators of poverty rates (POVERTY), unemployment rates (UNEMP), and rental rates (RENT) have a large positive effect ($\Gamma = .60$) on the police resources of sworn and civilian employees per 1,000 population (SIZE), vehicles per 1,000 population (VEHICLES), and mobile computers deployed in the field per 1,000 population (MOBCOM), and a medium effect ($\Gamma = .36$) on police efficiency (IOTA). Conversely, the Propensity of Crime indicators of percentage of the population age 15-25 (AGE), population age 25 or higher with no high school education or higher (EDUC), percentage of minority population (MINORITY), and crime rate per 100,000 (CRIME) has a large negative effect ($\Gamma = -.52$) on police resources. Population density (POPDEN) has a small to medium negative effect ($\Gamma = -.27$) on crime clearance (CLEAR). Eight indirect paths, environmental effects on performance via design structure, had no effect or a small effect.

The direct paths from the environment to resources, and environment to performance produced mixed results. Contingency theory seems to explain the large positive effects of Social Economic Disparity on Resourcefulness and IOTA. In other words, increases in poverty rates (POVERTY), unemployment rates (UNEMP), and rental rates (RENT) increase the police resources of SIZE, VEHICLES, and MOBCOM and increase organizational efficiency (IOTA): increased demands on police services generate more efficiency outputs and higher efficiency scores. Naturally, police organizational efficiency and resources seem to be shaped by the demands of the environmental Social Economic Disparity indicators, but the negative effect of

Propensity of Crime on Resourcefulness contradicts the contingency theory and requires further investigation.

The small to medium negative effect of POPDEN on CLEAR may be explained by isomorphism and institutional theory. Table 6 indicates, the mean for clearance rates is 24.97% and the mean of sworn police staffing that is assigned to criminal investigations is 13%. As population density increases, crime clearance decreases which indicates that police organizations do not properly respond to this environmental demand and this core process efficiency component of police services. The literature indicates criminal investigation is a primary police function but only approximately 10 to 20 percent of sworn personnel in medium to large police organizations are assigned to criminal investigation (Fyfe, et al., 1997). The modeling, study statistics, and the literature from nearly a decade ago confirm the influence of institutional theory on crime clearance in policing.

To answer research question #2, one hypothesis was proposed and six paths were analyzed (Table 19). Clearly, design structure has a much smaller effect on performance than the environment. Although negative, the most significant effect of design structure on performance was Resourcefulness to IOTA (β = -.21). It appears that an increase in the resources of SIZE, VEHICLES, and MOBCOM slightly decreases efficiency. Resources and INVSPEC also had an even smaller effect on CLEAR (β = -.12). Surprisingly, INVSPEC only slightly affects the performance indicators. It was proposed that the coercive, mimetic, or normative isomorphism forces, institutional theory, may explain a large effect of design structure on organizational performance. Conversely, the results indicate that the effect is minimal and institutional theory does not appear to explain this part of the conceptual model (Design Structure → Performance).

DEA was used to answer research question #3. It was proposed that small police organizations are more efficient, but three of the top five largest police organizations in the study scored maximum efficiency. Twenty three police organizations in the study scored maximum efficiency (Table 20) and the characteristics of these organizations are quite diverse: 1) population served 4,500 - 2.4 million, 2) budget range $1 million - $445 million, and 3) 19.5 – 4,970 employees. It appears that efficient police organizations operate under the contingency theory and are responsive to demands of their environments: budgets and resources are devoted to the core outputs of policing (calls for service, crime, arrests, and traffic citations).

Contributions of the Study

The methodology used in this study enhances the understanding of the relationship among the environment, design structure, and performance while subjecting environmental data and police organizational performance data to two comprehensive analytical techniques: SEM and DEA. Unlike this study, previous studies of police organizations have not employed comprehensive perspectives and this methodology can resolve the limitations of conventional statistical methods.

Although the goodness of fit statistics for the covariance models were not in the acceptable range, and there are no perfect studies in social science, the modeling developed in this study is a new contribution to police organizational and management research. The study combined data from several different sources to produce a unique data base on environment, structure, and performance of police organizations. This approach made it possible to test hypotheses that could not be tested in previous research. To test the complex theories associated

with police organizational structure and performance, the sophisticated methods and modeling utilized in this study creates a foundation for future research in this area.

Strengths and Weaknesses of the Study

The construct validity, sampling, and data are the strengths of this study that are worthy of discussion. The construct validity of the modeling developed in this study is based on logical relationships among the variables as confirmed in the literature review and methodology of this study. The comprehensive and methodical statistical techniques (efficiency analysis, univariate analysis, correlation analysis, multivariate analysis, covariance structure analysis, path analysis) tested the construct validity at all quantitative levels. All techniques offered evidence that the variables and constructs fit the modeling, did not fit the modeling, or needed revisions to fit the modeling and theoretical specification outlined in this study.

The inclusion of local police organizations only in the state of Florida is another notable strength of this study. Although institutional isomorphism is widespread throughout the policing industry, national organizational police studies that cross many state lines may reduce validity. Conversely, state specific police organizational studies increase validity because of state arrest statutes, state law enforcement accreditation standards, weather and climate stressors on police services, strength of police unions in each state, population trends, population demographics, and other environmental characteristics in a state. Moreover, this study included municipal and county police organizations of all sizes, from all geographic regions in Florida.

The study data is one other notable strength of this study. First, a full data set was collected for analysis: no mean replacement of data. Second, the inclusion of municipal and

county police agencies in this study proved challenging but adds to the validity of police service analysis throughout all communities in Florida. Extensive and relentless data follow-up was completed to ensure that all county organizational data was law enforcement, police service specific only: corrections, court security, or detention services were not reflected in budget or resource data. Last, as discussed early in Chapter 4, over fifty percent of the police organizations in Florida with 20 or more sworn officers are included in this study.

The sample size and data also strengthens the relative efficiency analysis (DEA) in the study. Table 1 lists ten studies that have utilized DEA for the analysis of police organizations. Nine of the studies analyzed a small sample, 44 or less police organizations. The largest study analyzed a sample of 163 police patrols, but was completed in New South Wales (Carrington et al., 1997). To date, this is the largest police organization study to employ DEA in the United States.

Weaknesses of the study include model fit, sample size (model power), and the reliability of clearance rates (CLEAR) as a performance measure. The goodness of fit statistics in Tables 14, 15, and 16 indicated that there is a poor fit between the data and model. The poor data fit may be explained by: 1) data quality (problems with self-reported data), 2) inadequate measurement of a construct or variable (the low squared multiple correlations of the endogenous variables of Resourcefulness: .113, INVSPEC: .083, IOTA: .146, and CLEAR: .099 may indicate that other variables may have been missed because the variable was not fully explained), 3) model configuration, and 4) a better model may be needed to fit the data.

Although the sample is a strength of the study, the sample size is a weakness and contributes to weakened model power. The final covariance model of this study (Figure 7) consists of 36 path parameters. As a general rule for model power, each parameter in SEM

requires 5-10 samples. Therefore, approximately 180 samples (police organizations) are needed to ensure model power in this study. Lastly, clearance rates may not be a reliable performance measure for several reasons. According to Walker and Katz (2002), only 36 percent of all crimes are reported, police organizations do not use the same criteria for clearing crimes despite UCR (Uniform Crime Report) guidelines, the data can be manipulated to produce an artificially higher clearance rate, and clearance rate data are not audited by outsiders.

Implications for Police Services Management

As indicated in Chapter 1, the underlying problem with current organizational performance analysis in police service delivery is the absence of research that accounts for the social, economic, design, and institutional factors that affect police organizational structure and performance. This study utilized contemporary public affairs informatics research techniques that accurately and effectively confirmed the casual effects on organizational structures and performance, and identified top performing police organizations. Thus, a new approach to police organizational analysis and comprehensive police services management research has been established: Police Services Management Research (PSMR). This research concept, which searched for structure and influences on police service delivery, encompasses a variety of disciplines: sociology, political science, public administration, governmental affairs, operations and organization research, statistics, and economics. The responsibilities of PSMR include research and theory building, collection and analysis of service delivery information and statistics, evaluation of systems and processes, and policy analysis, and a component of PSMR is the phenomenon of police organizational performance. Clearly, the methodology, latent

constructs, and variables used in thus study incorporated all the listed disciplines into one research effort.

Because of today's perceived absence and inability of evidence-based analysis of police organizational performance, this study makes a practical contribution to organization management and policy implications in policing. The policy implications and practical contributions of this study provide new knowledge and information to organizational management of police organizations. Results of this study can assist and improve budget and resource allocation decisions and policy on the micro level to optimize police organizations as the industry moves towards a business model that emphasizes improved efficiency and effectiveness, increased scrutiny of resources, and a new management performance ethic.

There will be a premium on managers with the knowledge, skills, and abilities to develop agreement on goals and strategies, and use performance measurement information in systems for managing their organizations and programs (Wholey, 1999). As an example, this study concluded that an increase in Social Economic Disparity, which is highly correlated to Propensity of Crime, leads to an increase in police technical efficiency because of increased demands on police service and more outputs (calls requiring police response, crime, arrests), thus increasing an IOTA score for large police organizations in urban areas with high demands for police services. Moreover, Social Economic Disparity has a large effect ($\Gamma = .60$) on the police resources of size (sworn and civilian employees), vehicles, and mobile computers. Highly specialized police organizations that deliver service in areas of with high social economic disparity (high poverty, high unemployment, and high rental rates) should reorganize resources to increase the outputs discussed in this study, thus increasing efficiency. Based on this study's confirmatory findings, police managers should analyze their organization to ensure their

resources are adequately policing the indicators in the exogenous constructs of Propensity of Crime and Social Economic Disparity.

Scholarly and Theoretical Implications

The primary responsibility of Police Services Management Research is theory building and the selection of a theoretical framework. The selection of the theoretical framework in this study consisted of five stages: conceptualization, model selection, critique of previous work in the field, review of evidence, and reformulation of the model. All five of these stages were carefully developed and articulated throughout this study.

First, the conceptual model for this study was based on the contingency theory and the relationships between three constructs: environment, structure, and performance. Moreover, due to the coercive, mimetic, and normative isomorphic forces that affect police organizational structure and performance, the institutional theory was presented and investigated in the conceptual and covariance structure modeling. Next, the review and critique of previous work in the police service delivery field indicated that there is agreement of the use of widely accepted variables among researchers, but no works analyzed the impact the environment has on the endogenous constructs and variables in this study nor have any works confirmed the institutional or isomorphic effects on police organizations and performance. Lastly, several stages of statistical analysis were employed to review the study data to ensure significant variables were developed and the assumptions of the methodology were met. Based on the results of in-depth statistical analysis, several revisions to the covariance structure model occurred before the final results were presented.

Recommendations for Future Research

Several suggestions for future research are proposed. First, there is a paucity of police organizational research that examines how time varying factors affect the performance of police organizations. Although this cross-sectional study introduces the explanatory power of predictor variables, further longitudinal research is needed to validate the reliability of the methods and modeling. Moreover, once results of analysis of this nature are accessed and adjustments to structure, policy, and processes are implemented by police managers, a longitudinal panel design should be developed. A panel design can be very useful for comparing the technical and process efficiency of an organization over time to determine if organizational changes are effective. Both short and long term dynamics in organizational performance can be examined with a panel study design (Wan, 2002).

Second, the low squared multiple correlations of the endogenous variables indicate that further research is needed in developing constructs and measures that fully explain the variation of indicators and variables. By increasing the squared multiple correlations of the endogenous variables, a more precise predication can be made when combining and measuring several variables together in structural equation modeling. The addition of more indicators should be investigated to add to the validity of the constructs and the theoretical specification of the modeling. Further studies should include more structure and performance characteristics of police organizations.

Third, researchers need to continue their focus on the quality of police organizational data and continue to development clear, concise, and comprehensive data collection and measurement instruments with the collaboration of police management personnel. As the policing industry continues its pursuit of efficiency analysis and business modeling, valid and reliable

measurement of data, "apples to apples," must continue to evolve from an academic and professional perspective to ensure future measures are useful to improve police service delivery.

Last, future research should include testing of this model in other states. As emphasized, studies of police service measurement that cross state lines can affect validity. Conversely, future research and measurement of police services that stays within state boundaries will not only validate the methodology and results of this study but it can lead to widespread scientific decision-making by local police organizations, thus giving police managers an alternative to the isomorphic decision-making that has influenced police service delivery throughout history.

Summary

Undoubtedly, this study provides a strong, scientific foundation for the continued evidence-based research of police organizations. Although taken from other service areas and not yet rooted in the police industry, the conceptual framework developed and confirmed in this comprehensive research appears to have significant scholarly, theoretical, and practical implications for PSMR. The results of this study present a reasonable explanation for the causal relationships between the environment, structure, and performance of police organizations. This study just "scratches the surface" of police organization analysis and it behooves researchers to continue research of this nature as police service delivery evolves into an efficiency-driven, data-driven, evidence-based generation.

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