

ABSTRACT

VANN, IRVIN BYRD III. Testing the Rocheleau Data Sharing Model on North Carolina Law Enforcement Agencies. (Under the direction of G. David Garson.)

This research tests nine hypotheses regarding computerized data sharing between public agencies. Rocheleau (1996) developed these hypotheses from private and public sector management literature. The hypotheses are grouped into three major categories: facilitating forces, internal facilitators, and inhibiting forces. From these hypotheses 13 independent variables and two dependent variables were developed.

This study developed an instrument to measure the correlation between the independent and dependent variables. The instrument was administered to police departments and sheriff offices in North Carolina from November 5th, 2003 through December 20th, 2003.

The research indicated the following six independent variables had a significant correlation with computerized data sharing in the law enforcement agencies: common goals, core functions, organizational survival, top management, Internet applications, and organizational autonomy. Respondents reported sharing computerized data with organizations that shared their common goals and supported their core functions. The respondents also shared data with selected organizations to ensure their organizational survival.

Initiating and sustaining computerized data sharing was strongly influenced by top management. However, the influence of top managers within the law enforcement agencies was more important than top management or political leadership outside of the agency. Additionally, having Internet connectivity was necessary but not sufficient to sustain data

sharing. Computerized data sharing required a certain level of skill within an agency to sustain it.

Finally, one potential impediment to computerized data sharing was agency autonomy. The concern for autonomy had two aspects. First, agencies were adamant about resisting data sharing agreement that would compromise the ability to control their data. Second, the agencies were also reluctant to share computerized data when they believed they would lose control of the interpretation of their data.

**Testing the Rocheleau Data Sharing Model On
North Carolina Law Enforcement Agencies**

By

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DEDICATION

I dedicate this work in memoriam to my parents, Irvin and Jean Vann who would not have been surprised that I chose to pursue a Doctoral degree and also to my wife Martha in thanks for her loving support throughout the process.

BIOGRAPHY

Irvin B. Vann was born in Albany, Georgia. After an initial enlistment in the U.S. Army, he earned a Bachelor of Science Degree in Physics from the University of North Carolina at Greensboro (UNCG). Before attending graduate school at North Carolina State University, he was a career Army officer serving in both active and reserve status. He began his Master of Public Administration degree while working as a National Guard Technician for the North Carolina National Guard. While studying for his Master of Public Administration (MPA), he developed an interest in Geographic Information Systems (GIS) as a decision support technology in the public sector. He received a Graduate Certificate in Geographic Information Systems during his Ph.D studies. It was his interest in information technology and its impact in the public sector that lead him to continue his education by obtaining a Ph.D in Public Administration from North Carolina State University. He presently lives in Clifton, Virginia with his wife Martha.

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TABLE OF CONTENTS

List of Tables.....	x
List of Figures.....	xiv
Chapter One: Introduction to the Study.....	1
Purpose.....	1
The Problem.....	3
Policy Relevance to Public Administration.....	7
Chapter One Summary.....	10
Chapter Two: Literature Review	12
Approach To The Literature	15
Definition	17
Hypotheses.....	18
Facilitating Forces.....	18
Internal Factors	18
Inhibiting Forces	18
Facilitating Forces.....	19
Expectation: Hypothesis One.....	20
Expectation: Hypothesis Two	22
Expectation: Hypothesis Three.....	23
Internal Facilitators	24
Expectation: Hypothesis Four.....	25
Expectation: Hypothesis Five	27
Expectation: Hypothesis Six.....	28
Inhibiting Forces	28
Expectation: Hypothesis Seven.....	29
Expectation: Hypothesis Eight.....	31
Expectation: Hypothesis Nine.....	33
Chapter Summary	33
Chapter Three: Methodology.....	36
Introduction.....	36
Research Justification	36
North Carolina Municipal and County Law Enforcement.....	37
Sampling Frame	38
Sampling	38
Validity Issues.....	39
Threats to Internal Validity.....	39
History.....	39
Selection.....	40
Interaction	40
Other Threats to Internal Validity.....	40

External Validity	41
Survey Methodology	42
Data Screening	43
Respondents And Non-Respondents	44
Data Analysis	44
Dependent Variables	45
Summary of Independent Variables	46
Moderating Variables	47
Independent and Moderating Variables Operationalization	47
Individual Computer Exchanges	47
Interest of Top Management	47
Compatibility	48
Interdependency, Common Functions, and Common Goals	48
Turbulent Environments	48
Autonomy	49
Symmetric Benefits	49
Organizational Survival	49
Demographic Variables	50
Summary of Hypotheses and Dependent Variables	50
Chapter Four. Univariate Analysis	52
Introduction	52
Demographic Variables	52
Independent Variables	53
Hardware and Software Resources	53
Email	56
Internet Applications	57
Interest of Political and Top Management	58
Data Quality	61
Common Functions	65
Common Goals	67
Organizational Survival	69
Organizational Autonomy	70
Turbulent Environments	71
Chapter Four Summary	74
Chapter Five: Bivariate Relationships and Analysis	77
Introduction	77
Hypotheses	78
Independent Variables	79
External Facilitating Forces	81
Interdependency Of Function, Common Goals, and Core Functions	81
Electronic Data Sharing and Organizational Survival	87
Turbulent Environments and Interdepartmental Data Sharing	91
Internal Facilitators	95

Interest of Top Management.....	95
Compatible Hardware and Software.....	101
Inhibiting Factors.....	111
Organizational Autonomy.....	111
Symmetric Benefits.....	117
Asymmetric Benefits and Data Quality.....	122
Summary.....	126
Hypothesis 1.....	127
Hypothesis 2.....	128
Hypothesis 3.....	129
Hypothesis 4.....	130
Hypothesis 5.....	131
Hypothesis 6.....	132
Hypothesis 7.....	133
Hypothesis 8.....	134
Hypothesis 9.....	135
Theoretical Approaches to Computerized Data Sharing.....	136
Classical Organizational Theory.....	137
Systems Theory.....	141
Interorganizational Relations.....	147
Stakeholder Theory.....	152
Theoretical Summary.....	157
Chapter Six: Further Research and Implications for Public Policy	160
Interdependency.....	161
Turbulent Conditions.....	162
Management Proximity.....	163
Data Definitions.....	164
Standard Operating Procedures and Email monitoring.....	164
Using Internet Applications.....	166
Controlling Data.....	166
Implications for Public Policy.....	168
Chapter Seven: Conclusions.....	173
Summary of Research Findings.....	175
Hypothesis One.....	176
Hypothesis Two.....	176
Hypothesis Three.....	177
Hypothesis Four.....	177
Hypothesis Five.....	178
Hypothesis Six.....	179
Hypothesis Seven.....	179
Hypothesis Eight.....	180
Hypothesis Nine.....	181
Summary.....	181

References.....185

**Appendix – Computerized Data Sharing Survey Sent to North Carolina Law
Enforcement Agencies 192**

LIST OF TABLES

Table 3.1 Dependent Variables.....	46
Table 3.2 Independent Variables	46
Table 3.3 Moderating Variables	47
Table 3.4 Hypotheses and Questions.....	51
Table 3.5 Dependent Variables and Questions.....	51
Table 4.1. Table of Independent Variables.....	53
Table 4.2. Hardware Resources	54
Table 4.3 Software Resources.....	55
Table 4.4. Number of Agencies Using the Internet In Any Official Capacity	56
Table 4.5. Percent of Employees with an Agency Email Address	57
Table 4.6. Internet Applications.....	57
Table 4.7. Most Frequent Answer for Leaders and Managers.....	59
Table 4.8. Data Quality	62
Table 4.9. Difficulty Sharing Electronic Data Due to Hardware Issues.....	63
Table 4.10. Difficulty Sharing Electronic Data Due to Software Issues	63
Table 4.11. Difficulty Sharing Electronic Data Due to Data Definitions.....	63
Table 4.12. Agencies Depending on Other Law Enforcement Agencies to Perform Their Primary Missions	64
Table 4.13. Agencies Depending on Non-Law Enforcement Agencies to Perform Their Primary Missions	64
Table 4.14. Agencies Sharing Electronic Data with Other Law Enforcement Agencies On Which They Are Not Dependent To Perform Their Primary Mission.....	65

Table 4.15. Agencies Sharing Electronic Data with Non-Law Enforcement Agencies on Which They Are Not Dependent To Perform Their Primary Mission.....	66
Table 4.16. Frequency Of Sharing Data With Common Goal Agencies.....	68
Table 4.17. Agency Perception Of Data Sharing And Organizational Autonomy.....	71
Table 4.18.The Likelihood Of An Agency Entering Into A Data Sharing Relationship That Would Limit Its Autonomy	71
Table 4.19. Frequency of Respondents Experiencing Budget Cuts.....	72
Table 4.20 Frequency of Respondents Reporting Changes in.....	73
Table 4.21 Frequency of Respondents Reporting Changes Of City Or County Manager.....	73
Table 4.22 Frequency of Respondents Reporting Changes In Political Leadership.....	73
Table 4.23 Frequency of Respondents Reporting Implementation Of Computer Statistics...	73
Table 5. 1. Hypotheses.....	78
Table 5.2. Hypothesized Effect Of Independent Variables On Electronic Data Sharing Independent Variable	80
Table 5.3. The Bivariate Relationship Between Dependence On Other Law Enforcement Agencies And Sharing Data	83
Table 5.4. The Relationship Between Dependence On Non-Law Enforcement Agencies And Sharing Data Electronically.....	84
Table 5.5. The Bivariate Relationship Between Sharing Data With Groups Supporting Law Enforcement Goals and Sharing Data Electronically.....	85
Table 5.6. The Bivariate Relationship Between Electronic Data Sharing With Local Budget Department And Sharing Requests For Data Electronically	89
Table 5.7. The Bivariate Relationship Between Supplementing Budgets By Data Sharing And Sharing Requests For Data Electronically	90
Table 5. 8. Questions of Environmental Turbulence with Range of Responses.....	93
Table 5.9. Interest Of Political And Top Management In Sharing Electronic Data.....	97

Table 5.10. The Bivariate Relationship Of The Interest Of Police Chiefs In Electronic Data Sharing By Agencies Sharing Electronic Data	98
Table 5.11. The Bivariate Relationship Of The Interest Of Sheriffs In Electronic Data Sharing By Agencies Sharing Electronic Data (Data Imputation).....	99
Table 5.12. Bivariate Relationship Between Different Data Definitions And Sharing Data Electronically	103
Table 5.13. Bivariate Relationship Of Software Difficulties And Sharing Data Electronically.....	103
Table 5.14 Bivariate Relationship Between Difficulty With Hardware And Sharing Data Electronically (Data Imputation)	104
Table 5.15. Bivariate Relationship Between Differences In Data Definitions And Sharing Data Electronically (Data Imputation).....	104
Table 5.16. Bivariate Relationship of the Percentage of Employee Email and Electronically Sharing Requests for Data	107
Table 5.17. The Bivariate Relationship Of Email SOPs And Sharing Electronic Data.....	108
Table 5.18. The Bivariate Relationship Of Email Monitoring And Sharing Electronic Data	108
Table 5.19. The Bivariate Relationship Of Downloading Professional Information From The Internet By Sharing Electronic Data	109
Table 5.20. The Bivariate Relationship Of Downloading Statistical Information From The Internet By Sharing Electronic Data	109
Table 5.21. Bivariate Relationship of Previous Data Sharing Experience By Probable Effect on Agency Autonomy	114
Table 5.22. The Relationship Of Past Data Sharing Agreements By Probable Effect Of The Agreement On Agency Autonomy (Data Imputation).....	114
Table 5.23. Bivariate Relationship of Previous Data Sharing Experience By Resistance to Agreements Affecting Autonomy	115
Table 5.24. Frequency of Perceived Benefits From Data Sharing Agreements	118

Table 5.25. Frequency of Agencies Granting Requests For Data in Electronic Format	119
Table 5.26. Bivariate Relationship Between Data Sharing Benefits and Electronically Sharing Requests for Data	120
Table 5.27. Bivariate Relationship Between Data Sharing Benefits and Sharing Data with Other Law Enforcement Agencies	121
Table 5.28. Frequency of Sharing Data For No Perceived Benefit	123
Table 5.29. Recoded Data Quality Provided By Agencies Receiving No Benefits	125
Table 5.30. Summary Of Findings.....	126
Table 5. 31 Theoretical Summary, Three Organizational Theories.....	159

LIST OF FIGURES

Figure 4.1. Frequency of Police Chiefs Expressing Interest in Computerized Data Sharing .	60
Figure 4.2. Frequency of Sheriffs Chiefs Expressing Interest in Computerized Data Sharing.....	60
Figure 4.3 The Frequency of Computerized Data Sharing With Other Law Enforcement Agencies	66
Figure 4.4. The Frequency of Computerized Data Sharing With Non-Law Enforcement Agencies	67
Figure 4.5. The Frequency of Sharing With Agencies That Have Common Goals	68
Figure 4.6. Frequency Of Sharing Data To Justify.....	69
Figure 4.7. Frequency Of Sharing Data To SupplementAnnual Budget.....	70
Figure 5.1. Effect of Turbulence on Internal Data Sharing	94
Figure 5.2. Sharing Data For No Perceived Benefit.....	123
Figure 5.3. Data Quality in Asymmetric Conditions	124
Figure 5.4 Recoded Data Quality Provided By Agencies Receiving No Benefits	125

Chapter One: Introduction to the Study

Purpose

The purpose of this study is to test the Rocheleau (1996) data-sharing model by identifying factors determining the extent to which one public agency electronically shares its data with other public agencies. As computer technology has diffused, public sector agencies have invested significant resources in acquiring hardware, software, and data. For example, the technology expansion was characterized in the federal sector by ever increasing budgets for information technology (IT).

In 1996, the Government Accounting Office (GAO) reported that the federal government spent \$24 billion for information technology products and services (Government Accounting Office, 1996). By fiscal year 2003 and 2004, the budget for these services rose to \$60 billion (Office of Management and Budget, 2003). At the same time, state and local governments began to outpace the federal government in the acquisition of information technology. In 1995, it was estimated that local and state governments outspent the federal government by 50% for information technology and services (International Data Corporation, 1995).

Why have public agencies invested so heavily in information technology (IT)? One frequently cited reason is to reduce the cost and burden of collecting information from the public itself. Most citizens do not enjoy providing the same information for each transaction with a government agency. In a perfect world, certain basic information would be collected once and stored until needed by citizens to apply for government benefits, renew licenses, and initiate other transactions with government.

Furthermore, for maximum efficiency, information collected once should be shared horizontally (between agencies) as well as vertically (within agencies). The willingness of agencies to share data should reduce duplication of effort in data collection and management (Government Accounting Office, 1993). Landsbergen and Wolken (2001) noted that sharing data among public agencies potentially improves the effectiveness, efficiency, and responsiveness of government operations.

Agencies often collect data needed by other agencies but do not share it due to organizational or legal restrictions. In 2003, the OMB's associate director for information technology and e-government estimated that 20% of the public's IT investment would be spent on redundant technology and services (Chabrow, 2003). Computerized data sharing could reduce these redundant costs.

Many citizens favor data sharing among government agencies as an efficiency measure. However, the public fears a "Big Brother" system that builds and maintains profiles of law-abiding citizens by using computer matching. They fear the agencies will be sharing and collecting personally identifiable information. Most of all, citizens are concerned that personal, identifying data will be matched across different government databases as part of "fishing" expeditions.

In computerized data sharing, two important distinctions should be noted prior to this study. First, the difference between data used as part of the business of government and personally identifiable data. Personal, identifiable data can be linked to an individual and, by using a personal identifier, matched to unique records in other databases. Names and social security numbers are examples of personal identifiers.

The other data type used in the business of government is called “routine use” data. All levels of government collect this data as part of their daily operations and it is considered the information burden that is place on citizens. These data would include operational, budget, program, or other non- personally identifiable data that could often enhance another agency’s efficiency or effectiveness if it was shared.

The second set of distinctions is between the concepts of information and data. Although the terms are used interchangeably, these terms should differentiate two different aspects of computerized data. The term data best describes individual bits of information. Jones (1996) as well as Denning (1995) noted that “information” as a concept has no precise definition. Jones (1996) proposed that information is data that is combined and used for a specific purpose. Denning (1995) noted there was a qualitative aspect to the information concept. A set of data may be information to one user and meaningless to another (Denning, 1995).

This dissertation uses Jones’ (1996) definitions of information and data as one of its guides in studying computerized data sharing. As noted before, Jones (1996) defines information as being comprised of data, used for a specific purpose, and not defined by subjective judgment of its value. In regards to sharing data, Rocheleau (1996) developed nine hypotheses about public sector data sharing. The hypotheses were developed from public and private sector literature and have not been empirically tested until this study.

The Problem

Early in the public sector technology expansion, Caudle (1989) proposed shifting research from studying the impact of acquiring technology to studying inter-agency and intra-agency information management. Despite significant expenditures in information

technology, empirical research on its effect in public sector agencies has been limited (Kraemer and Dedrick, 1997; Rocheleau, 2000).

Although the value of computerized data sharing is recognized, empirical research on sharing between agencies has been limited and constitutes a gap in public sector information technology literature. In spite of its importance, little is known about the variables affecting computerized data sharing between public agencies.

Rocheleau (1995), one of the few researchers who have investigated the correlates of data sharing, studied the rate of information sharing between police and other city departments in central Illinois. In the late 1980s and early 1990s, information technology was transitioning from a mainframe terminal on every desk to personal computers on every desk. Also, the Internet was not widely used by public agencies as it is today. Sharing computerized data meant that one shared a terminal on the same mainframe or exchanged computer disks. There was limited exchange capability using local area networks (LAN) or wide area networks (WAN).

Rocheleau (1995) found the highest rate of information sharing was between the police departments and the administrative and budget departments of their respective cities. Qualitative data from the study suggested that data sharing is correlated to variables such as hierarchical authority and accountability requirements rather than the task-oriented reasons. Data sharing appeared to be a “pulling” as opposed to “pushing” activity with the police departments reacting to requests from administrators.

However, Rocheleau’s (1995) data analysis indicated that using an electronic medium generated a higher overall rate of data sharing between the police and the departments in the study. Other variables, such as hardware configurations, departmental

size and autonomy, and crime related variables, were not significantly correlated with the data sharing activity (Rocheleau, 1995).

Rocheleau (1996) later noted the majority of research on electronic communication focused on interpersonal communication rather than organizational communication. In order to explore this gap, Rocheleau (1996) used available public and private sector literature to identify factors that eased as well as inhibited computerized information exchanges between organizations.

Factors easing the exchange were: common goals, technological compatibility, legal mandates, organizational survival needs, external incentives, symmetry of benefits, individual incentives, and top management interests. The factors impeding data sharing were: need for autonomy, database incompatibilities, privacy restrictions, limitations of computerized information, and asymmetry of benefits (Rocheleau, 1996).

Dawes (1996) studied the *attitudes* of public managers about interagency information sharing in New York State. In her results she noted, “Though representing different agencies eight in ten respondents judged information sharing to be moderately to highly beneficial (Dawes, 1996 p. 391).” Although the value of information sharing was recognized, Dawes (1996) determined there were two types of managers, those who were cautious in regards to information sharing with other agencies and those who were more confident in regards to the benefits of information sharing. Data from the study indicated the managers that were less risk averse to information sharing were better educated and had more variety in their assignments than more risk adverse managers.

Although the study’s respondents recognized the benefits of data sharing, both the cautious and the confident public managers wanted a legal framework and formal policies to

guide information sharing decisions and activities. They also wanted effective tools for managing public data and for sharing it effectively (Dawes, 1996).

Dawes (1996) was the first to develop a theoretical model of interagency information sharing. The model starts with a public problem or issue suitable for information sharing. Next, the participants enter the relationship with preconceived ideas regarding the benefits and risks of information sharing. Finally, information sharing produces actual benefits and risks that influence managerial expectations and attitudes about information sharing in future projects (Dawes, 1996).

Building on Dawes' (1996) research, Landsbergen and Wolken (2001) proposed an expanded theoretical model of interagency information sharing. Dawes' (1996) model sought to explain the behavior of individual agencies. In contrast, Landsbergen and Wolken (2001) developed a progressive three-stage model with Dawes' (1996) model representing stage one.

Stage two of the Landsbergen and Wolken (2001) model proposes a three-part infrastructure incorporating technical issues, interoperability policy architecture, and institutional concerns. Landsbergen and Wolken (2001) noted, as have others, the technical "plumbing" issues of hardware and software have been largely solved.

The policy architecture aspect of stage two incorporates issues such as meta-data about useful data and movement from strictly hierarchical to more lateral communication. From the institutional perspective, Landsbergen and Wolken (2001) propose that agencies establish clearinghouses for their data and develop standard procedures for sharing information.

Stage three of the Landsbergen and Wolken (2001) model envisions that information sharing will be generally enabled by the architectures of stage two as well as the policy environment. In the final stage of the model, agencies at the different levels of government are interoperable. To Landsbergen and Wolken (2001) the concept of interoperability implies that the various levels of government work together by capitalizing on information sharing.

Policy Relevance to Public Administration

Since the tragic events of September 11, 2001, a new focus regarding data sharing among different agencies and levels of government has developed. Much of this focus centers on specialized intelligence shared within law enforcement and national security channels. However, the business of government involves more than vertically sharing specialized data within narrow channels.

As previously noted, one purpose for sharing computerized data between public agencies is to reduce the information burden on citizens. The federal government has made the most visible and concerted effort to reduce this burden. In an effort to reduce costs and the information collection burdens, Congress passed the Paperwork Reduction Act of 1980 (PRA) (Paperwork Reduction Act, 1980). The PRA of 1980 built upon previous efforts to reduce government paperwork. It was the first major legislation to manage government information as a resource, and assigned one agency to establish guidance and monitor its use.

Despite both the Paperwork Reduction Act and investments in technology, the GAO observed that the paperwork burdens on citizens by the federal government were increasing rather than decreasing (Government Accounting Office, 2002). One issue limiting the

effectiveness of information technology is the “stand alone” nature of the systems agencies acquired.

The George W. Bush administration contends that agency-centered information technology initiatives have limited the federal government’s productivity gains and level of citizen service (Office of Management and Budget, 2002). One of the major objectives of the Bush administration’s e-government strategy is to overcome the silo approach to implementing information technology (Office of Management and Budget, 2002). In February 2002, a presidential task force identified 24 government-wide initiatives for integration across agency boundaries that would potentially save at least \$1 billion in various technical and administrative costs (Office of Management and Budget, 2002).

The “e-government” paradigm is a recent development in the study of public management information systems (PMIS). In its conceptual form, e-government is the delivery of citizen services using Internet technology. E-government has a five-stage typology ranging from an emerging Web presence, such as agency Web pages, to a seamless Web presence cutting across different agencies. The ultimate goal of e-government is transparent service delivery to the average citizen.

Transparent service delivery in e-government means that citizens are unaware of the origin of the information used to complete their transaction. For example, for a citizen applying for government benefits at a public kiosk, information to complete the transaction could be drawn from records located at agencies as diverse as the Veterans Administration (VA) and Health and Human Services (HHS). Public agencies will achieve the goal of transparency only by data sharing.

E-government as proposed by the Bush administration closely resembles the third stage of the Landsbergen and Wolken (2001) model. The e-government model is envisioned as a one-stop, citizen-centric, result-oriented, and market-based approach. The e-government model will attempt to achieve those goals by connecting the isolated information islands that characterize many government agencies as well as streamlining a variety of information collection processes (Office of Management and Budget, 2002). For e-government to be a reality, the architecture proposed for implementing this strategy requires an unparalleled effort in sharing computerized data.

At the agency level, e-government has the potential to change the traditional bureaucratic paradigm from an inward to more outward focus (Ho, 2002). Achieving transparency in e-government requires abandoning the traditional command and control focus and embracing the concepts of facilitation and coordination (Ho, 2002).

Moon (2002) noted that local governments are following the federal government in establishing Web sites and placing more information and routine transactions online. However, Moon (2002) also noted that despite the widespread start up of e-government, most municipalities in the 2000 International County Manager Association (ICMA) survey remain in the initial stages of the e-government typology.

According to Moon's (2002) analysis, most municipalities are in stages one and two with very few advancing to stage three and beyond. The first stage described by Moon (2002) is information dissemination and cataloging. At this stage, information rather than data is "pushed" internally and externally by using the World Wide Web or electronic bulletin boards.

The second stage of Moon's (2002) typology incorporates e-mail and electronic data interchange (EDI). Adding these capabilities enables local governments to engage in two-way electronic communications with other governments as well as citizens. At stage two, municipal agencies, such as law enforcement, are capable of participating in computerized data sharing among themselves and others outside of the law enforcement community.

Chapter One Summary

As one would expect, the public sector is the single largest collector of all types of data. Beginning in the 1970s, governments at all levels made large investments in information technology to improve internal efficiency and service delivery. As information technology became more available, public managers and citizens became more interested in government agencies sharing routine information. However, citizens want both government efficiency and their privacy protected from prying eyes and fishing expeditions.

Since the Internet and networked computers are now widespread, there is a greater opportunity for interorganizational data sharing. Initial research about computerized data sharing began in the private sector. In the private sector, interorganizational data sharing is important for companies that desire to dominate their sector or exercise control over their inputs. In the public sector, only a small group of researchers have pursued interests in computerized data sharing.

Two groups of researchers have developed models for information sharing. Dawes (1996) proposed one model of information sharing in which the managers' experience with an information sharing project determines whether the agency will participate in future

projects. Landsbergen and Wolken (2001) developed the other by further expanding Dawes' (1996) model.

The second stage of the Landsbergen and Wolken (2001) model is concerned with the infrastructure to support data sharing. Landsbergen and Wolken (2001) see the second stage as having three aspects: technical, architectural policy, and institutional. In the third and final stage legal, managerial, and policy are synthesized to facilitate information sharing at all levels of government.

Rocheleau (1996) proposed nine hypotheses about computerized data sharing between public agencies that have not been empirically tested until this study. Rocheleau's hitherto-untested hypotheses are now more important because e-government, a major thrust of the President's Management Agenda, requires an unprecedented level of interagency data sharing.

Chapter Two: Literature Review

The literature review for this study examines both empirical research as well as case studies of information technology in the public sector. Although private sector management information systems (MIS) literature addresses data sharing issues, there is a well-developed and distinct difference between public and private sector data sharing. Information systems in private sector companies are internally focused on creating a competitive advantage for the company. In public agencies, information systems are primarily focused externally on issues of service delivery. Other differences in public agencies include greater transparency, greater political accountability, and the need to consider diffuse public objectives rather than an empirically measurable “bottom line” of profits.

In MIS literature, early research noted differences between private and public sector organizations. In their research, Mansour and Watson (1980) explored external issues such as competitiveness, product lines, etc to determine their influence on the performance of information systems. They noted these issues were problematic for understanding government information systems because government systems were not used to provide a competitive edge.

Mansour and Watson (1980) tested different models for private business and government. In their research, they validated a model for private sector information system performance, but they were unable to validate a model that would predict government information system performance. As Mansour and Watson (1980) noted, not only do government organizations function in an environment different from private business, individual government organizations have vastly different functions.

Differences in public and private information systems motivated Bozeman and Bretschneider (1986) to develop a new theoretical framework from existing MIS literature labeled Public Management Information Systems (PMIS). In the PMIS framework, the external variables are redefined to accommodate the differences between public and private organizations.

Environmental variables such as economic and political authority are hypothesized to be more influential in PMIS than private sector MIS. Economic and political influences, discussed later in this study, are the primary differentiating factors for the separate models of public and private information systems. In particular, public sector managers are subject to the open scrutiny of the citizens they serve as well as absence of free market incentives for developing and implementing information systems (Bozeman and Bretschneider, 1986).

Bretschneider (1990) empirically tested the hypothesis of distinction between information systems in the public and private sector. In the study, Bretschneider (1990) determined that public and private sector information systems differed at the organizational level in their interdependence, “red tape”, evaluation of hardware and software, planning and finally the positioning of the MIS director within the organization.

Bretschneider (1990) found that public agencies were more interdependent and bound by more regulations or “red tape” in their business operations. Regarding the evaluation of hardware and software, public agencies were more focused on the “state of the art” than private sector agencies. This is due in part to the longer budget cycles found in the public sector. Public sector agencies also had more formal planning processes than private agencies. Finally, the director of MIS in public sector agencies was likely to be in a lower organizational position than in private sector organizations (Bretschneider, 1990).

Public sector information systems have evolved through three generations, the experimental, the mainframe, and the microcomputer (Anderson and Dawes, 1991). Now we are presently in the networking or fourth generation of computers (Landsbergen and Wolken, 2001). Each generation of computing offers greater opportunity for electronic data sharing and spanning organizational boundaries.

Cooperation among public agencies, in certain instances, is viewed as a public good. The e-government strategy document of the Bush administration notes that agency centered information technology initiatives have limited the federal governments' productivity gains and citizen service (Office of Management and Budget, 2002). Data sharing is one of the methods that will facilitate cooperation among agencies (Dawes, 1996; Landsbergen and Wolken, 2001). For the citizen, data sharing between agencies provides three fundamental benefits: effectiveness, efficiency, and responsiveness (Landsbergen and Wolken, 2001; Rahm, 1997). Data sharing, however, is difficult to initiate or sustain. Discussions of information sharing invariably invoke issues of "turf", "bureaucracy", and "power" to explain why agencies do not share information (Dawes, 1996).

In general, public sector information systems comprise a relatively small body of literature with few empirical studies. Kraemer and Dedrick (1997) noted the limited amount of research as well as a shifting emphasis in the literature from studying the impacts of computing in the public sector to promoting computer use. Beaumeister (1999) also noted the lack of generally relevant literature as well its lack of breadth. Computerized data sharing among public agencies is an even smaller subset of this domain.

Approach To The Literature

In reviewing the literature regarding data sharing in public sector information systems, a multiple search approach was used. The search included electronic database searches, website searches, and analysis of article references in peer-reviewed journals. The first step was to conduct an extensive search using electronic databases. The strategy for selecting the databases focused on the inclusion of peer-reviewed journals within the database. Another important strategy was employing terms commonly associated with “data sharing” and “information sharing”. In conjunction with the previous strategy, specifying the term “public” in conjunction with data or information sharing further restricted searches.

This was important as in the months following the attack on the World Trade Center, there were many articles written and published in the press about the lack of information or data sharing among public agencies. For the year 2001, the Lexis-Nexus news database listed 468 references about information sharing in the public sector. Though numerous, the references were focused on reporting about the lack of data sharing rather than studying the important aspects of it. As a database, Lexis-Nexus is focused on the general news environment rather than peer reviewed or professional literature.

By using a focused strategy, the selection of electronic databases was narrowed to Academic Search Elite, Expanded Academic ASAP, Journal Storage (JSTOR), DIALOG, Public Affairs Information Service (PAIS) International, Dissertation Abstracts, and the National Criminal Justice Reference Service (NCJRS). Each database was used to search peer reviewed journals or professional literature rather than news events.

Academic Search Elite searches among 1300 peer reviewed journals with 250 of them being focused in the public sector. Entering the term “information sharing” returned 350 references. Adding the term “public” by using the AND Boolean operator reduced the references to 27 with one of these references, Dawes (1996), being important to this study. Entering the term “data sharing” under the same conditions returned no usable references for this study.

Expanded Academic ASAP is a database that includes a variety of peer reviewed and news articles. The database contains at least 1600-refereed articles in its public administration subject area. Using the term “information sharing” returned 284 references, using it in conjunction with “public” returned 24 references. In the 24 references, one reference, Landsbergen and Wolken (2001), was important to this study.

The JSTOR database is an archive of scholarly literature, however few of the journals were directly pertinent to this study. Since the database is multi-disciplinary, it was useful for retrieving related information from disciplines other than public administration, for example articles in MIS that were published in business journals. The related information was identified by analyzing references found in articles directly related to this study. Since the database is cross-disciplinary, it was useful for retrieving corollary information from disciplines other than public administration. The corollary information was identified by analyzing references found in articles directly related to this study. For example, important references from authors who contributed to interorganizational theory such as Schermerhorn, Oliver, Van de Ven, etc. were located using this database.

The DIALOG database is a commercial database that allows selection of peer reviewed journals. It is comprised of over 900 individual databases. Searching this database

using the same search criteria as previously mentioned returned 60 possible research items. Of the sixty items, four of them were important to this study. The most important was Dawes' (1996) research on the risks and rewards of data sharing.

The Public Affairs Information Service (PAIS) database includes the literature of public policy, social policy, and the social sciences in general beginning in 1972. Using "data", "sharing", and "public" the PAIS database returned 18 potential records to use in research. Of the 18, one item was of interest. The item was *Sharing Geographic Information* by Harland J. Onsrud and Gerard Rushton (eds.). The Rocheleau (1995) article "Computers and Horizontal Information Sharing in the Public Sector" was published in this collection.

The U.S. Department of Justice maintains the National Criminal Justice Reference Service (NCJRS) database. It is a repository for professional information used in law enforcement. Using the prompts "data" and "sharing" returned a standard 500 returns. Of these 500 returns, two articles were useful to this study.

Definition

Making data sharing operational is complicated by the fact that the term is often used synonymously with data integration and information sharing. Goodhue, Wybo, and Kirsch (1992) defined data integration as a common language with standard definitions and codes. However due to the requirement for common definitions between users, integration is more restrictive and less global in nature.

Both Rocheleau (1996) and Dawes (1996) propose definitions for data sharing that are less restrictive and more global than integration. Rocheleau (1996) defined data sharing as the release of any information from a management information system and Dawes (1996) defined it as the release of *program* information in any media.

Hypotheses

The following section reviews the literature associated with Rocheleau's (1996) hypotheses. Rocheleau (1996) grouped the hypotheses into three major areas: facilitating forces, internal factors, and inhibiting forces.

Facilitating Forces

H1. Interdependency of function and common goals lead to sharing of information when the sharing is perceived by the organizations as assisting them with their core functions.

H2. The degree of interorganizational sharing of information that takes place will be positively associated with the extent to which sharing is viewed as necessary to organizational survival.

H3. Interdepartmental sharing is most likely in organizations that exist in competitive environments with rapidly changing services/products.

Internal Factors

H4. Interdepartmental and interorganizational information sharing are positively associated with the interest of top management in encouraging such sharing.

H5. Information sharing will be greater between organizations that share compatible hardware and software.

H6. Interdepartmental and interorganizational sharing will be greater in organizations that encourage individual computer exchanges (e.g. through establishment or participation in local and wide area networks, electronic mail, and bulletin board systems).

Inhibiting Forces

H7. Organizations will resist external sharing that threatens their autonomy.

H8. The degree of sharing is likely to be higher between organizations which perceive symmetry of benefits and costs.

H9. When sharing occurs despite an asymmetry of costs and benefits to the participants, there is a greater likelihood of data quality problems.

Facilitating Forces

H1. Interdependency of function and common goals lead to sharing of information when the sharing is perceived by the organization as assisting them with their core functions.

Mulford and Rogers (1982) noted that information is an organizational element and sharing it can be coordinated at any level. It is reasonable to expect common agency goals as well as interdependent functionality will lead to information sharing at least on an incidental basis. Schermerhorn (1975) noted that interorganizational cooperation is more likely where organizations recognize a mutual need or purpose. Dawes (1996) noted the potential for solving domain- level problems positively influenced managerial attitudes towards data sharing.

Law enforcement agencies in multiple jurisdictions often cooperate on unique cases perceived as a common threat to public safety. Rocheleau (1996) proposed that having similar values and socialization helps explain why they successfully share information with each other. An example of sharing in a unique case was the pursuit and eventual arrest of John Muhammad and Lee Malvo, the alleged “D.C. snipers.” The Federal Bureau of Investigation’s Director, Robert Mueller, described it as “an unprecedented large-scale effort by local, state and federal agencies working toward a single goal (Federal Bureau of Investigation, 2002).”

Creating a sustained data-sharing effort, however, is different than incidental cooperation. Even though information can be coordinated at any level, Dawes (1996) noted

that managers desired formal methods for data sharing that addressed legal, technical, and administrative issues. In 1994, several police jurisdictions centered on the Baltimore-Washington Metropolitan area in Maryland formed the Regional Crime Analysis System. Due to the mobility of crime, the primary motive for sharing data was analyzing crime trends crossing jurisdictional boundaries. Sharing crime data allowed members to understand external crime trends and their movement relative to their own jurisdiction.

As Dawes (1996) noted, managers in public agencies are more comfortable when the data sharing arrangement is formal. To facilitate the sharing process, the coalition members decided to use a variety of administrative tools to achieve essentially an integrated approach to sharing. These tools included collecting the data using a standard data entry template and sharing the common database with all of the member agencies.

Expectation: Hypothesis One

Data sharing will be positively and strongly implemented among agencies with perceived common goals thought to be consistent with and to assist in carrying out the agencies' core functions.

H2. The degree of interorganizational sharing of information that takes place will be positively associated with the extent to which sharing is viewed as necessary to organizational survival.

Katz and Kahn (1966) theorized organizations behaved as open systems that interact with their environment. One goal of interaction is to arrest the natural process of entropy by importing “energy” from the environment. Importing “energy” is key to renewal and therefore organizational survival. Farazmand (1994) noted that energy exchanges between organizations and their environment are multidimensional and include political, social,

economic, cultural, religious, technological, demographic, and interorganizational interactions. Data sharing can be one form of “energy exchange” for organizations.

Organizational survival in the public sector is a complex issue since “serving the public interest” may include significantly modifying, merging, or even dissolving a public agency. Bozeman and Straussman (1990) proposed that cooperation between agencies arises from combinations of competition, collusion, overlapping missions, and dependence on another organization’s specialization. Schermerhorn (1975) noted that resource scarcity might motivate organizations to coordinate with each other. Halpert (1982), however, stated that organizational survival, not simple resource scarcity, is the prime motivator for interorganizational coordination. Data sharing becomes an important method in locating critical resources to ensure organizational survival.

In a case study of the U.S. Bureau of Land Management (BLM) and the Forest Service, Rivera and Casias (2001) noted that during the 1990s the two agencies began data coordination in response to budget constraints and market-type incentives of the Federal Benchmarking and National Partnership for Reinventing Government programs. Critical reviews by the Government Accounting Office (GAO) resulted in budget cuts for the BLM’s Automated Land and Mineral Records System (ALMRS). The ALMRS program was the BLM’s effort to integrate all of its various databases into one super database and represented a significant investment of time, money, and expertise. Since ALMRS was a critical program for the agency, the BLM then pursued jointly funding the program with the Forest Service (Rivera and Casias, 2001). However, Rivera and Casias (2001) noted that it was only when Congress cut the ALMRS program budget and the survival of the project was in

jeopardy, did the BLM initiate coordination and data sharing with its long time rival, the Forest Service.

Expectation: Hypothesis Two

The degree of interorganizational information sharing will be strongly and positively associated with the extent to which it is perceived to be necessary to organizational survival.

H3. Interdepartmental data sharing is most likely in public organizations that exist in rapidly changing, turbulent environments.

Ideally, public agencies should be working cooperatively rather than competitively and, as Wilson noted, be “removed from the hurry and strife of politics (Wilson, 1887).” However, public agencies operate in a resource scarce environment where changes are dictated by political leadership, constituents, and fiscal restraints. At the federal level, competition among agencies for influence and budget dollars is well documented. The reinvention movement made the 1990s an era of “doing more with less” creating more environmental turbulence by blurring the operating boundaries between the private and public sector organizations.

One important aspect of the reinventing government movement that uses data sharing is results-based management. Results-based management is a process that attempts to make government agencies more proactive, agile, and results-oriented (Swiss, 2002). An important component of results-based management is scanning and reacting to environmental turbulence. Effectively reacting to a turbulent environment requires near real time data from various parts of the organization (Swiss, 2002). Interdepartmental data sharing is a solution to this requirement.

At the local government level, Rocheleau (1996) noted that basic services have remained steady for over 50 years and suggests this is an indicator of a less turbulent environment. However, despite the type of service remaining consistent, e.g. police, fire, parks, and etc., the fiscal environment for local government has changed dramatically in the last 20 years. Bozeman and Straussman (1990) noted that public sector competition is usually centered on budgetary matters, especially when one program is financed at the expense of another or additional programs are mandated but extra funds are not allocated. Budgetary competition has increased as local governments have instituted cost cutting measures to limit tax increases as well as the size of government.

In systems theory, open system organizations respond to their environment by seeking to influence it. Internal adjustments are one part of interacting with the environment (Farazmand, 1994). Rosenthal (1997) noted that agency competition or bureaucratic politics positively affects an agency's internal communication. Improvements in an agency's internal communication usually result from the belief that it may lose ground to its competitors. When faced with a crisis, agency members will rally together in response to the crisis (Rosenthal, 1997). Data sharing between departments is one important method of improving internal communication in turbulent environments.

Expectation: Hypothesis Three

Interdepartmental data sharing is moderately and positively associated with an agency's response to a turbulent and competitive environment.

Internal Facilitators

H4. Interdepartmental and interorganizational information sharing are positively associated with the interest of top management in encouraging such sharing.

One basic motivation for cooperating between agencies is a powerful extra-organizational force demanding it (Schermerhorn, 1975). At the organizational level, Oliver (1990) noted that top management motivates interorganizational relationships. In the public sector, extra-organizational forces include both political leadership and oversight agencies possessing the power to mandate cooperation or to shape it through public policy.

Many public sector technology applications develop as specific agency applications and become information islands. Extending beyond the islands often generates turf battles. If the battle is internal, strong executive leadership is the key to resolving conflicts. In the case of external sharing, both parties will have to agree to collaborate unless a federated relationship develops and one agency becomes the lead (Anderson and Dawes, 1991).

Besides voluntary cooperation, another possible force for data sharing is a mandate from political leadership. For instance, the Paperwork Reduction Act of 1995 directed the federal government to establish the government information locator service (GILS). The purpose of GILS is to aid federal agencies as well as the public in locating and accessing government information. Office of Management and Budget Bulletin 95-01 specifically states that GILS is to “reduce the information collection burden on the public by making existing information more readily available for sharing among agencies (OMB 95–01,1994).”

Based on interviews with public sector employees Northrop (2002) noted two important lessons for any successful information technology project:

- Managers must support the application and the employees using it.
- Managers must devote more resources and ongoing thought to training.

In regards to managerial support, Beaumaster (1999) as well as Northrop (2002) noted that support must be active rather than passive. Managers must do more than say “data sharing is a goal.” Managers must provide the encouragement, resources, and training to successfully implement a data-sharing project.

Studies of specific technologies also highlight the important influence of top management. Brown, O’Toole, & Brudney (1998) empirically studied the role of partnerships in geographic information systems (GIS) implementations, and noted that positive leadership helped stimulate commitment and correlated with achieving benefits from the project. Nedovic-Budic (2000) in a national case study of five regions noted that authority to act and stable project leadership were the critical success factors in GIS data sharing projects.

Expectation: Hypothesis Four

Data sharing will be strongly and positively correlated with the support of top management for data sharing projects.

H5. Information sharing will be greater between organizations that share compatible hardware and software.

Information technology in the mid-1990s was in a different state of development than it is now. Initially, hardware and software compatibility was an obstacle to data sharing. For example, one of the oldest problems in personal computing has been exchanging data between the Macintosh and Windows operating systems. Since the 1990s, more software

packages and operating systems have capabilities to translate data into other formats and cross platform applications have been developed to meet the needs of the network environment. The Internet environment itself has been designed to support cross-platform information transfer, allowing easy uploading from one hardware platform to downloading by an entirely different hardware platform.

Landsbergen and Wolken (2001) noted that hardware and software compatibility is an ever-present, but nonetheless, solvable issue. The Internet greatly facilitated applications like file sharing and email, the use of which grew exponentially during the 1990s. As noted before, many software packages have the capability to export data into other formats. However, when agencies define record categories differently, the receiving agency must use valuable resources to translate data before it can be processed, which may limit any expected gains from sharing data.

In September 2002, to support the Bush administration's e-government goals, the Office of Management and Budget selected the IBM computing grid platform and Microsoft .NET using Extensible Markup Language (XML) to serve as two service platforms for federal agencies (Daukantas, 2003). The underlying technology of these platforms allows agencies with disparate applications to share transaction engines as well as services (Daukantas, 2003). The application of this type of technology overcomes the limitations of different record definitions and formats by using XML translation schemes.

Expectation: Hypothesis Five

Based on technological improvements in the last decade, hardware and software compatibility is expected to be a weak or non-existent factor affecting the extent of data sharing among public agencies.

H6. Interdepartmental and interorganizational sharing will be greater in organizations that encourage computer exchanges by individuals (e.g. through establishment or participation in local and wide area networks, electronic mail, and bulletin board systems).

The ability to access electronic mail, bulletin boards, and connect to local and wide area networks indicates an agency has obtained a basic level of Internet connectivity. Email has become an important medium of exchanging messages between individuals and is extensively used in the public sector. In 1995, a survey of chief information officers (CIOs) in the public and private sector reported that 83% of government employees used email compared to 62 % of the private sector employees (“Government Takes Lead”, 1995).

Halpert (1982) noted any level of an agency, including rank and file individuals, could potentially engage in coordination with another agency by sharing information. Electronic mail between individuals overcomes the necessity for physical proximity that Schermerhorn (1975) noted as a correlate of interagency coordination. Although the initial exchange may not be agency-to-agency, the individual-to-individual dynamic may be a key factor in facilitating a more formal exchange later.

In an empirical study of email use by public employees Kettinger and Grover (1997) identified three general uses of email in an interorganizational context: task use, social use,

and broadcast use. Task use is centered on exchanging information regarding particular projects and work. Social use is defined as professional and personal communication between individuals. Broadcasting is defined as making information requests within a particular electronic community (Kettinger and Grover, 1997).

Kettinger and Grover's (1997) found their respondents used broadcasting significantly more than the other two. Requests to Internet "listservs" as well as bulletin boards are examples of broadcasting email. This type of email use benefits individuals and their agencies by facilitating access to expert communities beyond the organizational boundary. A moderated or controlled listserv allows individuals to share data among themselves as well as messages.

One example of such a listserv is the Crimemap listserv, accessed at <http://www.ojp.usdoj.gov/nij/maps/listserv.html>, which exists for the express purpose of sharing information about using spatial analysis to fight crime. Not only is the discussion moderated but membership is restricted and subject to the approval of the moderator. The selective environment of this listserv encourages both professional dialog and an opportunity for either information or data sharing between members.

Expectation: Hypothesis Six

Data sharing will be strongly and positively correlated with the extent to which employees are permitted to use email, listservs, and electronic bulletin boards.

Inhibiting Forces

H7. Organizations will resist external sharing that threatens their autonomy.

Mulford and Rogers (1982) defined organizational autonomy as the degree of power and control organizations exert in their environment. Meier (2000) noted that autonomy is the discretion agencies have to make decisions concerning their activities and is a dimension of their administrative power. Autonomy is important to public agencies and paradoxically they will either seek cooperation with others or resist cooperation in order to maintain it. Interorganizational cooperation potentially involves the loss of decision-making autonomy so agencies attempt to maintain power by adopting interorganizational strategies that least affect their autonomy (Van de Ven, 1976; Schermerhorn, 1975; Mulford and Rogers, 1982). Even in cases where coordination is mandated, public organizations will adopt strategies that allow them to maintain their autonomy (Mulford and Rogers, 1982).

In terms of data sharing

- Organizations seek to retain control over their information and the interpretation of it.
- Organizations will interpret mandates to coordinate information as flexibly as possible in order to protect their autonomy.

Expectation: Hypothesis Seven

Public organizations will strongly resist data sharing which threatens their autonomy.
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H8. The degree of sharing is likely to be higher between organizations that perceive symmetry of benefits and costs.

Weiss (1987) noted that despite encouragement to do so, public organizations do not coordinate as a matter of course, implying the act of coordination is costly to the agency and pursued with caution. Schermerhorn (1975) noted that interorganizational cooperation required the direct expenditure of scarce organizational resources, such as information.

Public agencies are created to fulfill special needs. Their expertise and specialized knowledge is one source of power and prestige for them. In sharing data, symmetric relationships exist when each agency perceives a benefit from the information exchange commensurate with the cost involved in providing data. Within organizational literature, it is consistently noted that agencies will voluntarily coordinate when there is some perceived net benefit to the agency (Schermerhorn, 1975; Halpert, 1982). Dawes (1996) proposed agencies benefited from data sharing in three dimensions: technical, organizational, and political and thus symmetrical benefits might occur in any of these dimensions.

In terms of Dawes' technical benefits, information sharing can provide a benefit by streamlining data management as well as enhancing information infrastructure. For example, social service agencies wishing to serve clients holistically could use an enterprise-wide approach to gather critical data once and make it available as long as the client is an active case. One benefit to the participating agencies would be the reduced cost of acquiring data one time only. Another benefit would be improving the information infrastructure so that data sharing among multiple agencies is possible (Dawes, 1996).

In terms of organizational benefits, Giodano (1998) noted that data sharing provides organizations access to previously unfamiliar data sources. Dawes (1996) noted that data sharing provides public organizations the opportunity to validate their own data by comparing information from multiple sources. Another organizational benefit is the

extended professional contacts made by individual members communicating by email (Kettinger and Grover, 1997; Dawes, 1996). The extended knowledge base of external professional contacts provides agencies with new approaches to solving problems.

In terms of political benefits, Dawes (1996) and Weiss (1987) noted that public organizations might gain political benefit from data sharing by solving domain-level problems. For example, in solving juvenile delinquency problems, if the schools, social workers, and others share data, then potential problems may be detected earlier and intervention may be more effective. Reducing a problem like juvenile delinquency may translate into political viability, policy relevance, and power for agencies involved.

In some circumstances, legislative or executive authority mandates data sharing. The mandated relationship does not allow an agency to actively assess the costs and benefits of entering the relationship. Halpert (1982) noted that mandated coordination potentially affected an agency's autonomy as well as authority. Since agencies carefully select their coordination partners, the mandated relationship may provide an opportunity for more powerful agencies to dominate less powerful partners.

Expectation: Hypothesis Eight

Except when it is mandated by outside authority, the degree of computerized data sharing will be positively and at least moderately associated with the perceived symmetry of costs and benefits between the participating agencies.

H9. When sharing occurs despite an asymmetry of costs and benefits to the participants, there is a greater likelihood of data quality problems.

Data collection and reporting within and between agencies is an integral aspect of the business of government. However, collecting information and producing reports are often seen as burdens to agencies and the public. In this environment, data quality is an ever-present issue. One aspect of data collection is the asymmetrical relationship. Asymmetrical relationships occur when one public organization benefits from a data exchange at the expense of another public agency. Asymmetrical relationships may result from mandates, funding, or reporting relationships directed by external legislative or executive action.

Halpert (1982) noted two issues regarding mandated coordination. First, mandated coordination is essentially a crisis condition for the organizations involved, especially the “subordinate” agency. The crisis develops from the internal adjustments required to meet the mandate. Second, agencies tend to interpret the mandate as flexibly as possible to maintain autonomy and preserve internal order. For example, a reporting mandate may be interpreted so strictly that any corollary information is omitted. In a case study of state health agencies, Giodano (1998) noted if federal or state laws were not specific, then agencies did not share data rather than risk violating some other regulation.

Giodano (1998) defined a high quality data exchange as being complete, comparable, and easy to use. In terms of computerized data sharing, asymmetrical relationships may produce data quality problems if the providing agency sees no benefit in the relationship (Rocheleau, 1996). A GAO (2001) report of the U.S. Navy’s Product Quality Deficiency Reporting Program found the program data incomplete and of limited value due to data quality issues in the reporting. The Product Quality Deficiency Reporting Program is a program developed in response to the Department of Defense’s mandate for each Armed Service to monitor its spare parts (Government Accounting Office, 2001). The GAO

determined that one of the leading causes of failure were no incentives, despite the mandate, to accurately report deficiencies (Government Accounting Office, 2001).

Because data quality was perceived as an issue, Congress passed the “Information Quality Act” within the fiscal year 2001 Appropriations Act. The Act directs the Office of Management and Budget (OMB) to provide guidance to federal agencies for ensuring the quality, utility, objectivity and security of information disseminated by the agencies (Office of Management and Budget, 2002b). For federal agencies, the OMB defines utility as the usefulness of the information to the intended users. Objectivity is defined as ensuring the data is factually accurate, reliable, and unbiased. Security is the act of protecting data from unauthorized access or revision (Office of Management and Budget, 2002b).

Although the intention of the Act is to provide better quality government information to the public, Graham (2002) noted the act of disseminating data is not separate from generating and using data so the new Act should have important ramifications for all government agencies. However, the Act applies only to federal government agencies and it is too early to assess any relevance to this study of local police agencies.

Expectation: Hypothesis Nine

Sharing data between agencies with an asymmetrical relationship will be correlated with data quality problems.
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Chapter Summary

Research about public sector information technology has been limited and focused on technology acquisition rather than how technology is used. During the years of rapid IT expansion, public sector agencies also acquired IT with all levels of government spending

more than the public sector. Despite investments in IT to increase efficiency, most efforts by agencies were focused inwardly creating data silos with significant amounts of redundant data.

Confounding the issue, the terms information and data are often used interchangeably when in actuality they are different concepts. Jones (1996) defined information as being comprised of data that is combined together for a particular purpose while Denning (1995) proposed that information is a subjective quality, defined by the user. Data /information sharing has often been proposed to take advantage of the immense amount of data collected by governments at all levels.

Even though research has been limited, two models of data sharing exist in public sector literature. Dawes (1996) developed a model in which a public managers experience with previous data sharing projects determines the likelihood they would engage in another one. The other model by Landsbergen and Wolken (2001) builds on Dawes' (1996) model. Landsbergen and Wolken (2001) built on Dawes' (1996) model by adding two more stages of development. Each stage involves greater interoperability and data sharing between the different levels of government.

Despite interest over the years, public sector scholars did not extensively study computerized data sharing between agencies leaving a gap in public sector IT literature. After reviewing public and private sector literature, Rocheleau (1996) identified facilitating and inhibiting forces as well as internal facilitating factors that affect organizational data sharing. Additionally Rocheleau (1996) developed the nine hypotheses about data sharing that are tested in this dissertation. Rocheleau (1996) also noted that organizations that exchange electronic data tended to have greater productivity. Until this dissertation, there has been no

empirical study of the relationship of Rocheleau's (1996) nine hypotheses and computerized data sharing.

Chapter Three: Methodology

Introduction

This chapter contains a description of the survey instrument as well as the data collection strategy. The study was a cross sectional survey assessing electronic data sharing by police and sheriff departments in North Carolina. It was conducted from November 5, 2003 until December 20, 2003. The survey also considers conditions affecting interorganizational and intraorganizational data sharing. This study focused only on North Carolina municipal and county police agencies as well as sheriff offices. Initially this study attempted to develop a census of these agencies rather than creating a representative sample.

In terms of a general classification, this study resembles a pre-experimental design where the “treatment” is already in place and observations are ex post facto (Cook and Campbell, 1979). This pre-experimental design is consistent with policy studies in public sector literature. In this study, the “treatment” was multifaceted and included having information technology and using the Internet. Additionally, the “treatment” was not the result of a single policy decision. It occurred as information technology became more widespread during the 1990s.

Research Justification

The primary reason for police or any other public agencies to acquire information technology is to improve the efficiency of their service delivery (Nunn, 2001). Information technology makes it possible to automate a variety of routine law enforcement functions as well as data collection. The number of local U.S. police agencies using computers almost doubled, from 40 to 78 percent, during the decade of the 1990s. Additionally, the rate of

Internet connectivity in municipal police agencies doubled from 24 to 56 percent from 1997 to 2000 (Hickman & Reeves, 2003).

More information technology in police agencies enabled increased computerization of police files such as incident reports, arrest reports, and calls for service. In 2003, Hickman and Reeves reported that 71 percent of local police departments serving a population greater than 2500 were computerizing these types of files. Increased computerization is a precursor for electronic data sharing.

North Carolina Municipal and County Law Enforcement

There are four major types of law enforcement agency in North Carolina: municipal police departments, sheriff offices, company police, and state level law enforcement agencies. Municipal police departments are the most numerous type of law enforcement agency in North Carolina. The Census of State and Local Law Enforcement Agencies listed 353 municipal law enforcement departments in North Carolina with one or more sworn officers (Census of State and Local Law Enforcement Agencies (CSLLEA), 2000). In contrast, the North Carolina Governor's Crime Commission (NCGCC) listed mailing addresses for 384 municipal departments.

There are 100 sheriff offices in North Carolina, one per county, with each sheriff chosen every four years in countywide elections. The sheriff's office is a function mandated by the North Carolina constitution and the numbers of sheriffs are fixed. Sheriffs are generally responsible for law enforcement in county or unincorporated areas, jail management, courtroom security, and processing and serving legal documents (NC Sheriff Association, n.d.).

The Inter-University Consortium for Political and Social Research (ICPSR) conducts the Census of State and Local Law Enforcement Agencies (CSLLEA) for the Bureau of Justice Statistics (BJS) (BJS, 2000). The CSLLEA was used in this study as the most authoritative source for the number of officers serving in the municipal police departments and sheriffs' offices.

Sampling Frame

The North Carolina Governor's Crime Commission (NCGCC) provided the sampling frame for this study. The NCGCC is the chief advisory body to the Governor as well as the Secretary for Crime Control and Public Safety for crime and public safety issues. The Commission maintains only a mailing list of police departments, sheriff offices, company police departments, as well as other types of state law enforcement agencies.

As noted before, the NCGCC mailing list had 384 entries compared to the CSLLEA census of 353 municipal police agencies, a difference of 31 agencies or approximately eight percent. The CSLLEA was not published until May 2004, after the survey for this study was completed. One possible explanation for the discrepancy is the NCGCC's list may be outdated. For example, during this study three municipalities from the NCGCC's list notified the principal investigator that they had closed their police departments.

Sampling

Initially, this study also attempted to create a census of North Carolina municipal and county police as well as the sheriffs' offices. Surveys were mailed to 384 municipal and county police departments as well as the 100 sheriffs' offices on the NCGCC's mailing list.

Validity Issues

In any study there are two general validity issues, the internal and external. Internal validity issues are concerned with defending against bias in cause and effect relationships whereas external validity issues are concerned with the generalizability of the relationship (Garson, n.d.). The following list highlights potential threats to internal validity in a classic cause and effect experiment and discusses them in the context of this study (Campbell and Stanley, 1963; Cook and Campbell, 1979, Garson, n.d.).

Threats to Internal Validity

History

History refers to outside world events that may affect a study. This study was conducted while the subject of “information sharing” between public agencies was frequently discussed in the news media. This awareness arose from investigations of information available to government agencies before the September 11, 2001 attack on the World Trade Centers and Pentagon. The perception was that many pieces of the information “puzzle” that might have prevented the attack were in separate government agencies and unavailable to create a complete picture (Kulish, 2002).

Information sharing is still a topical item in the news media. For example, searching the Lexus-Nexus news database using the term “information sharing and government” returned 125 “hits” for the period October 2003 to February 2004. Although data sharing is actually a subset of information sharing, it is possible this study benefited from increased awareness of the subject, which generated more focused responses from the participants.

Selection

This study focused on creating a census of municipal and county police as well as sheriff's departments in North Carolina. Since selection bias is an issue in sampling, the effects of selection bias would have been minimal. However, the response rate for this study was less than 100 percent making self-selection by the respondents a potential concern.

Interaction

This study does not involve multiple treatments. Potential interactions of the independent variables are not known. There is no formal "treatment" being applied, the issues of maturation, testing, regression to the mean, selection, and mortality are considered minimal. The issue of history, however, may affect the survey positively by sensitizing the respondents to information sharing and by extension, data sharing. Interactions between the independent variables are possible but the manifestation is unknown as there is no previous research using these particular variables.

Other Threats to Internal Validity

Six classical threats to internal validity did not apply to this study: maturation, test experience, mortality, instrumentation, and regression to the mean. Maturation is a threat when the respondent's experience threatens to alter their responses over time. The subjects in this study are organizations surveyed over a short period. There was no pretesting of the actual respondents so test experience was not a threat to the internal validity. The instrumentation threat refers to change of the measuring instrument. There was only one instrument so changes in variables or instruments were not a validity threat. Mortality is an issue when respondents leave a study over time so that a sample no longer resembles a population. This study was two months in duration so mortality was not a threat to internal

validity. Regression to the mean occurs when respondents are chosen for scores above or below a certain mean. There is no established mean of data sharing so there was no selection based on scoring above or below a certain mean.

External Validity

Generalizing this study to all municipal police and sheriffs in North Carolina requires a randomly selected sample of respondents that mirror the population or a census of all of the agencies. Due to the distribution of officers in the state, from one officer to 1533, creating a viable sample requires understanding the *range* of officers working in the state rather than the cumulative number of departments or officers.

Frequency analysis of the North Carolina CSLLEA data revealed that 60 percent of North Carolina municipal police and sheriffs overall have 18 or fewer full time sworn officers. Only eight and one-half percent of the municipalities and counties had 100 officers or more. The median number of officers was 13 while the mode was one.

Frequency analysis of the 141 respondents revealed that 60 percent of them reported between one and 33 officers. The mode for the respondents was 8 and the median was 21. Ten percent of the respondents reported 100 or more officers. Generally, the respondents to this study had more fulltime, sworn officers than the respondents to the CSSLEA survey. Consequently, the responses to this study would not be externally valid to North Carolina municipal police departments and county sheriffs'.

Despite the limited external validity, this study provided the opportunity to examine Rocheleau's (1996) hypotheses about computerized data sharing. Additionally, this study developed a set of independent variables that could be important in developing useful models of computerized data sharing between public agencies.

Survey Methodology

Collecting the data for the study was a multiphase approach: creating and testing the instrument, surveying the agencies, and analysis. The first phase involved creating and validating the instrument in addition to securing the sponsorship of the University of North Carolina's School of Government. Securing the sponsorship of a well-respected organization is one method of raising the response rate (Garson, n.d.)

The instrument was pre-tested by volunteer agencies that did not participate in the final North Carolina survey. The volunteer agencies were solicited via the CrimeMap Internet listserv. This listserv is operated by the Mapping and Analysis for Public Safety (MAPS) office of the National Institute of Justice. Additionally, the principal investigator contacted subject matter experts to review the instrument for clarity as well as subject matter. There was no prior existing research in public sector literature to validate the instrument measures.

Part of the second phase was seeking maximum response from North Carolina agencies. To attain maximum participation, this study surveyed the agencies using two methods, postal mail and an Internet website. Four hundred eighty four agencies were mailed a survey with a response envelope. One hundred eleven agencies or 23% responded by postal mail.

The second survey method was a website which was an exact copy of the mailed survey. Participants were given the choice of either returning the survey by mail or answering questions online. Email use as well as Internet access is growing in law

enforcement agencies. Hickman and Reaves (2003) noted that 60% of all departments were using computers and 56% of all departments had access to the Internet.

The actual number of North Carolina law enforcement agencies with email and Internet access is unknown. However, based on national survey results of agencies with similar characteristics, it is likely the number is high. Thirty-two agencies or 6% of the potential respondents used the website option.

There was no response by 71% of the total agencies despite multiple survey methods as well as sponsorship by a well-respected organization. The chief in one large city notified the principal investigator that department would not participate. No reason was given. North Carolina is predominately a rural state with many small towns and small police departments. However there were small departments that responded to the survey, some as small as one officer.

The final phase was the data analysis phase. A univariate profile of the data was developed (see Chapter 4). The bivariate relation between dependent, independent, and environmental variables was analyzed using non-parametric crosstables. The strength of association between variables was determined using Cramer's V in Chapter Five.

Data Screening

Data screening methods were used to assess the accuracy and quality of the data file. The data screening included examining missing values, outliers, and testing for multicollinearity. Examining the univariate frequency distributions for each variable assessed the accuracy of the data file. All values were determined to be within an acceptable range and there were no "out-of-range" variables. Missing values were rechecked and

reentered when necessary. Next, the missing data values were screened using SPSS 11.5 Missing Value Analysis. “*Don’t Know*” responses were changed to missing values.

Because choices provided to the respondents were tightly restricted, outliers in the questions were not an issue for this study. Only two demographic variables are candidates for outliers, the number of sworn officers and the population. The Charlotte-Mecklenburg Police Department and Mecklenburg County were the only outliers for the number of sworn officers as well as the population it serves. Neither demographic variable was used in the data analysis.

Respondents And Non-Respondents

As previously noted, the study respondents in general had more full time personnel when compared with the overall North Carolina CSLLEA data. The study instrument was sent to all departments listed by the NCGCC. It is reasonable to expect the respondents were probably interested in the topic and volunteered to complete the survey. As previously noted, volunteerism inputs external bias into a sample and affects the generalizability of the findings. There were no other common variables between this study and the North Carolina CSLLEA data.

Data Analysis

The analysis will use contingency tables for testing the independent variables in conjunction with a respondent’s data sharing activities. The independent variables will be correlated with internal and external data sharing.

Dependent Variables

Some authors define data sharing broadly. Dawes (1996), for instance, defined data as program information documenting the nature, content, and operation of public programs. Her definition is not restricted to computerized data but includes paper and machine-readable data also. Data sharing for Dawes means exchanging or otherwise giving other executive agencies access to program information (Dawes, 1996).

Rocheleau (1996), in contrast, defined data sharing more narrowly as the exchange of an organization's information residing in its management information system. These data could include budgetary, personnel, information on clients, organizational activities and other types of data that organizations maintain in their files. Sharing could range from the selective release of part of a database (extract) to total sharing of the database. Sharing of files owned by the organization involved may be contrasted with sharing of personal communications in which individuals own the information being communicated (Rocheleau, 1996).

This study will use Rocheleau's (1996) definition of data sharing for the dependent variable since it explicitly incorporates the information technology aspects of data sharing. In measuring data sharing, Rocheleau (1996) used three indicators: one indicator was nominal and dichotomous, measuring whether the agency shared its data and the other two indicators were nominal, assessing how often information was shared with a selection of other agencies.

Good data quality possesses three characteristics: utility, objectivity, and security (OMB, 2002b). This variable will be measured at the ordinal level and will assess the completeness of data received by the agency under two conditions; mandated and routine

sharing. Additionally one indicator will measure the completeness of data in interdepartmental sharing arrangements.

Table 3.1 Dependent Variables

Dependent Variable	Operationalization
Interorganizational data sharing	Exchange of any electronic data between agencies which resides in their management information systems (MIS)
Intraorganizational data sharing	Exchange of any electronic data within departments of an agency which resides in its management information system (MIS)
Data Quality	The completeness, objectivity, and usability of computerized data

Summary of Independent Variables

The following table sets forth all independent variables to be measured as well as their directional relation to the dependent variable and the hypothesized magnitude of the relationship with data sharing.

Table 3.2 Independent Variables

Variable	Direction	Magnitude
Interdependency	Positive	Strongly
Common Functions	Positive	Strongly
Common Goals	Positive	Strongly
Organizational Survival	Positive	Strongly
Interest of Top Management	Positive	Strongly
Individual Computer Exchanges (E-Mail)	Positive	Strongly
Internet Applications (Chat, Listservs, and Bulletin Boards)	Positive	Strongly
Hardware Compatibility	Negative	Weak
Software Compatibility	Negative	Weak
Organizational Autonomy	Negative	Moderate
Turbulent Environment	Positive	Strong
Symmetric Benefits	Positive	Moderate
Asymmetric Benefits	Negative	Strong

Moderating Variables

The following variable potentially has a moderating effect on the relationship between the dependent and independent variables.

Table 3.3 Moderating Variables

Variable	Direction	Affected Variable	Magnitude
Mandates	Negative	Data quality Data sharing	Strong

Independent and Moderating Variables Operationalization

The independent and moderating variables will now be operationalized in the following paragraphs.

Individual Computer Exchanges

Individual computer exchanges are messages exchanged between individuals using email as the communication channel. This variable will be measured at the ordinal level. Respondents' will estimate the percentage of their messages sent by email. Since having email is indicative Internet connectivity; the third measure assesses the use of Internet applications other than email. The final measure seeks to assess data sharing with applications besides browsing.

Interest of Top Management

Top management is leadership that is elected, appointed, or serves as the managerial head of the agency. Elected leadership includes executive leaders such as the mayor and governing boards such as city council or county commissioners. Appointed leadership includes city and county managers. Agency heads include chiefs of police and sheriffs. The

variable will be measured at the ordinal level and assesses the respondents' perception of top management's interest in data sharing.

Compatibility

Compatibility indicates that data received by an agency can be accessed using that agency's existing software or hardware. This includes overcoming software version issues as well as printing issues. Compatibility also includes having key items or variables in agency data sets similarly defined, e.g. social security numbers, or other identifiers. The variable is an ordinal measure assessing the respondents' perception of the three types of compatibility issues in their agency.

Interdependency, Common Functions, and Common Goals

Interdependency is a relationship in which an agency cannot perform its mission without the help of another specific agency. Interdependency is an ordinal variable assessing the respondents' perception of data sharing between their agency and another on which they may be dependent for performing their primary mission.

Common functions are similar missions shared by different agencies. For example, municipal police and sheriff's offices share the common function of general law enforcement. In contrast common goals may be shared by agencies and organizations that do not share common functions. For example a citizen's watch group and a local police agency may share the same goal of reducing crime in a neighborhood. However, the citizen's watch group does not share the common function of general law enforcement.

Turbulent Environments

Environmental turbulence in the public sector implies rapid change that requires a more flexible response from service providing agencies. In order to respond flexibly,

agencies often need to collect data in real time and adjust their services accordingly.

Although the definition of turbulence is not precise, Bozeman and Straussman (1990) noted some of the organizational stressors in the public environment are budgetary competition, mandates by other levels of government, as well as the tension between political executives and civil servants.

Autonomy

Oliver (1991) defined autonomy as an organization's freedom to make its own decisions regarding the allocation of its resources. Autonomy further implies that an agency has a high degree of control over its internal resources without satisfying the demands of external organizations (Oliver, 1991). In terms of computerized data sharing, autonomy is the freedom to set organizational standards for collecting and processing data as well as controlling the access to it.

Symmetric Benefits

When two or more agencies perceive a net benefit from an exchange then it is considered symmetric. There are a variety of benefits to agencies from sharing data, however, the agencies themselves must determine whether the exchange is symmetric or not.

Organizational Survival

The quest for organizational survival is considered an axiom in the study of organizational behavior. There are even metaphoric references comparing organizations to living creatures that seek to survive at any cost or obey imperatives to expand and control their environment. In the public sector, certain services are considered so critical their basic

existence is not questioned. The focus of this study, law enforcement agencies, is one of those services.

Although law enforcement is a basic civic function, law enforcement agencies still compete for funding increases in efforts to add new officers, purchase equipment, or secure training. The 2000 survey of local police departments by the Bureau of Justice Statistics noted that nationally the net budget increase to police departments was 33% even though the overall crime rate declined during the 1990s (Hickman and Reaves, 2003). Instead of just surviving, police agencies thrived and even expanded. Coe and Wiesel (2001) noted one method of securing these budget increases was the selective sharing of crime data outside their agency.

Demographic Variables

Demographic variables were adapted from the Bureau of Justice Statistics' Local Police Department surveys. These variables have been used frequently to gather descriptive data about police departments and sheriff's offices.

Summary of Hypotheses and Dependent Variables

Table 3.4 correlates the hypotheses with their respective questions in the instrument (See Appendix A). Table 3.5 correlates the dependent variables with their respective questions in the instrument (See Appendix A).

Table 3.4 Hypotheses and Questions

Hypothesis	Question(s)
H1. Interdependency of function and common goals lead to sharing of information when the sharing is perceived by the organizations as assisting them with their core functions.	Q31-Q37
H2. The degree of interorganizational sharing of information that takes place will be positively associated with the extent to which sharing is viewed as necessary to organizational survival.	Q52-Q53
H3. Interdepartmental data sharing is most likely in public organizations that exist in rapidly changing, turbulent environments.	Q42
H4. Interdepartmental and interorganizational information sharing are positively associated with the interest of top management in encouraging such sharing.	Q19-Q21
H5. Information sharing will be greater between organizations that share compatible hardware and software.	Q28-Q30
H6. Interdepartmental and interorganizational sharing will be greater in organizations that encourage computer exchanges by individuals (e.g. through establishment or participation in local and wide area networks, electronic mail, and bulletin board systems).	Q13-Q17
H7. Organizations will resist external sharing that threatens their autonomy.	Q44-Q45
H8. The degree of sharing is likely to be higher between organizations that perceive symmetry of benefits and costs.	Q48
H9. When sharing occurs despite an asymmetry of costs and benefits to the participants, there is a greater likelihood of data quality problems.	Q51

Table 3.5 Dependent Variables and Questions

Dependent Variable	Operationalization	Questions
Interorganizational data sharing	Exchange of any computerized data between agencies which resides in their management information systems (MIS)	Q38-Q41
Intraorganizational data sharing	Exchange of any data computerized data within departments of an agency which resides in its management information system (MIS)	Q43
Data Quality	The utility, completeness, and usability of computerized data.	Q51

Chapter Four. Univariate Analysis

Introduction

The purpose of this study is to determine empirically critical factors influencing the extent to which some public agencies electronically share their data with other public organizations more so than do other public agencies. Specifically this study tested nine hypotheses of public sector interorganizational data sharing developed by Rocheleau (1996) on North Carolina law enforcement agencies. Beginning with a demographic analysis of the respondents, the purpose of this chapter is to present the univariate analysis of the variables used in the study.

Demographic Variables

There were 141 survey respondents, in which 114 were police departments and 26 were sheriff's offices. In terms of population, the mean population served by the responding agencies was 38,770 with the median being 8600. The populations of the jurisdictions ranged from 210 to 1, 200,000. The mean number of sworn officers was 60, the median was 21, and the range was 1 to 1,524.

The largest department in North Carolina is Charlotte-Mecklenburg. This jurisdiction comprises the city of Charlotte as well as the unincorporated areas of Mecklenburg County. Both the jurisdiction population and the number of sworn officers skew the demographic averages of the sample. Analyzing the interquartile range indicates that 75% of the jurisdictions have populations of 28,000 or less. The interquartile range of the sworn personnel indicates that 75% of jurisdictions have 47 or fewer sworn officers.

Independent Variables

Table 4.1 summarizes the independent variables from the nine hypotheses. Each variable's univariate characteristics will be discussed in this section. In the survey there were multiple questions measuring various aspects of the independent variables.

Table 4.1. Table of Independent Variables

Variable
Email
Internet Applications (Chat, Listservs, and Bulletin Boards)
Interest of Top Management
Hardware Compatibility
Software Compatibility
Interdependency
Common Functions
Common Goals
Organizational Survival
Organizational Autonomy
Turbulent Environments
Symmetric Benefits
Asymmetric Benefits

Hardware and Software Resources

To share electronic data, information technology and Internet connectivity are critical assets for the agencies. The respondents were asked to indicate whether the agency had certain general types of hardware and software as well as Internet connectivity. The respondents were asked to indicate if their agency owned the following hardware assets:

- Mainframe Computer
- Personal Computer (PC)/Desktop
- PC Network
- Laptop

- Mobile data terminals
- Other; Personal Digital Assistants (PDA)

Table 4.2 summarizes the responses to the hardware questions of the information technology section in descending order.

Table 4.2. Hardware Resources

Hardware	Frequency	Percent
PC/Desktop	125	88.7
PC Network	105	74.5
Laptop	98	69.5
Mobile Data Terminal	95	67.4
Mainframe Computer	72	51.1
Other	3	2.1

Respondents were also asked to indicate if they owned any of the following software assets:

- Database Management
- Statistical Software
- Spreadsheets
- Word Processing
- Computer Aided Dispatch (CAD)
- Multimedia (Powerpoint, etc.)
- Desktop Publishing
- Internet Browsers

- Group/Info email
- Individual email
- Network Management
- Project Management
- Records Management
- Geographic Information Systems (GIS)

Table 4.3 summarizes the responses to the software section in descending order.

Table 4.3 Software Resources

Software	Frequency	Percent
Internet Browsers	130	92.2
Word Processing	125	88.7
Individual email	111	78.7
Database Management	109	73.3
Spreadsheets	109	73.3
Records Management System	105	74.5
Multimedia (Powerpoint,etc)	91	64.5
Group / Info email	88	62.4
Statistical Software	73	51.8
Desktop Publishing	66	46.8
Network Management	57	40.4
Computer Aided Dispatch	56	39.7
Geographic Information System	50	35.5
Project Management	19	13.5

In terms of Internet connectivity, table 4.4 summarizes the responses to the question “Does this agency use the Internet in any official capacity (e.g. research)?

Table 4.4. Number of Agencies Using the Internet In Any Official Capacity

Internet	Frequency	Percent
Yes	101	71.6
Missing	33	23.4
No	7	5

Overall, the frequency analysis indicates the agencies possess both technology and connectivity to share electronic data with others.

Email

The most important and frequently used Internet communication channel is email. Email provides individuals the ability to connect with others and share electronic data. In the survey, agencies were asked to indicate the percentage of employees with an agency email address, another indicator of Internet connectivity. About half of the respondents (n =70) have agency email addresses for at least three-quarters of their employees. Table 4.5 summarizes the percent of employees with an agency email address.

Table 4.5. Percent of Employees with an Agency Email Address

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	76 - 100 %	70	49.6	51.1	51.1
	51 - 75 %	17	12.1	12.4	63.5
	26 - 50 %	20	14.2	14.6	78.1
	10 - 25 %	30	21.3	21.9	100.0
	Total	137	97.2	100.0	
Missing	System	4	2.8		
Total		141	100.0		

Internet Applications

In addition to email, respondents were asked to indicate how often they gathered professional information through other Internet applications such as search engines, bulletin boards, and listservs. More than one-third (n = 51) of the respondents reported “Frequent” use of Internet applications. Table 4.6 summarizes the frequency the respondents reported using Internet applications other than email.

Table 4.6. Internet Applications

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Frequently	39	27.7	28.1	28.1
	Frequently	51	36.2	36.7	64.7
	Sometimes	39	27.7	28.1	92.8
	Rarely	8	5.7	5.8	98.6
	Never	2	1.4	1.4	100.0
	Total	139	98.6	100.0	
Missing	System	2	1.4		
Total		141	100.0		

Interest of Political and Top Management

As noted previously, the interest of top managers and leaders is almost axiomatic as a prerequisite for any IT initiative. The respondents were asked to indicate which political leaders and top managers publicly expressed interest in electronic data sharing between different public agencies. Because the survey was sent to police departments and sheriff offices, the choice of political leaders were mayor, city council, and county commissioners. Top management choices were city manager, county manager, sheriff, and police chief. The frequency choices were:

- Very Frequently
- Frequently
- Occasionally
- Only Once
- Never
- Don't Know

The “Don't Know” option was treated as missing data. Table 4.7 summarizes the most frequent answer for each leader or manager regarding their perceived interest in data sharing.

Table 4.7. Most Frequent Answer for Leaders and Managers

Leader/Manager	Most Frequent Response
Mayor	Never
City Council	Never
County Commissioners	Never
City Manager	Occasionally
County Manager	Never
Police Chief	Very Frequently
Sheriff	Frequently

Being closer to the respondents, police chiefs and sheriffs exert more influence on the agencies as leaders and managers. Figures 4.1 and 4.2 summarize the respondents' perception of their interest in electronic data sharing between public agencies with different functions and missions.

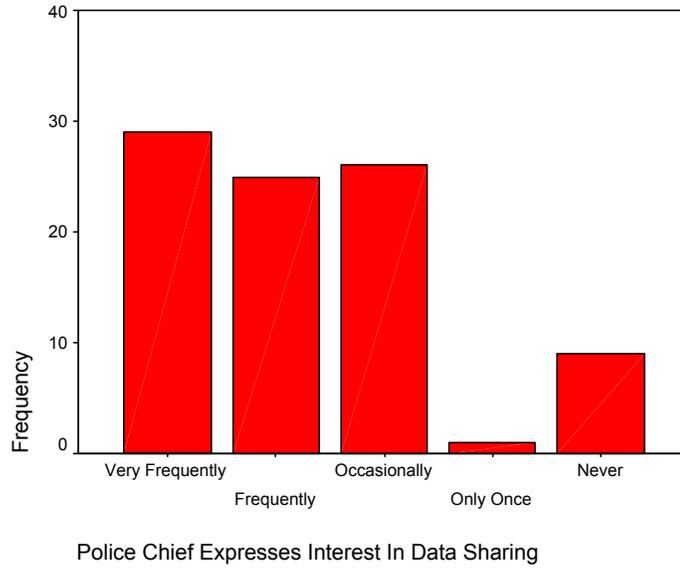


Figure 4.1. Frequency of Police Chiefs Expressing Interest in Computerized Data Sharing

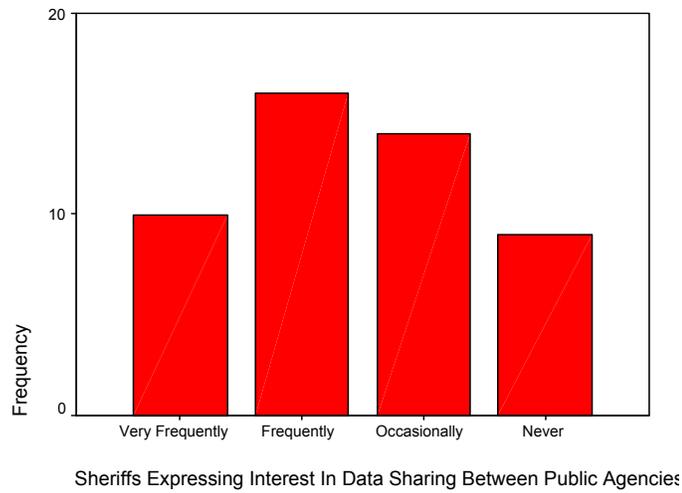


Figure 4.2. Frequency of Sheriffs Expressing Interest in Computerized Data Sharing

Data Quality

One issue with electronic data sharing is the quality of the data. To take advantage of electronic data sharing, data must be complete and usable. Responding agencies were asked to evaluate the completeness of electronic data routinely received from other public agencies. This question sought to differentiate between electronic data received as part of routine operations versus received due to a legal or administrative mandate. The respondents were asked to rate the data in terms of completeness and usability on the following scale:

- Always Complete
- Usually Complete
- Sometimes Complete
- Never Complete
- Not Applicable – Agency never receives electronic data from another public agency

The “Not Applicable” option was treated as missing data in the univariate analysis. Table 4.8 summarizes the responding agencies evaluation of electronic data received from other public agencies. The most frequent response from the agencies was “Usually Complete.” Over sixty percent (n = 88) of the respondents reported the data they received from other agencies was “Usually Complete.”

Table 4.8. Data Quality

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Always Complete	6	4.3	5.0	5.0
	Usually Complete	88	62.4	73.3	78.3
	Sometimes Complete	25	17.7	20.8	99.2
	Never Complete	1	.7	.8	100.0
	Total	120	85.1	100.0	
Missing	Not Applicable	18	12.8		
	System	3	2.1		
	Total	21	14.9		
Total		141	100.0		

Hardware and Software Compatibility

In addition to having technology and Internet connectivity, hardware and software compatibility have an impact on electronic data sharing. Respondents were also asked to indicate whether data definitions were a source of incompatibility. The selections for all three concepts were:

- Always
- Almost Always
- Frequently
- Sometimes
- Never

In terms of hardware compatibility, responding agencies reported they had difficulty “Sometimes” (n = 71). In regards to software, respondents again most frequently reported they had trouble was “Sometimes” (n = 72). Data definitions were also most frequently reported to be an impediment to electronic data sharing “Sometimes” (n= 65). Tables 4.9,

4.10, and 4.11 summarize the difficulty of electronic data sharing due to hardware, software, and data definitions.

Table 4.9. Difficulty Sharing Electronic Data Due to Hardware Issues

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Always	5	3.5	3.7	3.7
	Almost Always	5	3.5	3.7	7.4
	Frequently	20	14.2	14.8	22.2
	Sometimes	71	50.4	52.6	74.8
	Never	34	24.1	25.2	100.0
	Total	135	95.7	100.0	
Missing	System	6	4.3		
Total		141	100.0		

Table 4.10. Difficulty Sharing Electronic Data Due to Software Issues

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Always	7	5.0	5.2	5.2
	Almost Always	8	5.7	5.9	11.1
	Frequently	31	22.0	23.0	34.1
	Sometimes	72	51.1	53.3	87.4
	Never	17	12.1	12.6	100.0
	Total	135	95.7	100.0	
Missing	System	6	4.3		
Total		141	100.0		

Table 4.11. Difficulty Sharing Electronic Data Due to Data Definitions

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Always	7	5.0	5.2	5.2
	Almost Always	7	5.0	5.2	10.4
	Frequently	28	19.9	20.9	31.3
	Sometimes	65	46.1	48.5	79.9
	Never	27	19.1	20.1	100.0
	Total	134	95.0	100.0	
Missing	System	7	5.0		
Total		141	100.0		

Interdependency

Interdependency is a relationship in which an agency cannot perform its mission without the help of another agency. Responding agencies were asked if they depended on another law enforcement agency to perform their primary mission. The most frequent answer to this question was “No” (n = 91). In further exploration, agencies were also asked if they depended on any non-law enforcement agency to perform their primary mission. The most frequent answer was also “No” (n = 101). Tables 4.12 and 4.13 summarize the responses.

Table 4.12. Agencies Depending on Other Law Enforcement Agencies to Perform Their Primary Missions

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	42	29.8	31.6	31.6
	No	91	64.5	68.4	100.0
	Total	133	94.3	100.0	
Missing	Don't Know	6	4.3		
	System	2	1.4		
	Total	8	5.7		
Total		141	100.0		

Table 4.13. Agencies Depending on Non-Law Enforcement Agencies to Perform Their Primary Missions

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	31	22.0	23.0	23.0
	No	101	71.6	74.8	97.8
	Don't Know	3	2.1	2.2	100.0
	Total	135	95.7	100.0	
Missing	System	6	4.3		
Total		141	100.0		

Common Functions

Common functions are similar missions shared by different agencies. For example, municipal police and sheriff’s offices share the common function of general law enforcement. Respondents were asked to indicate how often they shared electronic data with other law enforcement agencies on which the agency is not dependent to perform their primary mission. The respondents were also asked to indicate whether they shared electronic data with non-law enforcement agencies on which they were not dependent to perform their primary mission.

The most frequent answer regarding the sharing of electronic data with other law enforcement agencies was “Sometimes” followed by “Frequently.” The “Don’t Know” answers were treated as missing data. The most frequent answer for whether the agencies shared electronic data with other agencies was also “Sometimes.” However, there is a difference in the distribution of the answers between the two questions. Tables 4.13 and 4.14 summarize the answers to both questions. Figures 4.3 and 4.4 illustrate the different frequency distributions of the two questions.

Table 4.14. Agencies Sharing Electronic Data with Other Law Enforcement Agencies On Which They Are Not Dependent To Perform Their Primary Mission

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Always	10	7.1	7.2	7.2
	Almost Always	8	5.7	5.8	13.0
	Frequently	37	26.2	26.8	39.9
	Sometimes	61	43.3	44.2	84.1
	Never	22	15.6	15.9	100.0
	Total	138	97.9	100.0	
Missing	6	3	2.1		
Total		141	100.0		

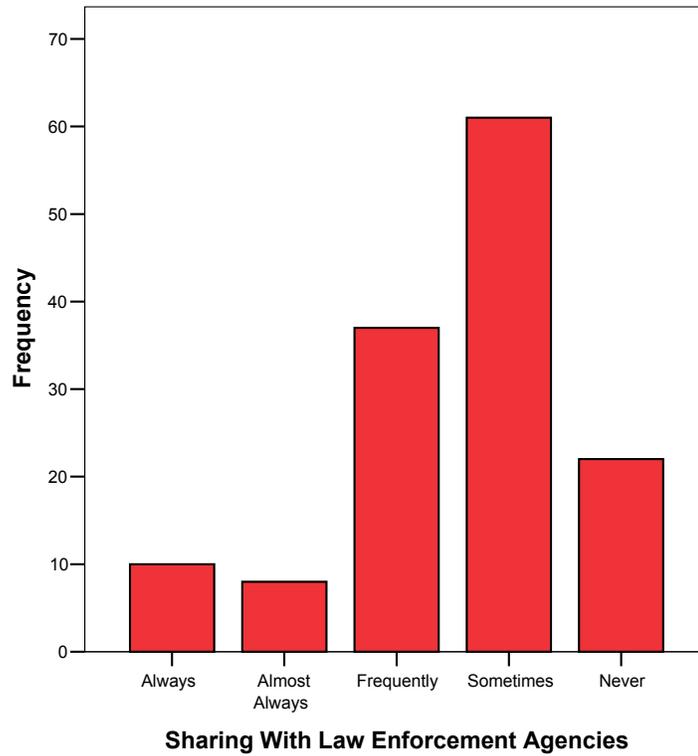


Figure 4.3 The Frequency of Computerized Data Sharing With Other Law Enforcement Agencies

Table 4.15. Agencies Sharing Electronic Data with Non-Law Enforcement Agencies on Which They Are Not Dependent To Perform Their Primary Mission

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Always	1	.7	.7	.7
	Almost Always	4	2.8	3.0	3.7
	Frequently	16	11.3	11.9	15.6
	Sometimes	71	50.4	52.6	68.1
	Never	43	30.5	31.9	100.0
	Total	135	95.7	100.0	
Missing	6	6	4.3		
Total		141	100.0		

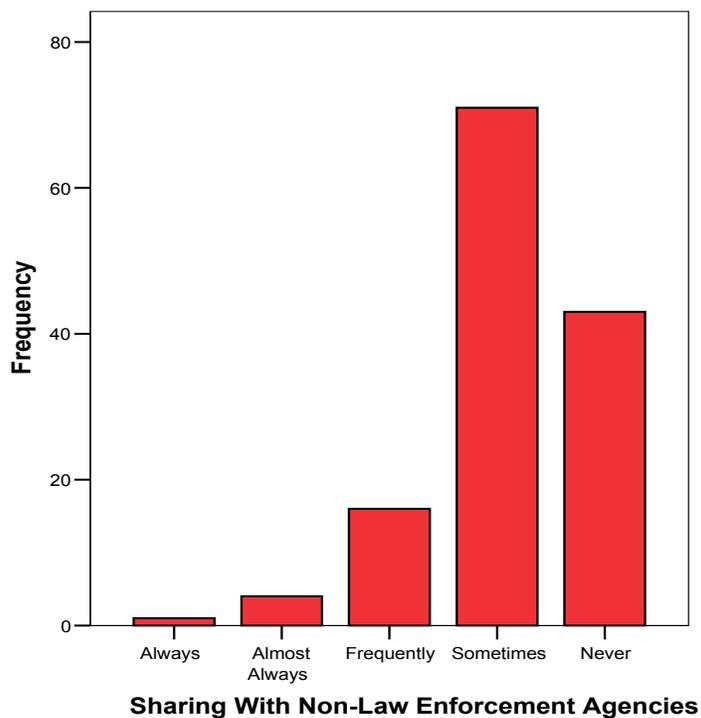


Figure 4.4. The Frequency of Computerized Data Sharing With Non-Law Enforcement Agencies

Common Goals

Common goals may be intertwined and yet differentiated from common functions. For example, police departments and sheriff offices have the common function of law enforcement and they may share the common goal of reducing crime. A community watch group or victim advocacy group may share the common goal of reducing crime without sharing the common function of law enforcement. The agencies were asked to indicate how often they shared electronic data with these organizations. Table 4.15 summarizes their responses. With the most frequent answer skewed towards “Sometimes” as illustrated in Figure 4.5.

Table 4.16. Frequency Of Sharing Data With Common Goal Agencies

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Always	1	.7	.7	.7
	Almost Always	5	3.5	3.7	4.4
	Frequently	21	14.9	15.6	20.0
	Sometimes	63	44.7	46.7	66.7
	Never	45	31.9	33.3	100.0
	Total	135	95.7	100.0	
Missing		6	4.3		
Total		141	100.0		

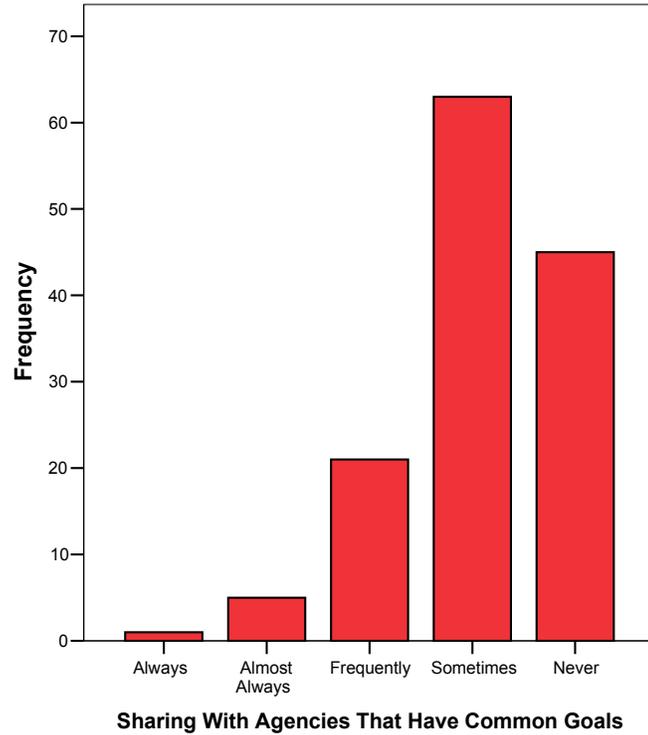


Figure 4.5. The Frequency of Sharing With Agencies That Have Common Goals

Organizational Survival

Organizational survival is practically an axiom in the study of organizational behavior, especially in the public sector. One critical factor in surviving is the organizational budget. Like other public agencies, law enforcement is also competing for a shrinking pool of money. Two questions assessed the organizations' electronic data sharing as part of survival. One question asked how frequently the agency shared electronic data to *justify* equipment and personnel. The other question asked how frequently the agency shared electronic data to *supplement* their annual budget. Figures 4.6 and 4.7 summarize the responses to these questions. Although the most frequent answer is "Never", there is considerable variability among the respondents.

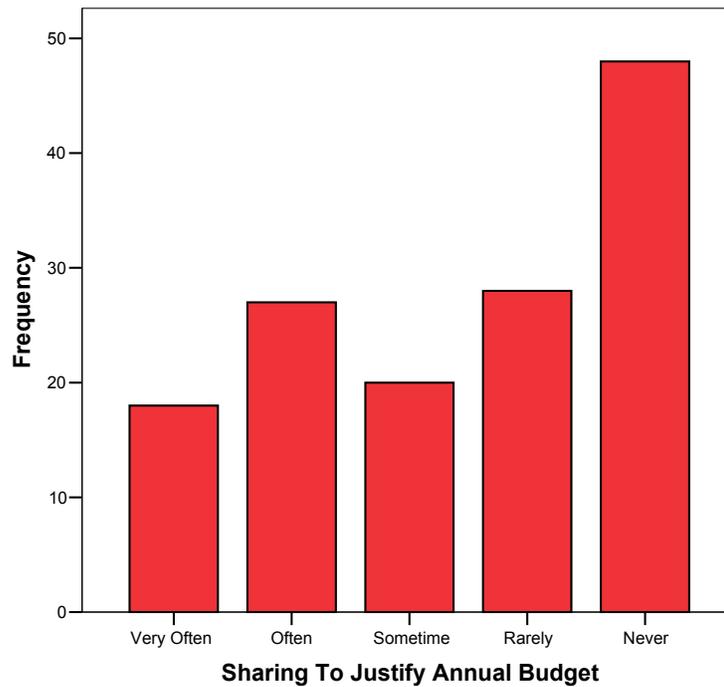


Figure 4.6. Frequency Of Sharing Data To Justify Annual Budget

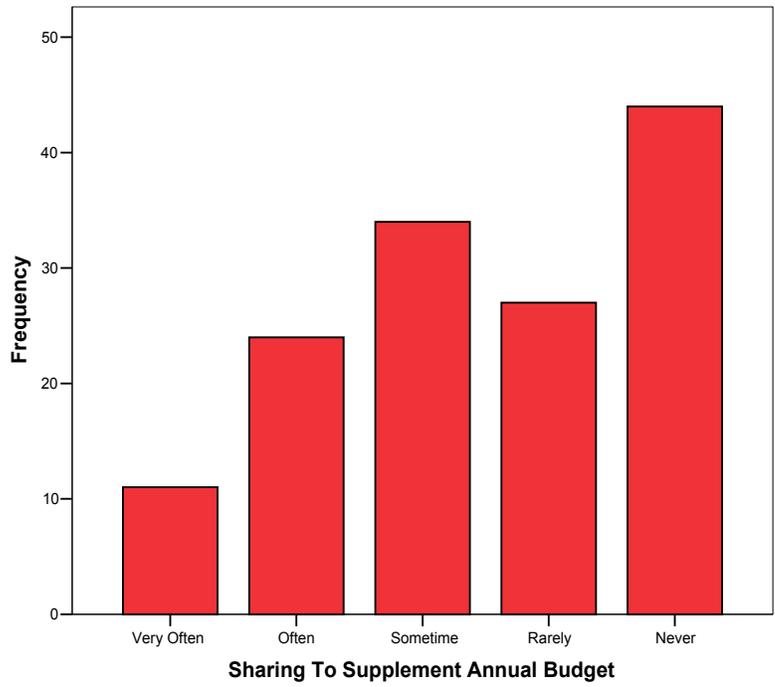


Figure 4.7. Frequency Of Sharing Data To Supplement Annual Budget

Organizational Autonomy

Organizational autonomy is the ability for an organization to set its own agenda and allocate resources without interference. In terms of electronic data sharing, autonomy includes control of and even interpretation of organizational data. Respondents were asked to indicate the probable effect on the agency’s autonomy if its data were shared with other agencies. Additionally, respondents were asked to evaluate the likelihood that entering into a data sharing agreement would lessen the agency’s ability to organize its own data.

Table 4.16 indicates that 62.4 % of the responding agencies felt they would maintain their autonomy in an electronic data sharing relationship. The cumulative percent in table 4.17 indicates that 68.8 % of the respondents would resist entering a data sharing relationship where the freedom to organize one’s data is lost.

Table 4.17. Agency Perception Of Data Sharing And Organizational Autonomy

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Increased Autonomy	24	17.0	17.1	17.1
	Same Autonomy	88	62.4	62.9	80.0
	Decreased Autonomy	4	2.8	2.9	82.9
	Don't Know	24	17.0	17.1	100.0
	Total	140	99.3	100.0	
Missing	System	1	.7		
Total		141	100.0		

Table 4.18. The Likelihood Of An Agency Entering Into A Data Sharing Relationship That Would Limit Its Autonomy

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Resist Strongly	19	13.5	13.8	13.8
	Very Likely Resist	39	27.7	28.3	42.0
	Probably Resist	37	26.2	26.8	68.8
	Would Not Resist	19	13.5	13.8	82.6
	Don't Know	24	17.0	17.4	100.0
	Total	138	97.9	100.0	
Missing	System	3	2.1		
Total		141	100.0		

Turbulent Environments

The following events were considered to create turbulence in an agency's environment:

- Budget cuts
- Leadership change from one political party to another
- Change in city or county manager

- Change in agency command staff (Chief, Sheriff, and etc.)
- Implementation of Computer Statistics (COMPSTAT) in some form

To assess environmental turbulence, respondents were asked to indicate which conditions they had experienced in the last five years. Chapter 5 analyzes and discusses the perceived effects of each factor on interdepartmental data sharing.

Percentage wise, budget cuts were the most frequently cited turbulence factor, followed in order by changes in command staff, changes in city or county manager, political leadership changes, and implementing computer statistics (COMPSTAT) in some form.

Table 4.18 summarizes the number of respondents citing budget cuts as an environmental factor. Table 4.19 summarizes the frequency of respondents reporting changes in their command staff. Table 4.20 summarizes the frequency of respondents reporting changes in city or county managers. Table 4.21 summarizes the frequency of respondents reporting changes in political leadership. Finally, Table 4.22 summarizes the frequency of respondents who reported their department implemented computer statistics (COMPSTAT) in the last five years.

Table 4.19. Frequency of Respondents Experiencing Budget Cuts

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	5	3.5	4.1	4.1
	Yes	116	82.3	95.9	100.0
	Total	121	85.8	100.0	
Missing	System	20	14.2		
Total		141	100.0		

Table 4.20 Frequency of Respondents Reporting Changes in Command Staff

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	12	8.5	14.0	14.0
	Yes	74	52.5	86.0	100.0
	Total	86	61.0	100.0	
Missing	System	55	39.0		
Total		141	100.0		

Table 4.21 Frequency of Respondents Reporting Changes Of City Or County Manager

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	13	9.2	17.8	17.8
	Yes	60	42.6	82.2	100.0
	Total	73	51.8	100.0	
Missing	System	68	48.2		
Total		141	100.0		

Table 4.22 Frequency of Respondents Reporting Changes In Political Leadership

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	22	15.6	36.1	36.1
	Yes	39	27.7	63.9	100.0
	Total	61	43.3	100.0	
Missing	System	80	56.7		
Total		141	100.0		

Table 4.23 Frequency of Respondents Reporting Implementation Of Computer Statistics (COMPSTAT)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	22	15.6	40.7	40.7
	Yes	32	22.7	59.3	100.0
	Total	54	38.3	100.0	
Missing	System	87	61.7		
Total		141	100.0		

Chapter Four Summary

The purpose of this chapter was to perform univariate analysis of the variables measured by the instrument. A summary of the chapter analysis is presented in the following order: hardware, software, Internet connectivity, and a summary of the twelve independent variables.

Eighty eight percent (n = 125) of the respondents reported having personal computers. Seventy four percent (n = 105) reported having networked personal computers. Internet browsers were the most frequently reported software item (n = 130) followed by word processing (n = 125) and individual email (n = 111). Also, respondents reported having database management software (n = 109), spreadsheets (n = 109), and records management systems (n = 105).

The twelve independent variables previously mentioned were analyzed in this chapter to create a univariate profile of the respondents. A summary of the results follows:

- About half of the respondents (n =70) have agency email addresses for at least three-quarters of their employees.
- More than one-third (n = 51) of the respondents reported “Frequent” use of Internet applications.
- Police chiefs and sheriffs expressed interest in computerized data sharing more often than other leaders external to the agencies.
- Over sixty percent (n = 88) of the respondents reported the data they received from other agencies was “Usually Complete.”

- In regards to difficulties with computerized data sharing due to hardware, software, or data definitions, the most frequent answers were “Sometimes.”
- Interdependency on other law enforcement agencies to do their primary mission was reported by thirty percent (n = 42) of the respondents. Interestingly twenty three percent (n = 31) of the respondents reported interdependency on non-law enforcement agencies to perform their primary mission.
- In terms of sharing with agencies that have common functions (i.e. law enforcement), respondents most often reported they shared data “Sometimes.” Respondents also most often reported they shared with agencies that have common goals “Sometimes.”
- Sharing computerized data to justify budgets elicited a variety of responses. Respondents most frequently (n = 48) reported that did not share computerized data to justify their budgets. However, responses to this item varied from “Rarely” to “Very Often” (n = 93). Also the respondents most frequently (n = 44) reported they also did not share computerized data to supplement their budget. These responses were also variable ranging from “Rarely” to “Very Often” (n = 96).
- Respondents were asked whether they had experienced any or all of the following conditions in the past five years:
 - Budget cuts
 - Changes in command staff

- Changes in city or county managers
- Changes in political leadership
- Implementing computer statistics (COMPSTAT)

The majority of respondents who answered this item reported they had experienced these conditions. Of these conditions, budget cuts elicited the most response (n = 116). In Chapter Five, the bivariate relationship between these variables and computerized data sharing with other agencies will be analyzed.

Chapter Five: Bivariate Relationships and Analysis

Introduction

The purpose of this study is to assess empirically the hypotheses regarding electronic data sharing between and within public agencies that Rocheleau (1996) developed from public and private sector organizational literature. The analysis of the hypotheses in this chapter begins with restating the general hypotheses regarding information sharing and then analyzing the particular bivariate relationships as they apply to electronic data sharing.

Each independent variable and its bivariate relationship to electronic data sharing are discussed in this chapter. The bivariate relationship between the independent variables and electronic data sharing were assessed using crosstabulation. The significance of the bivariate relationships were measured using the non-parametric Pearson chi-Square and the strength of association was assessed using Cramer's V.

Using SPSS 11.5, all of the bivariate relationships with more than 5% of the values missing were analyzed with the Missing Values Analysis option. SPSS 11.5 compared the variables in a row and column format and indicated whether the values are missing completely at random or not using the Separate Variance t test. Variables where $P(2\text{-tail}) \leq .05$ indicated the missing items were not random. In the items where the relationship between missing data values were significant (not random), expectation maximization (EM) was used to create hypothetical responses to the items and the relationship was reanalyzed with data that are more robust. The original relationships as well as the results of the Missing Value Analysis are discussed in their sections within this chapter.

Hypotheses

Table 5.1 restates the hypotheses regarding electronic data sharing Rocheleau (1996) developed from public and private sector literature. Rocheleau (1996) grouped the hypotheses into three major areas: external facilitating forces, internal facilitating forces, and inhibiting forces. Hypotheses H1, H2, and H3 addressed external facilitating factors that affected electronic data sharing. . Hypotheses H4, H5, and H6 addressed the internal facilitating forces that affected electronic data sharing. Finally, hypotheses H7, H8, and H9 addressed the inhibiting forces that affected electronic data sharing.

Table 5. 1. Hypotheses	Abbreviated Label
H1. Interdependency of function and common goals lead to sharing of information when the sharing is perceived by the organizations as assisting them with their core functions.	Interdependency of Function
H2. The degree of interorganizational sharing of information that takes place will be positively associated with the extent to which sharing is viewed as necessary to organizational survival.	Organizational Survival
H3. Interdepartmental data sharing is most likely in public organizations that exist in competitive environments with rapidly changing products/services.	Environmental Turbulence
H4. Interdepartmental and interorganizational information sharing are positively associated with the interest of top management in encouraging such sharing.	Top Management
H5. Information sharing will be greater between organizations that share compatible hardware and software.	Compatible Technology
H6. Interdepartmental and interorganizational sharing will be greater in organizations that encourage computer exchanges by individuals (e.g. through establishment or participation in local and wide area networks, electronic mail, and bulletin board systems).	Email and Internet
H7. Organizations will resist external sharing that threatens their autonomy.	Autonomy
H8. The degree of sharing is likely to be higher between organizations that perceive symmetry of benefits and costs.	Similar Costs and Benefits
H9. When sharing occurs despite an asymmetry of costs and benefits to the participants, there is a greater likelihood of data quality problems.	Data Quality

The bivariate analysis proceeds in the following steps:

- The independent variables and their hypothesized direction and magnitude on the dependent variable are restated.
- The hypotheses were grouped into facilitating, internal, and external forces
- Each independent variable was crosstabulated with the dependent variable. The independent variables are discussed in the order listed in Table 5.2.
- Each relationship was tested for significance using the non-parametric Pearson's Chi-Square. Relationships were considered significant at $P \leq .05$.
- The strength of the association was measured using Cramer's V.
- Each relationship with more than 5 percent of the cases missing was tested for either the Missing Completely at Random (MCAR) and Missing at Random (MAR) conditions. If the missing cases in the row were significantly correlated with the column variable (MAR), then Expectation Maximization (EM) was used to input the missing data and the significance and correlation of the relationship were reevaluated.

Independent Variables

The expected effect, magnitude, and direction of the independent variables on electronic data sharing were developed directly from Rocheleau's (1996) hypotheses and are summarized in table 5.2. Additionally, each independent variable was identified with an external facilitating, internal facilitating, or inhibiting force. In each bivariate relationship Pearson's Chi-Square, Cramer's V, and univariate frequency analysis were calculated to evaluate both the significance and strength of the relationship. The calculated significance and strength were compared to the previously hypothesized magnitude and direction of each relationship developed from the literature.

Table 5.2. Hypothesized Effect Of Independent Variables On Electronic Data Sharing

Independent Variable	Direction	Magnitude	Hypothesis	Force
Interdependency	Positive	Strong	H1	External Facilitating
Core Functions	Positive	Strong	H1	External Facilitating
Common Goals	Positive	Strong	H1	External Facilitating
Organizational Survival	Positive	Strong	H2	External Facilitating
Turbulent Environment	Positive	Strong	H3	External Facilitating
Interest of Top Management	Positive	Strong	H4	Internal Facilitating
Hardware Compatibility	Negative	Weak	H5	Internal Facilitating
Software Compatibility	Negative	Weak	H5	Internal Facilitating
Individual Computer Exchanges (Email)	Positive	Strong	H6	Internal Facilitating
Internet Applications (Chat, Listservs, and Bulletin Boards)	Positive	Strong	H6	Internal Facilitating
Organizational Autonomy	Negative	Moderate	H7	Inhibiting
Symmetric Benefits	Positive	Moderate	H8	Inhibiting
Asymmetry	Negative	Strong	H9	Inhibiting

External Facilitating Forces

Since this study focused on electronic data sharing between different public agencies, it would be expected that certain external forces would be influential to the process of sharing data. From the literature, Rocheleau (1996) developed three hypotheses of external forces affecting interagency and interdepartmental data sharing. Two hypotheses explored how external forces facilitated data sharing between agencies and one hypothesis explored the relationship of external forces and interdepartmental data sharing.

- Hypothesis 1 noted that interdependency of function and common goals lead to sharing of information when the sharing is perceived by the organizations as assisting them with their core functions.
- Hypothesis 2 proposed that the degree of interorganizational sharing of information that takes place will be positively associated with the extent to which sharing is viewed as necessary to organizational survival.
- Hypothesis 3 noted that interdepartmental data sharing is most likely in public organizations that exist in rapidly changing, turbulent environments

Interdependency Of Function, Common Goals, and Core Functions

In organizational theory, interdependence has been defined in the context of private sector companies. Most of the definitions were constructed by describing the flow of resources within and between companies. From the resource prospective, Thompson's (1996) model of pooled, serial and reciprocal flow resources has been used to describe the degree of interdependence found in and between private sector companies. For example,

companies or departments receiving resources from a common pool are less interdependent than those in a serial or reciprocal relationship in which they are dependent on others.

This study measured the relationship of electronic data sharing to the interdependency of function within and outside the law enforcement domain of the respondents. Dependency was defined for the respondent as requiring some type of input from another agency to perform its primary law enforcement function. Respondents were asked to indicate if their agency was dependent on another law enforcement or non-law enforcement agency to perform their primary mission. Respondents were not asked to estimate any degree of the interdependency.

Common goals in this study were defined as agencies or organizations that shared the police department or sheriff's office goals of reducing crime in the community. Common goals were differentiated from interdependence to better isolate this variable. Different groups or agencies may have the same goals without being interdependent. To elaborate the measurement, the respondents were prompted with examples such as Community Watch, Victim Advocacy, Neighborhood Associations, etc.

The core function of the respondents in this study was municipal or county law enforcement. In the systems theory of public organizations, all agency activities tend to support the core functions of the agency. One item in the instrument asked respondents to indicate if they had shared data with another agency for the following reasons:

- To gain new information technology
- To gain access to new data
- To validate existing data
- To gain access to professional advice not otherwise available

- To solve a problem that was common to you and another agency
- Other (Respondent specified)

Each of the previous reasons potentially supports the agencies' core function of law enforcement. Frequency analysis indicated the two most common reasons for sharing data with another agency was to gain new information technology, presumably through the budgeting or granting process, and to gain access to new data.

To assess the relationship of interdependence with other law enforcement agencies and electronic data sharing, the interdependence item was crosstabulated with the dependent variable of sharing data electronically with other agencies. Initially the relationship was not statistically significant. See Table 5.3.

Table 5.3. The Bivariate Relationship Between Dependence On Other Law Enforcement Agencies And Sharing Data

		Dependent On Other Law Enforcement		Total
		Yes	No	
Sharing Data Electronically	Always	3	6	9
	Almost Always	9	23	32
	Frequently	8	10	18
	Sometimes	12	24	36
	Never	8	16	24
Total		40	79	119

$$(\chi^2 = 1.381, df = 4, p > .05; V = .108, p > .05)$$

The total number of cases represented approximately eighty five percent of the respondents. To determine if the full number of cases would shift the significance, data imputation was used and the relationship was reevaluated. After data imputation, the relationship did not change its significance ($\chi^2 = 6.124, df = 4, p > .05; V = .208, p > .05$).

The relationship between electronic data sharing and dependence on inputs from non-law enforcement agencies was explored. It was also expected that the dependence on non-law enforcement agencies would not be significant. However, this relationship was statistically significant. A closer examination of the relationship indicated the significance was negatively skewed toward not being dependent on non-law enforcement agencies for inputs. See Table 5.4

Table 5.4. The Relationship Between Dependence On Non-Law Enforcement Agencies And Sharing Data Electronically

		Non Law Enforcement		Total
		Yes	No	
Sharing Data Electronically	Always	1	9	10
	Almost Always	8	24	32
	Frequently	9	10	19
	Sometimes	8	27	35
	Never	2	22	24
Total		28	92	120

$$(\chi^2 = 10.202, df = 4, p < .05; V = .292, p < .05)$$

Due to missing data, data imputation techniques were used and the relationship was reevaluated. Data imputation did not change the significance of the relationship of the dependence on non-law enforcement agencies and sharing data electronically ($\chi^2 = 6.124, df = 4, p > .05; V = .208, p > .05$).

The relationship between sharing data with other non-law enforcement agencies such as Community Watches, Victim Advocacy, Neighborhood Associations, etc. that share common goals law with enforcement agencies and sharing data electronically was evaluated. See Table 5.5. The relationship was statistically significant suggesting that another agencies' common goals with law enforcement would influence electronic data sharing. Missing data

required using data imputation to reevaluate the relationship. Data imputation did not shift the relationship between the variables ($\chi^2 = 43.690$, $df = 16$, $p < .05$; $V = .278$, $p < .05$).

Table 5.5. The Bivariate Relationship Between Sharing Data With Groups Supporting Law Enforcement Goals and Sharing Data Electronically

		Sharing Electronic Data With Groups Supporting Law Enforcement Goals					Total
		Always	Almost Always	Frequently	Sometimes	Never	
Sharing Data Electronically	Always	0	0	1	6	3	10
	Almost Always	1	4	7	13	6	31
	Frequently	0	0	3	12	3	18
	Sometimes	0	1	4	24	9	38
	Never	0	0	4	3	18	25
Total		1	5	19	58	39	122

$$(\chi^2 = 39.716, df = 16, p < .05; V = .285, p < .05)$$

Hypothesis 1 linked the interdependency of function and common goals to sharing information when this sharing is linked to performing the agency’s core functions. Interdependency was defined for the respondents as the agency requiring an additional input from another agency to perform its primary mission. Analysis of this data indicated that interdependence of function (e.g. depending on other law enforcement agencies) was not statistically correlated to electronic data sharing.

The relationship of depending on non-law enforcement agencies and electronic data sharing was statistically significant. However, closer evaluation indicated that although the relationship was significant it was rooted in a majority of the respondents answering “No” to the independent variable. This finding did not contradict the interdependency of function analysis.

One aspect of Hypothesis 1 that behaved as expected was the relationship between groups that had common goals with law enforcement and electronic data sharing. This

relationship was statistically significant, supporting that aspect of Hypothesis 1. For police departments and sheriffs' offices, interdependence of function was rare and when it existed, did not affect electronic data sharing.

Electronic Data Sharing and Organizational Survival

Hypothesis 2 stated that the degree of interorganizational information sharing would be positively associated with the extent to which sharing is viewed as being necessary to organizational survival. Ultimately, organizational survival for public sector agencies is determined by legislative action with public sector agencies using a variety of strategies to compete for budget rather than market shares. Municipal police departments are created and funded by local governments while the sheriffs' offices are positions mandated by the North Carolina constitution. Although it is an elected position, sheriffs' offices receive their basic funding from county commissions.

Most law enforcement agencies receive a basic level of operating funds determined by their city council or county commissioners. Depending on the location, basic operating funds may not be sufficient for agencies to modernize their equipment or hire new officers. Law enforcement agencies are then placed in a position of competing for their share of shrinking local budgets with other city or county departments.

Coe and Weisel (2001) noted that police departments competed effectively for their share local budgets and listed several methods by which the departments succeed. One data sharing technique noted by Coe and Weisel (2001) was publishing or highlighting crime statistics as part of the strategy to compete for more funding. Rather than surviving, law enforcement agencies appeared to be using information sharing with the public as a means to thrive and grow. Hickman and Reeves (2003) also noted that from 1990-2000 police budgets nationwide increased thirty-three percent overall after adjusting for inflation.

Two items in the study instrument measured the respondents' willingness to share data with other agencies as a part of the budgeting process. One item measured the

frequency of sharing electronic data with the city or county budgeting department in order to justify personnel and equipment. The other item measured the frequency of sharing electronic data with another agency to supplement their budget. The examples given in this particular item included federal, state, local, non-profit, and private organizations with the means to grant additional funds beyond the respondent's allocated budget. The type of electronic data was not specified for the respondent.

Nearly all of the respondents answered both of the items. When both items were analyzed, the most frequent answer to them was "Never". However, the "Never" answer was thirty-four and thirty one percent of the responses respectively for each item leaving seventy six to seventy nine percent of the respondents sharing electronic data for budget items on a range from rarely to very often.

These two independent variables were crosstabulated with the dependent variable that measured whether an agency shared requests for data from other agencies electronically. When the first item (sharing with budget department) was crosstabulated with the dependent variable, sharing data electronically the relationship was significant. Additionally the relationship was slightly positive overall as hypothesized. See Table 5.6.

Table 5.6. The Bivariate Relationship Between Electronic Data Sharing With Local Budget Department And Sharing Requests For Data Electronically

		Electronic Data Sharing With Budget Department					Total
		Very Often	Often	Sometime	Rarely	Never	
Sharing Requests For Data Electronically	Always	0	7	0	1	2	10
	Almost Always	12	5	2	8	5	32
	Frequently	4	6	4	2	4	20
	Sometimes	1	6	11	11	10	39
	Never	1	2	2	2	18	25
Total		18	26	19	24	39	126

$$(\chi^2 = 66.593, df = 16, p < .05; V = .363, p < .05)$$

The relationship between the two variables was missing more than 5 percent of the responses. The “Separate Variance t Tests” of SPSS 11.5 indicated that row data was significantly correlated with the column data so imputation was used to determine if there would be shifts in the relationship trend or statistical significance with more robust data. After using the expectation maximization (EM) technique in SPSS 11.5, there was no shift in significance or the relationship.

When the second independent variable (supplemental budget) was crosstabulated with the dependent variable of sharing requests for data electronically, the relationship was also significant and slightly positive at the margins. See Table 5.7.

Table 5.7. The Bivariate Relationship Between Supplementing Budgets By Data Sharing And Sharing Requests For Data Electronically

		Supplementing Budget By Data Sharing					Total
		Very Often	Often	Sometime	Rarely	Never	
Sharing Requests For Data Electronically	Always	1	2	3	1	2	9
	Almost Always	7	8	5	7	5	32
	Frequently	2	5	10	1	2	20
	Sometimes	0	7	10	11	11	39
	Never	1	2	4	1	17	25
Total	11	24	32	21	37	125	

$$(\chi^2 = 45.146, df = 16, p < .05; V = .300, p < .05)$$

This relationship was also missing more than 5 percent of its cases with missing row variables being correlated with column variables. Data imputation was used to reexamine the relationship for any shift in significance or relationship. The relationship remained both statistically significant and strongly correlated ($\chi^2 = 55.660, df = 16, p < .05; V = .314, p < .05$).

Hypothesis 2 positively correlated the degree of data sharing with organizational survival. Since public agencies are legislated into existence, budget activity was used as a proxy for an organization's survival strategy. Respondents were first asked to estimate how often they shared data with their city or county budget departments. Next, the respondents were asked to estimate how often they electronically shared data with other agencies to supplement their budgets. Each relationship was statistically significant and strongly correlated with electronically sharing requests for data from other agencies. Based on analysis of this data, Hypothesis 2 is supported. The quest for organizational survival does affect electronic data sharing between public agencies. As Coe and Wiesel (2001) noted,

“In competing for limited resources, police departments can play an ace in the hole; crime” (p.718).

Turbulent Environments and Interdepartmental Data Sharing

Hypothesis 3 proposed that interdepartmental data sharing is most likely in organizations that exist in competitive environments with rapidly changing products/services. Most public agencies do not exist in an environment where they are rapidly changing their products and services. Rather than change their services, they strive to deliver their services more equitably, efficiently, or in some combination of both. Rapid change has been rare in the public sector.

Rocheleau (1996) noted that local government agencies were “loosely coupled”, almost independent service providers with little competition, or need to dominate their particular market. For example, there are no other law enforcement agencies competing with the local police to provide similar services. However, this study proposed there were certain external stresses acting on all public agencies that were analogous to the more competitive environment of the private sector. Consequently, these stresses should stimulate more interdepartmental data sharing in public agencies.

Bozeman and Straussman (1990) noted there were several environmental conditions that pushed public agencies into competition with each other. One of these conditions was the competition for shrinking public budgets. Especially when one program is financed at the expense of another or additional programs are mandated but without extra funding to implement them. Bozeman and Straussman (1990) also noted that style or party differences between political and civil leaders were another source of competition in the public sector.

Another source of potential competition between public agencies was implementing results based management programs. Swiss (2002) has noted that implementing results based management programs enables agencies to be more nimble and outwardly focused. An agency that is more responsive uses the opportunity to effectively compete for desired resources. Interdepartmental sharing of near real time data is one method used in results based management that enables an agency to effectively respond to the external environment and compete effectively for scarce resources.

For this study, events with the potential to induce competition between agencies were defined as environmental turbulence. Based on the literature, this study used three general event types as indicators of environmental turbulence: financial stress, changes in political or administrative leadership, and implementing some form of performance-based management. These general events were selected because they represented cyclical and recurring stresses in the public sector rather than a single incident or event.

Respondents were asked to indicate how certain environmental factors had affected interdepartmental data sharing within the agency. Table 5.8 summarizes both the environmental factors and the range of responses. The analysis of this data did not support Hypothesis 3. Figure 5.1 summarizes how the respondents perceived the effect of the turbulent conditions on interdepartmental data sharing. The most frequent answer is “No Change” in interdepartmental data sharing.

Each of the turbulence factors had more than 5% of the data missing. The separate variance t test indicated the data met the criteria for imputation. In this particular set of items, it was possible that respondents did not have knowledge of the independent variable and choose not to answer. For example, it is possible that respondents in municipal police

departments did not answer questions regarding sheriffs or county managers. In the same manner, county government respondents may not have answered questions regarding the mayor’s office or city manager.

The analysis of this data for Hypothesis 3 did not change with data imputation. The most frequent answers to the independent variables questions were “No Change”. It was originally hypothesized that certain environmental factors would increase interdepartmental data sharing. In this study, three general types of organizational stress were measured: financial stress, changes in political or administrative leadership, and implementing some form of performance-based management. These general stresses did not affect the respondent’s perception of interdepartmental data sharing in any measurable way. Hypothesis 3 was not supported by this study.

Table 5. 8. Questions of Environmental Turbulence with Range of Responses

Please consider interactions within your entire agency and other groups listed as you consider the statement below. Check all that apply. In the past five years, electronic data sharing between departments within in your agency has _____ due to the following changes

Changes	Increased Significantly	Increased	Not Changed	Decreased	Decreased Significantly
Budget Cuts					
Different Political Party assumes Mayors Office					
Different Political Party assumes Sheriff’s Office					
Change in City Manager					
Change in County Manager					
Changes in Command Staff					
Implementation of Computer Based Statistics (COMPSTAT)					

Effect Of Turbulence On Internal Data Sharing

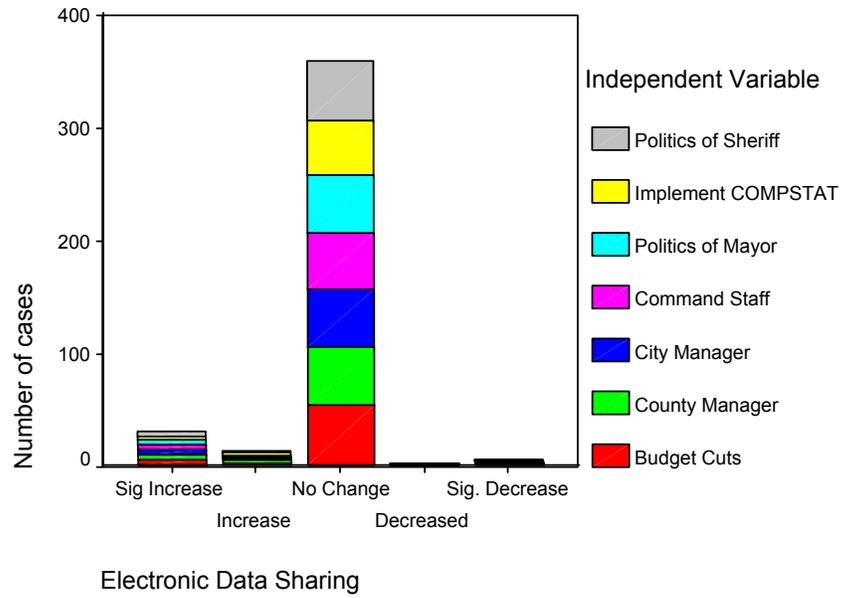


Figure 5.1. Effect of Turbulence on Internal Data Sharing

Internal Facilitators

Three hypotheses, called internal, facilitators propose the following data sharing relationships:

- Hypothesis 4 proposed that interdepartmental and interorganizational information sharing were positively associated with the interest of top management in encouraging such sharing.
- Hypothesis 5 proposed that information sharing would be greater between organizations that share compatible hardware and software.
- Hypothesis 6 proposed that interdepartmental and interorganizational sharing would be greater in organizations that encourage computer exchanges by individuals (e.g. through establishment or participation in local and wide area networks, electronic mail, and bulletin board systems).

Interest of Top Management

Hypothesis 4 stated that interorganizational and interdepartmental information sharing is positively associated with the interest of top management in encouraging the sharing. One of the oldest observations in public and private sector management studies is that organizations align to the interest of their leaders. The interest of top management has been frequently cited as a contributing factor in all phases of information technology (IT) projects.

Beginning with the initial planning, Byrd, Sambamurthy, and Zmund (1996) noted that top management support significantly influenced the quality of planning for new IT projects in public organizations.

During the installation phase of IT projects, Cats-Baril and Thompson (1995), more recently Beaumaster (1999), and Schelin (2004) have also highlighted the importance of the interest of top management in successful implementations. Once IT projects enter their sustaining phase, the interest of top management through Chief Information Officers (CIO) or other agency leaders remains critical to maintaining and improving projects.

The instrument measured two aspects of the interest of top management in electronic data sharing. One item measured the publicly stated interest of political and appointed leaders in electronic data sharing between public agencies with different functions and missions. The frequency of support was measured for selected officials on a scale from “Don’t Know” to “Very Frequently.” Table 5.9 illustrates the assessment item used in the instrument.

Another item measured the frequency that an agency leader such as the police chief or sheriff expressed an interest within the agency as opposed to publicly about sharing electronic data between different agency departments. This item was measured on a scale from “Don’t Know to Very Frequently.” The “Don’t Know” selections in both items were treated as missing data.

Table 5.9. Interest Of Political And Top Management In Sharing Electronic Data

<i>Please consider your entire agency as you answer the questions below.</i>						
How frequently has any leader mentioned in the table below publicly expressed an interest in sharing electronic data between public agencies with different functions and missions? Please check all that apply to your agency.						
	Very Frequently	Frequently	Occasionally	Only Once	Never	Don't Know
Mayor						
City Council						
County Commissioners						
City Manager						
County Manager						
Police Chief						
Sheriff						

Since the top manager in a municipal police agency is the chief, this item was crosstabulated with the dependent variable that measured the frequency of sharing requests for data from other agencies in an electronic format. The relationship between these two variables was statistically significant. However, more than 5 percent of the cases between the two variables were missing. Data imputation was used to provide hypothetical data and determine if there would be a shift in significance. In the relationships between the expressed interest of police chiefs and electronic sharing, data imputation did not change the statistical significance at the $p < .05$ level. Table 5.10 is the original crosstabulation without data imputation.

Table 5.10. The Bivariate Relationship Of The Interest Of Police Chiefs In Electronic Data Sharing By Agencies Sharing Electronic Data

		Interest of Police Chiefs in Electronic Data Sharing					Total
		Very Frequently	Frequently	Occasionally	Only Once	Never	
Sharing Electronic Data	Always	2	2	2	0	0	6
	Almost Always	5	9	3	0	1	18
	Frequently	7	3	0	0	2	12
	Sometimes	11	5	11	0	2	29
	Never	4	4	6	0	4	18
	Don't Know	0	1	3	1	0	5
Total		29	24	25	1	9	88

$$(\chi^2 = 38.447, df = 20, p < .05; V = .330, p < .05)$$

Sheriffs are in the unique position of being both top management and elected officials at the same time. The initial crosstabulation of the frequency of the Sheriffs expressing an interest in electronic data sharing between public agencies of different functions and the dependent variable was not significant at the $p < .05$ level.

The sample was composed of twenty-five of the possible one hundred sheriff departments in North Carolina. The instrument item allowed any respondent to indicate if they had knowledge of any official publicly expressing an interest in data sharing. Based on the structure of the instrument item, there was some overlap in regards to all of the officials i.e. a police agency could have knowledge of a sheriffs' position on electronic data sharing or vice versa.

The crosstabulation of the sheriffs' interest in electronic data sharing and an agency's willingness to share electronic data had more than 5 percent missing based on the total sample size of one hundred and forty one respondents. Standard data imputation using estimation-maximization (EM) was used to fill in the missing data and reexamine the

relationship using crosstabulation. After using data imputation techniques, the relationship between the variables was significant at the $p < .05$ levels. See Table 5.11.

Table 5.11. The Bivariate Relationship Of The Interest Of Sheriffs In Electronic Data Sharing By Agencies Sharing Electronic Data (Data Imputation)

		Sheriffs Interest In Electronic Data Sharing				Total
		Very Frequently	Frequently	Occasionally	Never	
Sharing Electronic Data	Always	1	7	2	0	10
	Almost Always	1	1	28	2	32
	Frequently	2	3	14	1	20
	Sometimes	3	9	27	3	42
	Never	3	1	19	2	25
Total		10	21	90	8	129

$$(\chi^2 = 32.000, df = 12, p < .05; V = .288, p < .05)$$

For police agencies, there is another level of top management in North Carolina, the city manager. The crosstabulation between the emphasis of the city manager on data sharing and sharing data electronically was not significant. Because more than 5 percent of the cases were missing, data imputation was used before the relationship was reexamined. The statistical significance of the relationship did not change.

The remaining leadership positions of mayor, city council, county commissioners, and county manager followed a pattern similar to the city manager. Each relationship had a significant number of missing cases, so data imputation was used to fully explore the relationship. Even with the hypothetical data, there was no significant correlation between the public support of the mayor, city council, county commissioners, and county manager for electronic data sharing and the agencies propensity for sharing data in an electronic format.

Hypothesis 4 stated that interdepartmental and interorganizational information sharing is positively associated with the interest of top management in encouraging such

sharing. Data in this study indicated that the interest of top management (police chiefs) in police departments in data sharing was correlated with the agencies' propensity for sharing data electronically. Using data imputation, there was also a significant correlation between top management (sheriff) interest in sheriffs' offices and the agencies' propensity for sharing data electronically.

Analyzing the data for the political and appointed leaders suggested a proximity factor in Hypothesis 4. Police departments and sheriffs' offices traditionally function as quasi-military, hierarchical organizations with police chiefs and sheriffs occupying the top of the hierarchy. The top management, chiefs and sheriffs, exert a great deal of influence on the police officers and deputies.

By using data imputation, the relationship between an agency sharing data electronically and support by other managers and leaders was not statistically significant. Based on these data, Hypothesis 4 was supported with the caveat that the support of top management *within* the agency positively influences electronic data sharing.

Compatible Hardware and Software

Hypothesis 5 stated that hardware and software compatibility between organizations was influential in electronic data sharing. Technically speaking, compatible hardware and software would be a critical first step for successful electronic data sharing. Landsbergen and Wolken (1998) noted that “technical incompatibility” was the reason most cited for interoperability problems between public agencies. Landsbergen and Wolken (1998) proposed there were three general types of technical incompatibility: hardware, software, and data definitions.

Desktop computing has now entered a phase of networked interconnectivity and file sharing via the Internet. Even files originally created in either the Windows or the Macintosh operating systems are now shared with applications in either operating system. During the 1990s, open standards between commercial software formats also reduced potential data sharing problems between agencies due to software conflicts. For example, most word processing as well as database software began to provide options for translating and creating files into other formats.

Landsbergen and Wolken also (1998) noted that the differences in data definitions were the most difficult of the “technical incompatibilities”. In many data sharing projects, standardized data definitions are often proposed as one method to improve data sharing between different law enforcement agencies. Standardized definitions have been resisted as the “one size fits all” approach limiting agencies with unique needs.

Rocheleau (1996) hypothesized that compatible hardware and software would be an important factor affecting interagency information sharing. However based on developments in file sharing and network interconnectivity, it was expected in this study that hardware and

software compatibility would be a minimal issue between law enforcement agencies. The exact influence of data definitions, however, was unknown but potentially influential to electronic data sharing based on public and private sector literature.

Three items in the instrument measured the compatibility issues of hardware, software, and data definitions. These items asked the respondents to indicate the frequency of difficulty in using electronic data due to software, data definitions, and hardware compatibility issues. The responses were measured on the following scale:

- Always
- Almost Always
- Frequently
- Sometimes
- Never

Each of the three items was crosstabulated with the dependent variable. The dependent variable was defined as the frequency of granting requests for data from other agencies in an electronic format. The initial, before data imputation, analysis, indicated that software issues and data definitions were statistically correlated with sharing data electronically. See Tables 5.12 and 5.13.

Table 5.12. Bivariate Relationship Between Different Data Definitions And Sharing Data Electronically

		Data Definitions					Total
		Always	Almost Always	Frequently	Sometimes	Never	
Sharing Data Electronically	Always	0	0	0	7	3	10
	Almost Always	1	1	7	17	5	31
	Frequently	0	3	7	6	2	18
	Sometimes	1	3	7	22	5	38
	Never	4	0	3	9	8	24
Total	6	7	24	61	23	121	

$$(\chi^2 = 28.781, df = 16, p < .05; V = .244, p < .05)$$

Table 5.13. Bivariate Relationship Of Software Difficulties And Sharing Data Electronically

		SOFTWARE					Total
		Always	Almost Always	Frequently	Sometimes	Never	
Sharing Data Electronically	Always	0	0	2	7	1	10
	Almost Always	1	1	9	20	0	31
	Frequently	0	3	6	8	2	19
	Sometimes	2	1	10	23	2	38
	Never	3	2	3	6	10	24
Total	6	7	30	64	15	122	

$$(\chi^2 = 39.812, df = 16, p < .05; V = .286 p < .05)$$

In each of the significant relationships, there was a distinct clustering of the independent variables towards the “Sometimes” and “Never” choices of those items. In regards to the dependent variable, approximately 1.7 % of the respondents indicated they “Never” shared data electronically. The rest of the respondents shared electronic data despite having software and data definition problems either “Frequently”, “Sometimes” or “Never” and to a lesser extent “Almost Always” and “Always”.

More than 5 percent of the cases were missing from each of the relationships so data imputation was used to evaluate if hypothetical data in the missing cases, would change the

statistical significance of the relationship. After using data imputation, two relationships changed their significance, hardware and data definitions.

The relationship between difficulties in hardware and sharing data electronically changed from statistically insignificant to significant ($\chi^2 = 23.901$, $df = 16$, $p > .05$; $V = .221$, $p > .05$). See Table 5.14. The relationship between difficulty with data definitions and sharing data electronically also shifted from significant to insignificant. See Table 5.15. The relationship between software difficulties and sharing electronic data remained significant.

Table 5.14 Bivariate Relationship Between Difficulty With Hardware And Sharing Data Electronically (Data Imputation)

		Difficulty With Hardware					Total
		Always	Almost Always	Frequently	Sometimes	Never	
Sharing Data Electronically	Always	0	0	0	7	3	10
	Almost Always	0	1	6	18	7	32
	Frequently	0	0	5	22	7	34
	Sometimes	1	4	6	21	8	40
	Never	4	0	3	9	9	25
Total		5	5	20	77	34	141

$$(\chi^2 = 27.745, df = 16, p < .05; V = .222, p < .05)$$

Difficulty in using electronic data due to incompatible hardware was inversely correlated with sharing data electronically, confirming one part of Hypothesis 5.

Table 5.15. Bivariate Relationship Between Differences In Data Definitions And Sharing Data Electronically (Data Imputation)

		Differences in Data Definitions					Total
		Always	Almost Always	Frequently	Sometimes	Never	
Sharing Data Electronically	Always	0	0	0	7	3	10
	Almost Always	1	1	7	18	5	32
	Frequently	0	3	11	14	6	34
	Sometimes	2	3	7	23	5	40
	Never	4	0	3	10	8	25
Total		7	7	28	72	27	141

$$(\chi^2 = 24.030, df = 16, p > .05; V = .206, p > .05)$$

With data imputation, the bivariate relationship between differences in data definitions between agencies and sharing electronic data became statistically insignificant. See Table 5.15. Data definitions were not an original aspect of Hypothesis 5. The relationship between data definitions and electronic data sharing was developed from later literature. The hypothetical data indicated that respondents would share data electronically, ranging from “Sometimes” to “Always” despite differences in data definitions between agencies.

The relationship between incompatibilities in software between agencies and sharing data electronically remained statistically significant ($\chi^2 = 37.690$, $df = 16$, $p < .05$; $V = .259$, $p < .05$). After using data imputation, Hypothesis 5 was not supported by this study.

Email and Internet Applications

Hypothesis 6 stated that interdepartmental and interorganizational data sharing would be greater in organizations that encouraged computer exchanges by individuals (e.g. through establishment or participation in local and wide area networks, electronic mail, and bulletin board systems). Since this hypothesis was originally developed, there has been a significant change in applications used for exchanging computerized information. The sharp distinction between local and wide area networks has been blurred by increased Internet connectivity.

Hypothesis 6 had two aspects for investigation, email as well as Internet applications. Consistent with the computing explosion in the 1990s, Hickman and Reaves (2001) noted that in the two years from 1997 to 1999, the number of local police agencies connecting to the Internet doubled. This increased connectivity also increased the opportunities to easily exchange electronic data.

Five items in the instrument measured the respondents' use of email and Internet applications. The following email and Internet aspects were measured:

- Percentage of employees with an agency email address
- Presence of written policies or standard operating procedures (SOP) for using email
- Estimated range of restrictions on using email from none to official use only
- Whether email was monitored for compliance with a SOP
- Use of the Internet for professional research
- Downloading statistical data from the Internet

To test the relationship of email to electronic data sharing, the item measuring the percentage of employees with an agency email address was crosstabulated with the dependent variable which measured how often the agency electronically shared data with other agencies. Neither of these variables had a significant number of missing cases. The results of the analysis shown in Table 5.16 indicated that having agency email addresses was not significantly correlated with sharing electronic data.

Table 5.16. Bivariate Relationship of the Percentage of Employee Email and Electronically Sharing Requests for Data

		Employee Email				Total
		76 - 100 %	51 - 75 %	26 - 50 %	10 - 25 %	
Sharing Electronic Data	Always	5	1	3	1	10
	Almost Always	20	2	4	6	32
	Frequently	9	6	2	2	19
	Sometimes	18	4	8	8	38
	Never	13	2	2	6	23
	Don't Know	4	2	0	6	12
	Total	69	17	19	29	134

$$(\chi^2 = 20.826, df = 15, p > .05; V = .228, p > .05)$$

However, two aspects of managing the use of agency email by employees, having SOPs (see Table 5.17) and monitoring email use (see Table 5.18), were significantly correlated with sharing electronic data with other agencies.

On first analysis, the range of restriction of the email policies was not significantly correlated with sharing electronic data with other agencies. These two variables had significant numbers of missing cases, greater than 5 percent, within the relationship. However, when data imputation was used to reexamine the relationship, there was no shift in the statistical significance.

Table 5.17. The Bivariate Relationship Of Email SOPs And Sharing Electronic Data

		Email Standard Operating Procedure			Total
		Yes	No	Don't Know	
Sharing Electronic Data	Always	6	3	1	10
	Almost Always	25	6	0	31
	Frequently	14	5	0	19
	Sometimes	25	12	1	38
	Never	6	18	0	24
	Don't Know	5	4	3	12
Total		81	48	5	134

$$(\chi^2 = 40.413, df = 10, p < .05; V = .388, p < .05)$$

Table 5.18. The Bivariate Relationship Of Email Monitoring And Sharing Electronic Data

		Email Monitoring			Total
		Yes	No	Don't Know	
Sharing Electronic Data	Always	5	4	1	10
	Almost Always	18	13	0	31
	Frequently	9	10	0	19
	Sometimes	20	16	2	38
	Never	5	18	1	24
	Don't Know	2	3	6	11
Total		59	64	10	133

$$(\chi^2 = 48.861, df = 10, p < .05; V = .429, p < .05)$$

The Internet applications noted in Hypothesis 6 did have a significant relationship with electronic data sharing between organizations. The Internet applications were divided into downloading professional information via listservs and bulletin boards and downloading statistical or other tabular type data from professional websites. In both relationships neither of the variables crosstabulated with electronic data sharing had a significant number of missing data cases in the relationship. Data imputation methods were not used. Tables 5.19 and 5.20 summarize the significant relationships between the two variables.

Table 5.19. The Bivariate Relationship Of Downloading Professional Information From The Internet By Sharing Electronic Data

		Downloading Professional Information From The Internet					Total
		Very Frequently	Frequently	Sometimes	Rarely	Never	
Sharing Electronic Data	Always	4	2	4	0	0	10
	Almost Always	14	10	8	0	0	32
	Frequently	7	6	4	2	0	19
	Sometimes	10	20	5	3	0	38
	Never	1	9	13	1	1	25
	Don't Know	2	4	4	2	0	12
Total		38	51	38	8	1	136

$$(\chi^2 = 32.960, df = 20, p < .05; V = .246, p < .05)$$

Table 5.20. The Bivariate Relationship Of Downloading Statistical Information From The Internet By Sharing Electronic Data

		Downloading Statistical Or Other Data From The Internet					Total
		Very Frequently	Frequently	Sometimes	Rarely	Never	
Sharing Electronic Data	Always	4	2	3	1	0	10
	Almost Always	6	11	11	4	0	32
	Frequently	1	10	7	1	0	19
	Sometimes	5	12	17	4	0	38
	Never	0	7	8	8	2	25
	Don't Know	1	2	5	4	0	12
Total		17	44	51	22	2	136

$$(\chi^2 = 33.753, df = 20, p < .05; V = .249, p < .05)$$

For Hypothesis 6, basic email connectivity was not sufficient to significantly influence electronic data sharing between agencies. However, the presence of employee management controls such as the standard operating procedures (SOP) and email monitoring were significantly correlated with sharing electronic data between agencies. Also, the use of Internet applications to download professional, statistical, and other information did have a significant relationship with electronic data sharing. Based on analysis of this data, only the Internet applications aspects of Hypothesis 6 were supported. Interdepartmental data

sharing by email was not measured, however environmental factors affecting interdepartmental electronic data sharing were analyzed in Hypothesis 3.

Inhibiting Factors

Along with the facilitating factors there were also inhibiting factors. Three hypotheses addressed issues that inhibited interorganizational or interdepartmental electronic data sharing:

- Hypothesis 7- Organizations will resist external sharing that threatens their autonomy
- Hypothesis 8- The degree of sharing is likely to be higher between organizations that perceive symmetry of benefits and costs
- Hypothesis 9- When sharing occurs despite an asymmetry of costs and benefits to the participants, there is a greater likelihood of data quality problems

Organizational Autonomy

Hypothesis 7 stated that organizations would resist external data sharing that threatens their autonomy. Oliver (1990) noted that organizational autonomy had two aspects; control of the company resources and the relative freedom from satisfying external demands. Oliver's (1990) definition was defined in terms of private sector companies. Public sector agencies have never been totally free from satisfying the external demands of citizens or political leaders who also ultimately control their resources.

Bozeman and Straussman (1990) noted that because public agencies are legislated into existence they are monitored and controlled in many ways that would seem to thwart any efforts to achieve greater autonomy. Bozeman and Straussman (1990) also noted that agencies were not passive but struggle to establish their autonomy through a variety of methods.

In the instrument, agency autonomy was defined for the respondents as the ability to maintain a distinctive identity. The instrument measured two autonomy issues. First, the respondents were asked to determine the probable effect on agency autonomy of entering into a data sharing agreement. The second autonomy item measured the likelihood that the responding agency would enter into a data sharing agreement where it would lose the ability to control its data.

In Chapter 4, it was noted that 80.0 percent ($n = 112$) of the responding agencies thought data sharing with other organizations would not affect their autonomy. It was also noted in Chapter 4 that autonomy was so important to the agencies that 68.8 percent ($n = 95$) would resist any data sharing agreement that would lessen the freedom to control their data.

Both of these items suggested that the respondents to this study were determined to maintain their distinctive identities in any data sharing relationships. Dawes (1996) as well as Landsbergen and Wolken (2001) proposed that a manager's previous experience in other information sharing activities was one determinant of participating in future interagency information sharing relationships.

The instrument contained one item that measured the agencies' opinion of the costs and benefits of data sharing agreements in the past five years. The item measured whether the agreement had cost more than it benefited, costs and benefits were the same, or the benefits outweighed the costs. The instrument did not provide any definitions of costs and benefits. The respondent was free to define their definition of a cost or benefit.

To understand if experience was significantly correlated with strong opinions about autonomy, the respondents' previous experience with data sharing agreements was cross-tabulated with each autonomy item. Since each relationship had greater than 5

percent of the cases missing, data imputation was used to determine if additional data shifted the significance of the relationships.

The crosstabulation of their experience with past data sharing agreements and the probable impact on their autonomy was neither significant nor strong. Initially, experience did not affect agencies' expectations of autonomy in data sharing agreements. See Table 5.21.

Since the relationship had a significant number of missing cases, the expectation maximization (EM) technique was used to input hypothetical answers for all respondents for both variables. With hypothetical data imputed, the bivariate relationship between previous data sharing experience and the respondents' opinion of the probable effect of data sharing with other agencies shifted from insignificant to significant at the $p < .05$ level. See Table 5.22. Also, with the imputed data, the percentage of respondents who thought a data sharing agreement would decrease their autonomy dropped from 5.8 percent to 2.8 percent.

This data imputation provided support for Dawe's (1996) as well as Landsbergen and Wolken's (1998 & 2001) model where prior data sharing experiences were an important independent variable in determining the potential of future data sharing relationships.

Table 5.21. Bivariate Relationship of Previous Data Sharing Experience By Probable Effect on Agency Autonomy

		Past Data Sharing Agreements			Total
		Cost More than Benefited	Cost And Benefits Are Same	Benefits Outweigh Costs	
Agency Autonomy	Increased Autonomy	0	2	8	10
	Same Autonomy	3	14	21	38
	Don't Know	0	1	2	3
Total		3	17	31	51

$$(\chi^2 = 2.515, df = 4, p > .05; V = .157, p > .05)$$

Table 5.22. The Relationship Of Past Data Sharing Agreements By Probable Effect Of The Agreement On Agency Autonomy (Data Imputation)

		Past Data Sharing Agreements			Total
		Cost More than Benefited	Cost And Benefits Are Same	Benefits Outweigh Costs	
Probable Effect of Data Sharing Agreements on Agency Autonomy	Increased Autonomy	0	2	22	24
	Same Autonomy	3	14	72	89
	Decreased Autonomy	0	4	0	4
	Don't Know	0	20	4	24
Total		3	40	98	141

$$(\chi^2 = 58.732, df = 6, p < .05; V = .456, p < .05)$$

Experience also did not affect the likelihood that respondents would resist entering into restrictive data sharing agreements where they would give up more control of their data. The relationship of the two was neither significant nor strong. Table 5.23 summarizes this particular relationship. When data imputation was used to input hypothetical data and the relationship was reexamined, the statistical significance did not change.

Table 5.23. Bivariate Relationship of Previous Data Sharing Experience By Resistance to Agreements Affecting Autonomy

		Past Data Sharing Agreements			Total
		Cost More than Benefited	Cost And Benefits Are Same	Benefits Outweigh Costs	
Agreements Affecting Autonomy	Resist Strongly	1	3	7	11
	Very Likely Resist	1	6	6	13
	Probably Resist	0	5	10	15
	Would Not Resist	1	3	3	7
Total		3	17	26	46

$$(\chi^2 = 3.310, df = 6, p > .05; V = .190, p > .05)$$

Two univariate items (see Chapter 4) in the instrument detected that autonomy in data sharing relationships was important to the respondents. Dawes (1996) as well as Landsbergen and Wolken (2002) hypothesized that previous experience was an important determinate in whether agencies would enter into any data sharing agreements. Data from this study indicated that prior data sharing experience was not significant to opinions about autonomy in new data sharing relationships.

However, when data imputation was used, costs and benefits experience was significantly correlated with how the agency thought a data sharing agreement would affect its autonomy. Using hypothetical data, the more a respondent benefited from prior data sharing agreements then the less likely they were to think that new data sharing agreements would lessen their autonomy.

Finally, respondents indicated they would resist in some manner any data sharing agreement that would lessen the agency's ability to control their data. Based on the previous analysis, Hypothesis 7 is supported. Organizations will resist external data sharing

agreements that threatens their autonomy. Additionally, organizations will resist external data sharing agreements that threaten their ability to organize their data as they see fit.

Symmetric Benefits

Hypothesis 8 stated that the degree of data sharing is likely to be higher between organizations that perceive symmetry of benefits and costs. In the instrument, symmetric benefits were not defined. Each respondent was free to determine the value of a “benefit.” To analyze the relationship between symmetric benefits and electronic data sharing, three items from the instrument were crosstabulated with the agencies’ perception of benefits from any data sharing agreements they had entered into in the previous five years.

First, the agencies perception of their past data sharing agreements was crosstabulated with their willingness to grant requests for data from other agencies and provide the requested data in electronic format. The perception of data sharing agreements was treated as the independent variable and the willingness to grant requests for data in electronic format was the dependent variable. This particular dependent variable did not differentiate the status of the requesting agency, i.e. civilian or law enforcement.

The second part of the analysis was to assess whether the domain of the requestor was a factor in whether the respondent shared electronic data with a requesting agency. Again, the perception of data sharing agreements was crosstabulated with two other items that specifically differentiated between civilian and law enforcement agencies.

The independent item assessed how the respondents perceived they benefited from prior data sharing agreements. Respondents were asked to indicate whether any data sharing agreement in the past five years had:

- Cost the agency more than it received in benefits
- Cost and benefits have been the same
- Benefits outweigh the costs

- Don't Know

The most frequent answer to the item was that the “Benefits Outweigh the Costs” followed by “Costs and Benefits Are Same” which indicated that overall, agencies perceived some benefit from their data sharing agreements. “Don't Know” answers were treated as missing data. This variable had more than 5 percent of the cases missing. See Table 5.24.

Table 5.24. Frequency of Perceived Benefits From Data Sharing Agreements

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Cost More than Benefited	3	2.1	4.9	4.9
	Cost And Benefits Are Same	17	12.1	27.9	32.8
	Benefits Outweigh Costs	31	22.0	50.8	83.6
	Don't Know	10	7.1	16.4	100.0
	Total	61	43.3	100.0	
Missing	System	80	56.7		
Total		141	100.0		

Respondents were also asked whether requests for data from other agencies were granted and then provided in electronic format. Table 5.25 summarizes the responses. Initially, this item had less than five percent of the cases missing. However, the frequency of respondents answering “Never” and “Don't Know” was 17.7 percent and 8.5 percent respectively. The “Don't Know” responses were treated as missing data points which raised the missing values to 10.6 percent. The rest of the respondents were willing to electronically share requests for data at varying frequency from “Sometimes.” to “Always”

Table 5.25. Frequency of Agencies Granting Requests For Data in Electronic Format

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Always	10	7.1	7.9	7.9
	Almost Always	32	22.7	25.4	33.3
	Frequently	20	14.2	15.9	49.2
	Sometimes	39	27.7	31.0	80.2
	Never	25	17.7	19.8	100.0
	Total	126	89.4	100.0	
Missing	Don't Know	12	8.5		
	System	3	2.1		
	Total	15	10.6		
Total		141	100.0		

Since agencies generally reported they benefited from their data sharing agreements, this perception should positively influence electronic data sharing with other agencies. The greater the benefits of the data sharing relationships, then the more frequently agencies share electronic data with other agencies. Table 5.26 is the crosstabulation of the benefit of data sharing agreements and the frequency of agencies electronically granting requests for data. There was no discrimination in the item, regarding whether the domain of the agency was law enforcement or non-law enforcement. When there was no discrimination in the agency domain, symmetric benefits between agencies had no significant effect on the frequency of sharing electronic data.

Since the relationship had a significant number of missing cases, estimation maximization (EM) was used to input hypothetical data in order to reexamine the relationship for a shift in significance.

Table 5.26. Bivariate Relationship Between Data Sharing Benefits and Electronically Sharing Requests for Data

		Data Sharing Benefits				Total
		Cost More than Benefited	Cost And Benefits Are Same	Benefits Outweigh Costs	Don't Know	
Sharing requests electronically	Always	0	3	1	2	6
	Almost Always	1	5	10	1	17
	Frequently	1	4	7	1	13
	Sometimes	0	2	9	1	12
	Never	1	2	2	5	10
	Don't Know	0	1	2	0	3
Total		3	17	31	10	61

$$(\chi^2 = 19.362, df = 15, p > .05; V = .325, p > .05)$$

As Dawes (1996) previously noted, managers are more favorable to information sharing to solve domain level problems. Based on Dawes (1996) observation, law enforcement agencies would most likely share information with other law enforcement agencies. The previous bivariate analysis incorporated law enforcement and non-law enforcement agencies in the dependent variable item.

To determine whether the domain of data sharing was important, the same data sharing agreement item was crosstabulated with another item asking the respondent, “ How often does your agency share computerized data with other law enforcement agencies on which your agency is not dependent to perform its primary mission?” Table 5.27 is the crosstabulation of the two items. When there was discrimination in the agency domain, the relationship is significant.

Table 5.27. Bivariate Relationship Between Data Sharing Benefits and Sharing Data with Other Law Enforcement Agencies

		Data Sharing Benefits				Total
		Cost More than Benefited	Cost And Benefits Are Same	Benefits Outweigh Costs	Don't Know	
Sharing with law enforcement	Always	1	3	5	0	9
	Almost Always	0	1	1	0	2
	Frequently	2	4	6	4	16
	Sometimes	0	7	17	1	25
	Never	0	2	2	5	9
Total		3	17	31	10	61

$$(\chi^2 = 21.728, df = 12, p < .05; V = .425, p < .05)$$

To confirm whether domain was important in a data sharing relationship the benefits item was crosstabulated with another item that asked the respondent how often they shared electronic data with non-law enforcement agencies they were not dependent on to perform their primary mission. The results were not significant in association or strength at the $p < .05$ levels. Based on these data, the symmetric benefits hypothesis was not supported in its general form. However, based on this data analysis, the degree of sharing was higher between organizations *in the same domain*.

Asymmetric Benefits and Data Quality

Hypothesis 9 asserted that when data sharing occurred despite an asymmetry of costs and benefits to the participants, there was a greater likelihood of data quality problems. In the instrument, asymmetry was defined as one agency benefited from electronic data sharing and another did not. The respondents judged the asymmetric condition from the general principle of one agency benefiting and the other not benefiting.

Two different items in this study measured asymmetry. One item asked the respondents to evaluate data quality when they benefited from receiving electronic data and the providing agency did not. Another potentially asymmetric exchange is receiving electronic data due to a legal or administrative mandate. In this case, the electronic data sharing relationship is forced. A second item in the instrument asked respondents to evaluate electronic data received from other agencies because of a mandate.

When agencies were asked whether *they* had shared data with other agencies when there was no perceived benefit, the answers were variable; the most frequent answers were “Sometimes” followed very closely by “Often.” Table 5.28 summarizes the agencies’ responses to that item and Figure 5.2 illustrates the variability of the answers.

Table 5.28. Frequency of Sharing Data For No Perceived Benefit

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Often	8	5.7	11.0	11.0
	Often	17	12.1	23.3	34.2
	Sometimes	18	12.8	24.7	58.9
	Rarely	12	8.5	16.4	75.3
	Never	12	8.5	16.4	91.8
	Don't Know	6	4.3	8.2	100.0
	Total	73	51.8	100.0	
Missing	System	68	48.2		
Total		141	100.0		

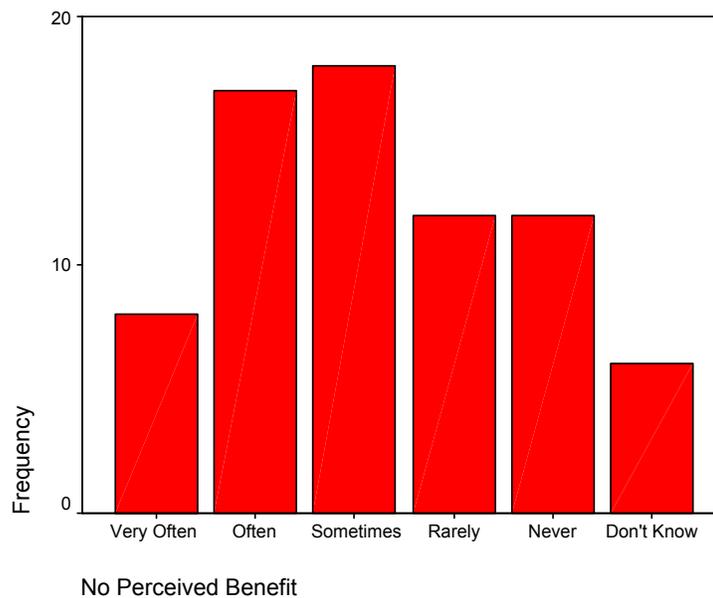


Figure 5.2. Sharing Data For No Perceived Benefit

In a second item, respondents were directly asked to evaluate the quality of data they received from other agencies when they benefited from the data and the other agency did not. Respondents rated the quality of data on a continuous scale between 1 and 5. The lowest rating, 1, indicated the data was incomplete and unusable. The median rating, 3 indicated the

lowest level of reliably usable data. The highest rating, 5, indicated the data was complete and usable. Figure 5.3 illustrates the responses to this item.

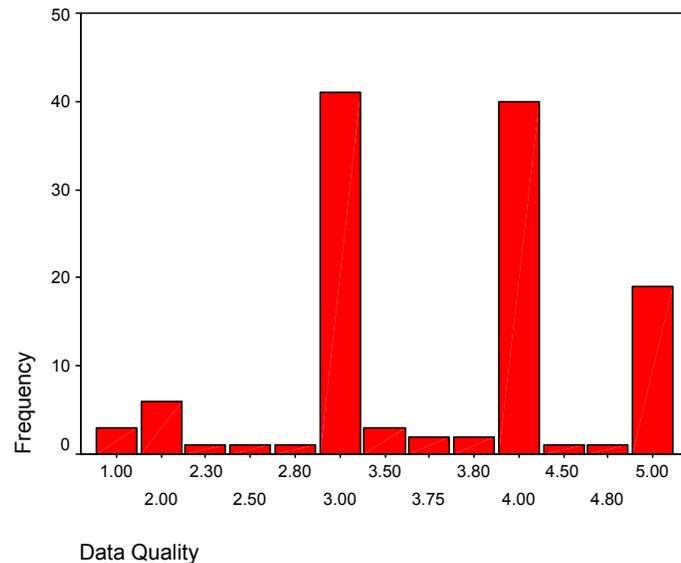


Figure 5.3. Data Quality in Asymmetric Conditions

The mean of the data quality ratings was 3.59, well into the usable range. The data formed three distinct modes at 3.00, 4.00, and 5.00. The three modes were all considered to be in the usable range of data.

- 1.00 relabeled to Incomplete/Unusable
- 2.00 relabeled to Moderately Usable
- 3.00 relabeled to Usable
- 4.00 relabeled to Very Usable
- 5.00 relabeled to Complete/Usable

The most frequent answer was both “Usable” and “Very Usable.” Table 5.29 summarizes the recoded respondents answer. The mean of the frequencies was 3.58 and the

mode was 4.00, again the quality was rated higher than usable. Figure 5.4 illustrates the pronounced left skew (–. 343) of the recoded responses.

Table 5.29. Recoded Data Quality Provided By Agencies Receiving No Benefits

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Incomplete	3	2.1	2.5	2.5
	Moderately Complete	8	5.7	6.6	9.1
	Usable	45	31.9	37.2	46.3
	Very Usable	45	31.9	37.2	83.5
	Complete	20	14.2	16.5	100.0
	Total	121	85.8	100.0	
Missing	System	20	14.2		
Total		141	100.0		

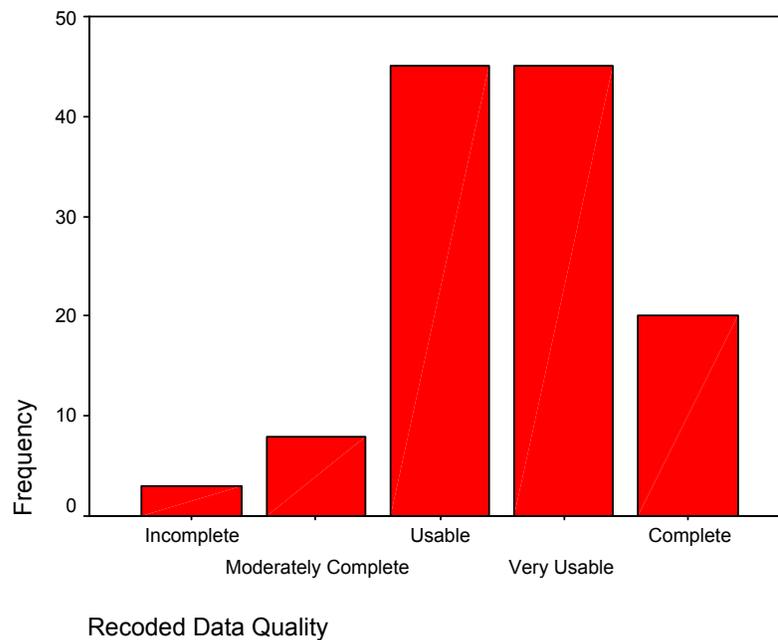


Figure 5.4 Recoded Data Quality Provided By Agencies Receiving No Benefits

Based on the frequency analysis of these bivariate relationships, Hypothesis 9 was not supported.

Summary

The following table summarizes the bivariate relationships between the independent variables and the dependent variable of data sharing and whether a relationship was confirmed, inconclusive, conditional or not confirmed. A short summary of findings follows Table 5.30.

Table 5.30. Summary Of Findings

Independent Variable	Hypothesis	Force	Confirmed
Interdependency	H1	External Facilitating	No
Core Functions	H1	External Facilitating	Yes
Common Goals	H1	External Facilitating	Yes
Organizational Survival	H2	External Facilitating	Yes
Turbulent Environment	H3	External Facilitating	No
Interest of Top Management	H4	Internal Facilitating	Yes
Hardware Compatibility	H5	Internal Facilitating	Inconclusive
Software Compatibility	H5	Internal Facilitating	No
Individual Computer Exchanges (Email)	H6	Internal Facilitating	Conditional
Internet Applications (Chat, Listservs, and Bulletin Boards)	H6	Internal Facilitating	Yes
Organizational Autonomy	H7	Inhibiting	Yes
Symmetric Benefits	H8	Inhibiting	Conditional
Asymmetry	H9	Inhibiting	No

Hypothesis 1

Hypothesis 1 correlated the independent variables of interdependency, core functions, and common goals to electronic data sharing. The instrument did not detect an interdependent condition between the respondents and any other agencies. There was no statistical correlation between interdependency and electronic data sharing in these law enforcement agencies.

This lack of correlation is understandable since law enforcement agencies are empowered to act either independently or at the direction of the judicial system. This situation is different from the judicial system, for example, which is not able to enforce its own orders without the law enforcement community. Although there was no measurable interdependency in this study, research in other public sector agencies may illuminate the relation between interdependency and electronic data sharing.

To explore the relationship between electronic data sharing and the respondents' core functions, the instrument listed probable circumstances for sharing electronic data. Each of the circumstances could support many aspects of their core function of law enforcement. The probable circumstances were: to gain new information technology (hardware or software), access to new data, validate existing data, access to professional information that is not otherwise available, and to solve a problem common to themselves and other agencies.

The respondents most frequently shared data with other agencies in order to acquire both new information technology assets and to access new data. Computer statistics (COMPSTAT) as well as other problem solving and accountability strategies have increased the use of new technologies in law enforcement such as geographic information systems (GIS). To fully use these strategies and technologies, law enforcement agencies need to

acquire various types of new data. Accountability strategies in crime prevention require data sharing inside and outside the agency. Consequently, electronic data sharing to acquire new information technology as well as access to new data potentially supports the respondents' core functions of municipal and county law enforcement.

A common goal between respondents and other agencies was also statistically correlated with electronic data sharing. Data sharing between organizations in the same domain is not unusual i.e. between law enforcement agencies, public health agencies, and etc. What is unusual is data sharing across domains. For example, law enforcement and school system or law enforcement and local social services.

The instrument measured the frequency of the respondents' sharing electronic data with non-police agencies that supported law enforcement goals such as Community Watch, Victim Advocacy groups, Neighborhood Associations, private corporations, and etc. The statistical significance of the correlation indicated that common goals were an important consideration for implementing electronic data sharing outside the law enforcement domain. One unique aspect of this result is exploring which goals must be common to make a multi-agency, multi-domain relationship thrive.

Hypothesis 2

Hypothesis 2 correlated the relationship of organizational survival and electronic data sharing. The instrument measured organizational survival by inquiring about two types of budget activity. First, the instrument measured electronic data sharing with the local (municipal or county) budget agency. Since law enforcement agencies depend on public funding, it is reasonable to expect they would exchange data with these departments, at least for accountability purposes.

Second, the instrument measured whether the respondents shared electronic data with agencies that could grant supplemental funds to their budgets. The type of data was not measured. Two traditional sources of supplemental funding in the public sector are the state and federal government. Coe and Weisel (2001) also noted that police departments used a variety of other grant sources including businesses and non-profit agencies to finance capital improvement projects.

Electronic data sharing with each type of organization was statistically significant and strongly correlated with electronic data sharing. This finding is consistent with local governments emphasis on fiscal accountability or results based management. It is also consistent with the considerable regulation in the government granting process.

Both funding and organizational survival are synonymous enough that respondents in this study were willing to electronically share data to secure their survival. The largest source of potential supplemental income was the federal government, which granted an estimated 56.8 billion dollars in 2004 to state, and local governments for capital improvement programs.

Hypothesis 3

Hypothesis 3 noted that interdepartmental data sharing is most likely in public organizations that exist in rapidly changing, turbulent environments. Rocheleau (1996) illustrated the turbulent environment concept with the product-to-market time measurement. As Rocheleau (1996) noted, the faster product-to-market times in the private sector have contributed to more interdepartmental data sharing. Although this measure is sufficient for private sector companies, the public sector does not create new products and rush them to the “market.”

To explore Hypothesis 3 in public sector agencies, other conditions that would be as stressful as product-to-market time had to be identified. Three conditions identified in public sector literature were considered indicative of a turbulent environment: financial stress, changes in new political or administrative leadership, and implementing some form of performance-based management. Overall, the respondents reported there was “No Change” in their interdepartmental data sharing due to environmental turbulence as measured by this study. Hypothesis 3 was not supported by this study. The lack of correlation possibly suggests that these general events do not increase interdepartmental data sharing or there is yet another factor or set of factors that will.

Hypothesis 4

Hypothesis 4 proposed that interdepartmental and interorganizational information sharing was positively associated with the interest of top management. The more top management supports the concept, the more likely there will be both interdepartmental and interorganizational data sharing. One interesting aspect of this study was that sheriff offices were also included. Sheriffs are unique in law enforcement because they are elected as leaders and act in the capacity as top management.

The perceived impact of political leadership as well as professional managers was measured in this study to detect an effect on electronic data sharing. This study did not find a significant correlation between electronic data sharing and the influence of political or appointed municipal leaders such as the city or county manager. However there was a very strong and significant correlation between the interest of police chiefs and sheriffs in electronic data sharing.

Police departments and sheriffs' offices operate as pseudo-military organizations with a hierarchical, "top down" management structure. Although the positive correlation of top management and electronic data sharing was not surprising, the findings in this study tend to reiterate that in certain types of agencies the proximity of the top manager is important.

Hypothesis 5

Hypothesis 5 proposed that information sharing would be greater between organizations that shared compatible hardware and software. When Rocheleau (1996) developed these hypotheses, compatible hardware and software was a critical issue if two organizations were attempting to share data. Since these hypotheses were developed, most hardware has been developed to operate with the Windows platform. This has raised the expectation of a certain level of interoperability between hardware such as printers. When electronic data is shared today, very few people would give any thought regarding the hardware another person is using. It is expected to work with the electronic format that is being used.

In this study, the relationship between issues with computer hardware and data sharing was inconclusive. Initially, the relationship was found not to be statistically significant although when data imputation techniques were used the relationship became significant. In examining Table 5.14, however, the relationship is significant but hardware issues are not preventing the respondents from sharing data.

The relationship between issues with software and electronic data sharing was significant and the relationship remained significant after data imputation. Again, in Table 5.13 the cell correlations indicate that issues with software are not adversely affecting electronic data sharing between agencies.

Another related issue explored in this study was the effect that different data definitions made in interorganizational data sharing. Like the compatibility issues with hardware and electronic data sharing, the relationship between data definitions and electronic data sharing was inconclusive. Initially the data definitions issue was significantly correlated with electronic data sharing and after using data imputation, the relationship shifted from significant to insignificant. As Hypothesis 5 was originally stated, this study did not find that hardware and software issues affect electronic data sharing.

Hypothesis 6

Hypothesis 6 proposed that interdepartmental and interorganizational information sharing would be greater in organizations that encourage computer exchanges by individuals. This study examined computer exchanges by individuals in terms of basic connectivity (email addresses) and the use of Internet applications (browsers, listservs, etc).

For Hypothesis 6, basic email connectivity did not significantly influence electronic data sharing between agencies. However, the presence of employee management controls such as the standard operating procedures (SOP) and email monitoring were significantly correlated with sharing electronic data between agencies. It is possible that management controls are indicative of a certain level of email activity that correlates with electronic data sharing.

Using Internet applications to download professional, statistical, and other information was significantly correlated with electronic data sharing. Based on analysis of this data, only the Internet applications aspects of Hypothesis 6 were supported. Again, the instrument may be detecting a certain level of expertise and comfort that translates into more electronic data sharing.

The technical aspect of basic email connectivity was necessary but not sufficient to influence electronic data sharing. Municipalities and counties that propose to use electronic data sharing to improve their efficiency will probably need to invest resources in familiarizing and educating their personnel with the concept.

Hypothesis 7

Hypothesis 7 noted that organizations would resist external information sharing that threatened their autonomy. The instrument measured two autonomy issues. First, the respondents were asked to predict the probable effect on their agencies' autonomy of entering into a data sharing agreement with another agency. The second autonomy item measured the likelihood that the responding agency would enter into a data sharing agreement where it would lose the ability to control its data.

Most of the respondents in this study did not predict that entering into a data sharing agreement would affect their autonomy. Also respondents who had entered into data sharing agreements in the past five years most frequently reported that they were satisfied with the experience. However, when respondents were asked if they would enter into an agreement if it meant they would lose control of their data, the most frequent response was that they would not enter into the agreement.

Control of data is central issue in electronic data sharing. Although the term "control" was not defined for the respondents, one possible definition is how data is interpreted. The difference between data and information as defined in this study is that information is created from data so information might be a filtered interpretation of a data set. So, losing control of one's data could mean losing the ability to explain why certain crime rates may be high, low, or even unsolved.

Both autonomy items supported Hypothesis 7. However, the issue of data control may become more important as agencies begin to share data across boundaries as part of local e-government initiatives. Agencies that perceive they will lose control of their data probably will not participate in electronic data sharing. One solution may be to set up commissions to mediate between agencies as well as developing memorandums of understanding (MOU) regarding the control and interpretation of raw data.

Hypothesis 8

Hypothesis 8 proposed that information sharing was more likely between organizations that perceive symmetry of costs and benefits. In the instrument, symmetric benefits were not defined. Each respondent was free to determine the value and definition of a “cost” as well as a “benefit.” To measure the influence of symmetric costs and benefits, the respondents were asked to rate their experience with data sharing agreements in the past five years. As noted before, most respondents believed the benefits of data sharing exceeded the costs.

The analysis of variables for Hypothesis 8 indicated that satisfaction with the benefits of data sharing agreements was not significantly correlated with sharing data electronically. The dependent variable did not discriminate between the types of organization (law enforcement versus non-law enforcement). Interestingly, satisfaction with previous data sharing agreements was significantly correlated with electronic data sharing with other law enforcement agencies.

Confirming Hypothesis 8 within the domain of law enforcement suggests that the type of agency mediates between symmetric benefits and electronic data sharing. In terms

of general data sharing, Hypothesis 8 lends more support to formal rather than spontaneous development of data sharing agreements.

Hypothesis 9

In Hypothesis 9, data quality problems were associated with sharing data when benefits between the participants were unequal or asymmetric. Asymmetry was defined for the respondents as a condition where one agency benefits from electronic data sharing and their agency does not. Data quality was defined for the respondents with two characteristics: completeness of the data and its usability.

For Hypothesis 9 two conditions were measured, voluntary sharing when there was no benefit to the agency and sharing electronic data under a mandate condition. Neither condition contributed to any measurable data quality problems. Hypothetically sharing data on the basis of a mandate should be equivalent to an asymmetrical situation. So data quality would be expected to suffer.

It is interesting to note that one crime statistician interviewed for this study thought that mandates regarding data sharing would make data quality better and not worse. As noted before, since police departments and sheriff's offices are more hierarchical, the perception of top management interest might influence data quality. The results of this analysis did not support Hypothesis 9.

Theoretical Approaches to Computerized Data Sharing

Three theoretical approaches provide opportunity for exploring computerized data sharing between public sector agencies. The three approaches are Classical Organizational Theory, Systems Theory, and Interorganizational Relations (IOR). Classical Organizational and Systems Theory are two well-known paradigms for explaining the behavior of public sector agencies. The two previous theories, in particular, are foundation theories in the study of both private and public sector agencies.

Classical Organizational theory, developed at the end of the 19th century, focused on studying internal processes in organizations. Though there are several theories that comprise Classical theory, each of them was focused to some degree on the efficiency of internal operations. In Classical Organizational theory the environment as well as relationships to other agencies is not directly addressed. The organization itself is the focus of study with the potential to explain the interdepartmental aspects of computerized data sharing.

General Systems theory or Systems theory changed the focus of organizational study from predominately internal processes to including the organization's relationship with the external environment as one of the variables affecting organizational behavior. Later developments in Systems theory addressed the concepts of open and closed systems. Open systems theory acknowledges the potential for reaching beyond the limits of the organization. The boundary-spanning role within an organization may provide some insight to computerized data sharing between public agencies.

The theory of interorganizational relations (IOR) has its roots in the study of private sector firms rather than public sector agencies. Because private sector firms are normally in competition with each other, IOR seeks to explain actions not normal for these firms, i.e.

cooperation. Public sector agencies, however, are expected to cooperate with each other and yet coordination is easier to advocate than to practice (Weiss, 1987). Based on its frequent emphasis by politicians, coordination also appears to be an abnormal activity in the public sector. Since coordination is a problem for both sectors, IOR may provide insights to fostering computerized data sharing between public agencies.

Classical Organizational Theory

Classical organizational theory does not adequately explain all the hypotheses on computerized data sharing between public agencies. Classical organizational theories developed in the late nineteenth and early twentieth century predominately focused on the internal processes of an organization. The organization was seen as standing alone and apart from any environmental concerns (Farazmand, 1994). Although there were several classical theories developed during this period, Weber's model of the pure type bureaucracy was the most prominent and is the framework for the following discussion.

Weber defined six characteristics of the modern office or bureaucracy:

1. There are fixed and official jurisdictional areas for the office that are ordered by rules, laws, or regulations.
2. There is a hierarchy of authority and supervision of lower offices by higher ones.
3. Office management is based on written documents in their original or draft form.
4. Employment is based on merit and qualifications to fill clearly defined jobs and roles.
5. The duties of the office require the full attention of the office holder.
6. The rules of the office are rational, knowable, exhaustive, and can be learned (Weber, 1946).

With an internal focus, Weber's bureaucracy model would anticipate and explain four of the hypotheses associated with computerized data sharing: organizational survival (Hypothesis 2), interest of top management (Hypothesis 4), hardware and software compatibility (Hypothesis 5), and the need for organizational autonomy (Hypothesis 7).

Hypothesis 2 is externally focused on sharing data with other agencies to ensure organizational survival. Weber (1946) observed that one characteristic of the modern bureaucracy is supervision of lower offices by higher offices. Even though classical theory is internally focused, a Weberian agency would be expected to report to the next highest organization in their chain-of-command or risk some form of sanction that would threaten the entire agency.

For example, if an organization fails to submit supporting data for its annual budget request to its higher office, this may result in sanctions that cripple the effectiveness of the organization. More broadly, sharing data with higher hierarchical levels within the jurisdiction facilitates closer integration of a unit with high levels in its bureaucratic chain of command. Closer integration and alignment, in turn, builds organizational cohesiveness and increases the chance that funding authorities will view the agency's request sympathetically.

Hypothesis 4, the interest of top management in computerized data sharing, is classified as an internal facilitating force. Both interorganizational and interdepartmental data sharing are positively associated with the interest of top management. The management and data sharing relationship could be hypothesized and explained by classical organizational theory.

As previously noted, one of the characteristics of Weber's (1946) bureaucracy is the supervision of lower offices by higher ones. Weber (1946) also proposed that communication

is the pacesetter for bureaucratization. Depending on the communication media, supervision of lower offices would be enabled by better technology. This facilitates the transmission of orders down the bureaucratic chain and the reception of reports up the bureaucratic chain.

The importance of supervision and hierarchical authority makes the interest of top management important to any computerized data sharing initiatives. Support of top management for computerized data sharing would be critical in large public agencies composed of divisions or bureaus with different functions that tend to work independently.

Hypothesis 5 proposed that hardware and software compatibility between departments and agencies increases computerized data sharing. Two of Weber's (1946) observations of bureaucracy would be applicable to hardware and software compatibility. First, office management is based on written documents in their original or draft form. Management as well as internal processes would be more effective if these documents were easily distributed throughout the agency. Compatible hardware and software would make internal processes involving data sharing and distribution of "written documents" more efficient. As previously noted, Weber (1946) understood that communication set the pace for the bureaucracy.

Second, the hierarchical relationship within the agency should preclude individual offices from adopting their own versions of hardware and software. Classical theory would predict that an internally focused agency would dictate standardized hardware and software to achieve greater efficiency. Technical standards for hardware and software take advantage of the pacesetting possibilities of a uniform communications medium. In public information technology, the agency's chief information officer (CIO) is responsible for directing and managing hardware and software standards.

Finally, Hypothesis 7 noted that organizations would resist any computerized data sharing threatening their autonomy. In the Weberian type bureaucracy, organizations are created by a higher authority and have an expressed function and purpose with fixed and official jurisdictional areas for the offices. Since laws or regulations determine these areas, it would be expected both identity and autonomy of action would be important to the organization as long as it legally existed. Weber (1946) hypothesized that once a bureaucracy is established it is very hard to destroy.

Although the modern bureaucracy as a whole is often depicted as blindly following orders, Weber (1946) realized that a fully established bureaucracy was in a unique position of power. The bureaucracy becomes the indispensable expert in the affairs of government while the politician is considered a “dilettante”. Weber (1946) also noted these experts tended toward secrecy and control of their expert information. In terms of computerized data sharing, it would be easy to maintain secrecy and protect organizational autonomy by turning data into summary information that could not be deeply investigated or questioned by political authorities.

Classical organizational theory, Weber’s bureaucracy, addressed four of the nine hypotheses. Weber’s theory best explained the most internally focused of the hypotheses, leaving unexplained or unanticipated hypotheses that address interorganizational data sharing. Because there is little emphasis on environmental interaction in classical organizational theory, another theory is needed to account for the remaining hypotheses.

The remaining hypotheses involve actively interacting with the environment beyond the boundaries of the agency. For example, sharing computerized data with other agencies that have common goals and functions requires the agency to look outward for these agencies

rather than focusing on internal processes. Also the reaction to turbulent environments, the use of Internet applications, computerized data sharing based on symmetric exchange of benefits, and data quality issues due to asymmetric exchanges with other agencies are all based on interacting beyond the agency.

Systems Theory

Systems theory accepts the influence of the external environment on the whole organization and expects the organization will react to adapt to the new environment. Systems theory classifies organizations as either open or closed systems. A closed system resembles classical theory with its focus on internal processes and indifference to the external environment. The closed system model would also explain the internally focused hypotheses and leave the others unexplained and not anticipated. Conversely, open systems devote some of their processes and subsystems to looking outward and seeking equilibrium between themselves and the surrounding environment.

Vasu, Stewart, and Garson (1998) noted that open systems exchange information, energy, or material with their environment. These exchanges are facilitated by the boundary spanning subsystem of the organization (Katz and Kahn, 1966). In the context of this study, computerized data rather information would be shared across the organizational boundary. At the macro-level, systems theory better explains computerized data sharing than Weber's classical organizational theory. The following discussion reexamines each hypothesis from a systems theory perspective and where it is appropriate compares classical and systems theory.

Hypothesis 1 stated that interdependency of functions and common goals lead to information sharing when the sharing is perceived by the organizations as assisting them with

their core functions. In systems theory, the organization seeks to exert influence on its environment and computerized data sharing is one method of doing that. It was noted earlier in this chapter that organizations protect their technical core, so computerized data sharing with others who assist with performing core functions would be expected. Boundary-spanning in systems theory would explain computerized data sharing between certain organizations.

Hypothesis 1 presents the opportunity to note one of the differences between private and public sector information sharing. In the private or commercial sector, organizations with similar core functions would probably be in competition with each other in the marketplace. For example, two passenger airlines share the same core function but are not likely to share either data or information with one another. The exception may arise if the two airlines want to dominate the market sector at the expense of another airline.

In the public sector, it is likely that two agencies with similar core functions would share data and information because they are working on a similar issue. For example, two law enforcement agencies attempting to solve crime that is common to both jurisdictions. Also, as noted before, two public agencies with the same goal may share electronic information or data with each other. The current trend of law enforcement, schools, and social services working together to prevent gang and juvenile crime is a good example.

Hypothesis 2 asserted a positive association between the degree of interorganizational information sharing and organizational survival. Both Weber's bureaucracy and systems theory acknowledge the concept of organizational survival. In classical organizational theory, organizational survival is a static concept governed by

directives from higher authority. Organizations survive so long as they continue to provide their specialized function, especially in the public sector.

Systems theory depicts the organization as interacting with the outside environment in order to ensure its own survival (Katz and Kahn, 1966; Thompson, 1996). At the local, public agency level, the interaction could include garnering support from constituents, lobbying lawmakers, pursuing outside funding, etc.

Hypothesis 3 noted that interdepartmental information sharing is most likely in public organizations that exist in competitive environments with rapidly changing products/services. As Thompson (1996) noted, classical organizational theory (bureaucracy) focuses on maximizing internal efficiency within a closed system where external variables do not interfere with the drive toward efficiency. Classical theory does not address responses to the rapidly changing environment.

Systems theory as espoused by Thompson argues that at least two organizational systems are working simultaneously. One system is an open system and spans across organizational boundaries to interact and influence the environment. This open system with its boundary spanning functions would use computerized data sharing as a tool to understand and influence its environment.

The second system, the closed system, protects the technical (i.e. law enforcement) core of the agencies from the influence of the outside environment experienced by the open system (Thompson, 1996). The closed system could protect the technical core in two ways. First, it may buffer interaction with the outside totally and protect the technical core from any outside contact. Also, closed systems could mitigate interactions between the technical core

and the open system allowing only necessary interactions to allow the core to continue its functions.

It was previously noted in this study, there was no significant change in computerized data sharing within police departments and sheriff's offices due to environmental turbulence. Thompson's concept of organizational rationality would explain Hypothesis 3 in terms of open and closed systems. Interdepartmental, computerized data sharing was unaffected by a turbulent environment because the core of the agencies were being protected from outside interference.

Hypothesis 4 positively relates interdepartmental and interorganizational information sharing with the interest of top management in encouraging that sharing. This hypothesis could have been developed either from classical organizational theory or systems theory. As noted previously, classical organizational theory presupposes there is a superior to subordinate relationship between departments within an agency as well as between agencies in the public sector. In this respect, emphasis by top management on computerized data sharing would be critical to its success.

Hypothesis 4 could have also been developed from open systems theory. Organizations modeled by open systems theory are composed of inputs, throughput processes, outputs, and corrective feedback. For example, if one of the outputs were computerized data sharing, then the top management would receive feedback to indicate how it affects the agencies' environment. Based on the feedback, top management would be able to place appropriate emphasis on the data sharing output.

Hypothesis 5 proposed that information sharing would be greater between organizations that share compatible hardware and software. Compatible hardware and

software within an agency would contribute to perfecting internal processes making computerized data sharing within an agency possible from the classical organizational theory perspective. However, if two different agencies had compatible hardware and software, data sharing between them would require a directive from a higher authority or agreement between the two highest leaders in the organizations.

As previously noted in this study, the development of the Internet and file sharing changed the concept of software and hardware compatibility. Initially, compatible meant having the exact same type rather than having more adaptable translation capability. From a systems theory perspective, the Internet is the ultimate boundary spanning subsystem. As long as Internet use is not restricted, it provides the potential for computerized data sharing. Though Hypothesis 5 could be explained by either theory, the systems theory approach with the Internet as the boundary spanning subsystem better explains the relationship between compatibility and computerized data sharing.

Hypothesis 6 noted that interdepartmental and interorganizational sharing would be greater in organizations that encourage computer exchanges by individuals (e.g. through establishment or participation in local and wide area networks, electronic mail, and bulletin board systems). Hypothesis 6 would be consistent with boundary spanning subsystem of open systems theory. Rather than having a formal boundary spanning subsystem, individual members would be the boundary spanners and by their collective actions become a boundary spanning subsystem.

Hypothesis 7 proposed that organizations would resist external sharing that threatens their autonomy. Both theories would predict that organizations would resist any external computerized data sharing threatening their autonomy. From the classical theory

perspective, organizations are created by a higher authority and have fixed jurisdictional areas (Weber, 1946). In classical theory, as long as an organization had a legal mandate to exist it would be expected to maintain its autonomy. Computerized data sharing would occur only in a limited and controlled context, probably as information and not data.

Systems theory would also predict that an organization would seek to preserve its autonomy. Using the system's feedback loop from the environment, the organization would be able to detect a threat to its autonomy and reduce its information output accordingly. Even though Hypothesis 7 can be explained by both theories, only systems theory would anticipate regular computerized data sharing beyond the organizational boundary and a corresponding adjustment if organizational autonomy is threatened.

Hypothesis 8 proposed that the degree of sharing is likely to be higher between organizations that perceive symmetry of benefits and costs. Based on receiving feedback from the environment, open systems theory would predict that an organization receiving positive feedback from computerized data sharing would continue this sharing.

Hypothesis 9 noted that when sharing occurs despite an asymmetry of costs and benefits to the participants, there is a greater likelihood of data quality problems. Hypothesis 9 is consistent with entropy aspects of open systems theory. Although computerized data sharing would be considered a subsystem of an agency, the principle of negative entropy as proposed by Katz and Kahn (1996) would be consistent with computerized data shared under asymmetric conditions.

Negative entropy requires an organization to import energy to overcome its natural tendency toward disorganization (Katz & Kahn, 1996). If an organization is not receiving positive feedback regarding its computerized data sharing, then it is reasonable to expect

that it will not invest energy to stop the entropy process and the quality of computerized data will not improve.

The activities of public agencies are often explained from the perspective of classical organizational (bureaucracy) theory and collectively public agencies are colloquially known as “The Bureaucracy.” However, the classical theory is focused on the internal processes within agencies. Because computerized data sharing connects departments as well as agencies, classical organizational theory does not sufficiently explain sharing data with other agencies.

In contrast, open systems theory proposes that agencies can be modeled with inputs, throughputs, outputs, and a feedback loop. The organization is modeled as an organism that is capable of evaluating the costs and benefits of an output such as computerized data sharing. Additionally, technology such as the Internet provides the capability to truly span organizational boundaries that is consistent with open systems theory. This more “organic” system provides a better model for computerized data sharing both within and between agencies than Classical organizational theory.

Interorganizational Relations

Another organizational theory with potential relevance for developing hypotheses about electronic data sharing between public agencies is interorganizational relations (IOR). Management, economics, and sociology are the major contributors to the IOR field (Barrienger & Harrison, 2000). Barringer and Harrison (2000) noted there were six paradigms associated with IOR: transaction costs economics, resource dependence, strategic choice, stakeholder theory, learning theory, and institutional theory. Although these

paradigms are traditionally associated with private sector management, they will now be analyzed in terms of the public sector emphasizing the electronic data sharing hypotheses.

Transaction Cost Economics

Transaction cost economics (TCE) predicts organizational behavior by comparing the costs and benefits across a variety of transactions. For example, transaction cost economics is very applicable in the private sector manufacturing environment. In the private sector, TCE compares the cost of an activity conducted within an organization (vertical) or beyond organizational boundaries (horizontal). In theory, the activity should be conducted where the transaction cost is the least in proportion to the gain.

In the public sector, transaction cost economics resembles the “administrative man” of Herbert Simon. Similar to TCE, “administrative man” makes decisions within a preset range of alternatives (bounded rationality). Based on the available alternatives, “administrative man” makes a selection that provides the greatest administrative gain for the least administrative cost (Simon, 1997).

In terms of electronic data sharing, this theory anticipates four of the hypotheses. First transaction costs would theoretically be less between organizations sharing compatible hardware and software. This would provide a basis for Hypothesis 5. Second, it would be expected that symmetry of costs and benefits would lessen the transaction costs of electronic data sharing, supporting Hypothesis 8. Third, a turbulent and rapidly changing environment would raise the potential transaction costs between agencies and lower the transaction costs of interdepartmental rather interorganizational data sharing that would support Hypothesis 3.

Finally, higher transaction costs in the form of asymmetric benefits would predict that data quality would be less than perfect for an agency that received no benefit from a computerized data exchange. Transaction cost theory would predict the data quality issues of Hypothesis 9.

Resource Dependence Theory

Resource dependence theory predicts that interorganizational relationships are formed to access resources critical to organizational survival (Johnson, 1998). In the private sector, relationships such as partnerships, acquisitions, and mergers are examples of relationships that include acquiring resources.

In the public sector, there are a variety of resources such as funding, expertise, manpower, etc. necessary for organizational survival. Public sector agencies will form relationships by lobbying legislative bodies or building support with clients who will lobby legislative bodies for more resources. Public sector agencies will also form complimentary partnerships with non-governmental agencies to deliver services together that neither one can deliver individually.

Regarding electronic data sharing between public agencies, two hypotheses were explained by this theory. Both Hypothesis 1 and 2 correlated organizational operation and survival with electronic data sharing. Hypothesis 1 noted that electronic data sharing occurs when an agency desires assistance with its core function. In this case, an agency would be lacking some resource that causes it form a relationship with another agency by electronic data sharing. Hypothesis 2 positively associated the degree of sharing with the perceived threat of organizational survival. Resource dependence theory would predict that an agency critically short of resources would seek to share data with a number of agencies to acquire data rather than increasing the volume of electronic data it was sharing with just one agency.

Strategic Choice Theory

Strategic choice theory involves the study of multifaceted approaches to ensure organizational survival, usually in the marketplace. Strategic choices usually incorporate environmental issues potentially affecting the agency. In this respect, strategic choice theory is reminiscent of open systems theory. In the private sector, strategic choices include selecting organizational goals, choosing products or services to offer, and designing competitive strategies (Rumelt, Schendel, & Teece, 1991). Private sector firms sometimes ally themselves with other firms to control a particular marketplace or even to shut out a rival.

Strategic planning in the public sector also involves setting organizational goals and designing strategies for service delivery. However, public agencies usually have no competitors for their services and are directed as to the services they should provide. Public agencies also make strategic alliances but usually it is to enhance their service delivery rather than dominate a marketplace. For example, one trend in the social and health service agencies is for non-governmental organizations and government agencies to form strategic alliances to provide services to citizens that neither organization could do alone.

For computerized data sharing, strategic choice theory best predicts and explains Hypotheses 1, 2, 4, and 6. Hypotheses 1 and 2 addressed an agency's concern with its core functions and organizational survival respectively. Hypothesis 1 stated that interdependency of functions and common goals with other agencies lead to greater information sharing. The recognition of common goals and functions with other agencies suggests an outward focused, strategic orientation with the potential for forming alliances for service delivery.

In Hypothesis 2 the amount of interorganizational information sharing is positively correlated with its necessity for organizational survival. Sharing computerized data to ensure organizational survival indicates that an agency is making strategic choices to ensure its future. For a public sector agency, this could include enlisting constituents and legislators to lobby for a greater share of the public budget by selected releases of data.

Hypothesis 4 associated interorganizational and interdepartmental computerized data sharing with the interest of top management in encouraging that sharing. One method to implement a strategic process is to incorporate managerial input from all levels of the organization (Tyran, Dennis, Vogel, & Nunamaker, Jr., 1992). Interdepartmental data sharing is one method for obtaining the necessary inputs for formulating strategic plans. The support of top management for information technology projects and initiatives has been emphasized numerous times in public and private sector literature. Strategically, the interest of top management in interorganizational and interdepartmental data sharing is most likely to originate from decisions to seek better efficiency with internal processes or to access data and information from another agency.

Hypothesis 6 noted that organizations encouraging individuals to use technology would have a greater amount of computerized data sharing. As previously noted in this study, possessing technology is necessary but not sufficient to encourage computerized data sharing. Some guidance or emphasis is needed to achieve improvements in agency operations using electronic data sharing.

Despite purchasing thousands of computers during the 1990s, in 1996 the GAO noted that the federal government had spent billions of dollars on information systems without any measurable benefits to government processes (GAO, 1996). Most of these

expenditures were the results of not developing or using strategic planning for the information systems (GAO, 1996; GAO, 2002). Both strategic vision and emphasis from top management are important to successfully improving agency processes and service delivery using tools like computerized data sharing.

Stakeholder Theory

Buckholz and Rosenthal (2004) noted that stakeholder theory attempts to understand the various influences on the decision making process of private firms. Stakeholders are individuals or groups with something to gain or lose by the activities of a private firm (Buckholz & Rosenthal, 2004). In theory, some stakeholders are more influential than others and no firm can truly satisfy all stakeholders. Firms devote resources to stakeholder management by filtering the most influential stakeholders from the least influential.

Regarding the public sector, Scholl (2001) noted that stakeholder theory is now more prominent in public administration literature. Rainey and Steinbauer (1999) defined public sector stakeholders as persons, groups, and institutions that have enough interest in the outcomes and activities of an agency that they pay attention to it and participate in its processes. For public agencies, the stakeholder pool is considerably larger than private sector firms since it incorporates the entire public. In addition to citizens, the other stakeholders for public agencies include executive, legislative, and judicial agencies (Rainey and Steinbauer, 1999).

Stakeholder theory best explains Hypotheses 2, 3, and 7. Hypothesis 2 correlated the degree of interorganizational data sharing with its impact on organizational survival.

Hypothesis 3 noted that turbulent, rapidly changing environments would increase

interdepartmental data sharing. Finally, Hypothesis 7 stated that organizations would resist any external sharing which threatens their autonomy.

Stakeholder institutions have the potential to influence computerized data sharing in public sector agencies. Hypothesis 2 correlated computerized data sharing with its impact on organizational survival. During the 1970s, citizens became concerned with their personal information and the use of government databases. These concerns resulted in two federal laws that influenced a citizen's relationship with government information.

The Freedom of Information Act (FOIA), the Privacy Act, and their subsequent amendments gave stakeholders a greater opportunity to influence the flow of information from government to the citizen. Additionally, as technology changed both FOIA and the Privacy Act were amended to include provisions to provide the requested information in an electronic format. Although neither of the Acts can wholly threaten an organizations survival, they are examples of stakeholders having an influence on the degree of computerized data an agency shares.

In Hypothesis 3, turbulence and rapidly changing environments are correlated with electronic data sharing. Although the definition of a rapidly changing and turbulent environment might be varied, it is reasonable that stakeholders can make the environment turbulent enough to influence interdepartmental data sharing.

Stakeholder influence beginning in the 1980s forced the restructuring of the Internal Revenue Service (IRS). The restructuring of this agency included using information technology to streamline internal processes more efficiently and increase taxpayer's (stakeholders) satisfaction with the agency (Mani, 1995).

Hypothesis 7 correlated an agency's resistance to external data sharing with their concerns for autonomy. In one respect, the FOIA and the Privacy Act enabled stakeholders to exert pressure on agencies to increase the flow of data from the agency to the stakeholders. However, agencies might thwart efforts by stakeholders to obtain computerized data by narrowly interpreting requests or censoring parts of the data.

From another aspect, if the interested stakeholders are legislators, an agency may control the release of information that could threaten their budget share. Computerized data in this category could include performance measures generated by using results based management. Potentially an agency can mask aspects of its operations by narrowly interpreting a request for data or converting data into higher order information.

Organizational Learning

Argyris (1976) defined organizational learning as the detection and correction of errors. Learning theory asserts that firms do this by seeking interorganizational relationships to acquire new knowledge or resources. Because of the competitive nature of the private sector, a typical approach used by these firms is to form a consortium to do organizational learning by engaging in non-proprietary research and development (Barrienger & Harrison, 2000). Another method is to acquire the firm having the necessary knowledge by buying it.

Brown and Brudney (2003) noted that learning organizations in the public and the private sector are rooted in a problem-solving paradigm. Public sector agencies also use consortia to pool expertise and money as public budgets shrink. Searching the federal Internet portal at <http://www.firstgov.gov> returned over 1000 "hits" each for the terms consortia as well as consortium (<http://www.firstgov.gov>, accessed September 16, 2004).

Public sector agencies do not absorb other agencies for their knowledge unless legislators or the executive branch of government directs them to.

Brown and Brudney (2003) noted that learning organizations could potentially use information and data as a signaling device to indicate organizational performance. Because learning theory is rooted in organizational problem solving, it has potential for explaining Hypotheses 2, 3, and 5. In each of these hypotheses, the organization adjusts its electronic data sharing in a manner that suggests organizational learning.

Hypothesis 2 correlates the degree of data sharing and its perceived effect on organizational survival. Learning theory would anticipate that organizations would learn the amount and type of computerized data sharing that correlates with organizational survival. Agencies would then adjust their computerized data sharing accordingly to ensure organizational survival.

Hypothesis 3 emphasizes that interdepartmental data sharing will be more likely where the environment is rapidly changing and turbulent. Learning theory expects that organizations would use computerized data sharing to react and adapt to the changing environment (Brown & Brudney 2003).

Finally, Hypothesis 5 noted that information sharing is greater between organizations having compatible hardware and software. Again learning theory would expect that organizations seeking a data sharing arrangement would make the necessary adjustments to share computerized data.

Institutional Theory

Institutional theory proposes that organizations seek legitimacy by adapting to the expectations of the society in which they exist. Scott (1988) noted that the process of institutionalization instills values in an organization that enable it to persist over time. In the private sector, this includes conforming to accepted norms of the market place. For example, many computer software and hardware companies began as iconoclasts in their infancy and adopted the values of older companies as they entered the mainstream of the private sector.

Although public sector agencies are legitimate in the sense that they are created by legislation, they also seek legitimacy by adapting to societal expectations. The most visible indicators are agency norms such as codes of conduct, uniforms, and standard operating procedures. Since the 1990s, the norm in the public sector is to refer to citizens as customers and to provide excellent “customer service” rather than just service delivery. Adopting these “values”, at least externally, is seen as important to agencies whether or not they realign their internal processes.

In regards to institutional theory, only one of the hypotheses would likely be explained. Hypothesis 3 correlates interdepartmental data sharing and a turbulent, rapidly changing environment. Rocheleau (1996) used the private sector “time to market” concept to illustrate how private sector firms adjust to a turbulent environment by interdepartmental data sharing. The public-at-large now expects improved standards of standards and delivery. Because these characteristics are widespread in society, institutional theory would anticipate that public sector agencies would also adopt these methods as they sought public support.

The expectations of public sector services have risen due to the impact of the reinventing government movement. Because the reinventing government movement borrowed techniques from private sector methods, public sector agencies also adopted private sector methods. Some of these methods included cutting red tape to deliver service faster, satisfying customers (citizens), decentralizing authority, and working better for less cost (Moe, 2000).

One method of achieving some of these goals is to improve internal communications in order to react to changing public expectations and the operating environment. Effectively using interdepartmental data sharing, gives a public agency an edge in meeting expectations such as faster service delivery.

Theoretical Summary

Classical Theory as defined by Weber's ideal-type bureaucracy did not sufficiently explain the interorganizational aspects of computerized data sharing. In a similar manner, other theories that are considered classical would not explain the interorganizational aspects any better. Other classical theories of organization also focus primarily on internal processes with little focus on the environment and relationship with other agencies.

Systems Theory and Interorganizational Relationship (IOR) Theory both provide a theoretical basis for the interorganizational and interdepartmental aspects of the 9 data-sharing hypotheses. Both theories consider the external environment as well as relationships with other agencies in explaining organizational behavior. Even though both theories explain the hypotheses, Systems theory is considered a macro-theory lacking a more granular level of abstraction (Kast & Rosenweig, 1974).

For example, Systems theory anticipates that interorganizational data sharing would be carried out by the boundary spanning subsystem of the organization. In terms of granularity, Systems theory does not explain why the organization would want to expand beyond its boundaries except to say “it” desires to interact and control the surrounding environment. From a systems perspective, the issues of granularity are better addressed by Contingency theory (Kast & Rosenweig, 1974; Farazmand, 1994).

Although Interorganizational Relations (IOR) is comprised of 6 theories, each of these theories contributes a different perspective to computerized data sharing. The question of why the organization would seek an external relationship can be answered from a multidisciplinary perspective. Barringer and Harrison (2000) noted that private sector firms create relationships for a number of reasons. Weiss (1987) noted that public agencies are frequently chastised for not forming cooperative relationships with each other as expected by the public. Likewise, it is reasonable to assume that public agencies also form relationships for a variety of reasons other than the public’s expectation. In this respect, Interorganizational Relations (IOR) provides a much richer theoretical prospective to understand computerized data sharing between public agencies.

Table 5. 31 Theoretical Summary, Three Organizational Theories

Hypotheses	Classical Theory	Systems Theory	InterOrg. Relations (Overall)
Hypothesis 1: Interdependency of Function	No	Yes	Yes
Hypothesis 2: Organizational Survival	Yes	Yes	Yes
Hypothesis 3: Environmental Turbulence	No	Yes	Yes
Hypothesis 4: Top Management	Yes	Yes	Yes
Hypothesis 5: Compatible Technology	Yes	Yes	Yes
Hypothesis 6: Email and Internet	No	Yes	Yes
Hypothesis 7: Autonomy	Yes	Yes	Yes
Hypothesis 8: Similar Costs and Benefits	No	Yes	Yes
Hypothesis 9: Data Quality	No	Yes	Yes

Chapter Six: Further Research and Implications for Public Policy

The purpose of this chapter is to highlight opportunities for future research as well as propose implications for public policy decisions related to computerized data sharing. This study tested nine hypotheses Rocheleau (1996) developed about computerized interorganizational information sharing. Rocheleau (1996) grouped the hypotheses into three concepts called facilitating forces, internal facilitating forces, and inhibiting forces. Although the subject of data sharing has been discussed in many contexts, the hypotheses had never been empirically tested in the public sector until this study.

From the hypotheses, this study developed and tested 13 different independent variables hypothesized to affect computerized data sharing between public sector agencies. Data quality, an additional dependent variable, was also tested. Each variable had been discussed individually in business management and public sector literature. However, they had never been analyzed for their effect on computerized data sharing within the context of a single type of public agency.

In addition to testing the hypotheses, the concept of computerized data sharing in the public sector had not been explored as part of any theoretical construct. This study explored three organizational theories with potential to explain the relationship of the independent to the dependent variables. Two of the theories, Weber's ideal type bureaucracy and Systems theory are frequently used to explain the behavior of public organizations.

Neither theory successfully explained the behavior of organizations in regards to computerized data sharing. Because it is focused on internal processes, the Weberian type bureaucracy could not reconcile the external aspects of computerized data sharing between public agencies.

In contrast, Systems theory acknowledges that organizations have external interests and receive inputs from the surrounding environment as well as other organizations. However, Systems theory did not explain *why* the organization would want to expand beyond its boundaries except to say “it” desires to interact and control the surrounding environment.

Although Systems theory supports the hypotheses, it does so from a macro level. This study explored Interorganizational Relationship theory (IOR) to seek a more granular level of understanding for the relationship of the independent variables to computerized data sharing. Comprised of six different theories, this study proposes that IOR offers a richer context for understanding and facilitating computerized data sharing between public agencies.

During this study, certain aspects of the hypotheses were found to merit further research and investigation. There were eight concepts that had unanticipated effects on computerized data sharing. Interdependency, Turbulence, Management Proximity, Data Definitions, Standard Operating Procedures, Email Monitoring, Internet Applications, and Controlling Data were variables that behaved in unexpected manners. In the following section, each of the unexpected relationships will be further discussed and suggestions for future research will be made.

Interdependency

The agencies in this study were not interdependent with others to perform their primary functions. However, there are public agencies that exist in an interdependent relationship with other agencies. For example, the judicial system is interdependent with law enforcement agencies to carry out its orders.

Without good data sharing or information sharing with law enforcement agencies, the actions of judicial agencies would be ineffectual. Logically, interdependence should also promote information sharing.

Interdependency may be a condition in which one agency dominates another. Future research should first focus on other agencies, leading to opportunities for further research going beyond the parameters of the present dissertation. Considering high and low interdependence as one dimension and equal versus superior/subordinate relationships as a second dimension, researchers should compare the four resulting classes of organizations, seeking to understand the effect these two dimensions have on interagency data sharing.

Turbulent Conditions

A second area for future research is turbulent conditions. Rocheleau (1996) noted that turbulent environments would increase interdepartmental as well as interorganizational data sharing. Rocheleau (1996) used the private sector's "time to market" cycle as a proxy measure for environmental turbulence. Using this indicator, Rocheleau (1996) noted that more competition and a reduced "time to market" forced different departments in private organizations to share data.

For public sector agencies, this study measured the effects on data sharing of budget restraints, changes in political leadership and implementation of results-based management systems. Respondents did not report change in computerized data sharing due to any of these turbulence-related conditions.

However, there is evidence some environmental factors increase computerized data sharing between law enforcement agencies. The environmental factors affecting

computerized data sharing appear to be situational. For example, when there is serious cross-jurisdictional crime (such as murders, gang activity, and narcotics) law enforcement agencies actively seek cooperation and data sharing with each other.

Because public sector agencies have no indicator comparable to “time to market”, measuring the effect of turbulence is difficult. Environmental turbulence needs better operational definitions. Future researchers would make an important contribution to the literature by developing a reliable and validated turbulence scale for using in public sector research. Such a validated instrument could be used, for instance, in temporal studies of turbulence, seeking to understand how long turbulence must last before it significantly affects computerized data sharing.

Management Proximity

Obtaining the support of top management for any project is almost an axiom in management studies. Although the support of top management was hypothesized as important to computerized data sharing, this study noted the proximity of top management affected computerized data sharing. Support from managers within the agency was more influential on data sharing than was support by external management, especially in the more hierarchical law enforcement agencies.

Based on the results of this study, any widespread or multilevel data sharing initiative should focus on soliciting the support of top management within an agency. Future researchers may want to explore the question, “how proximate does the management or leadership have to be to affect computerized data sharing?”

An additional issue would be whether the proximity of the leadership varies by agency type. For example, would a human service agency be more responsive to leadership outside of the agency than a law enforcement agency?

Data Definitions

Data definitions are potentially the most limiting technical factor for computerized data sharing initiatives (Landsbergen & Wolken, 2001). For example, demographic abbreviations of individual characteristics can vary widely among agencies at any level of government. There are many other examples of how definitions vary from agency to agency. Some experts have advocated adopting integration, with common definitions and standardized equipment, to facilitate sharing.

True integration could be problematic since there are many so many different information systems in the public sector. One potential solution is using the Extensible Markup Language (XML) to translate between different databases. Although XML has been seen as the solution to federal government information sharing issues, it has not been widely implemented in local government. If XML supports computerized data sharing, then it is important to identify the characteristics of agencies that will adopt the technology early and understand how guide its implementation.

Standard Operating Procedures and Email monitoring

In this study, computerized data sharing was significantly correlated with the presence of standard operating procedures (SOP) and email monitoring. These variables are interesting as Hypothesis 6 (Email and Internet) was framed in the context of unrestricted computer exchanges between individuals. Hypothesis 6 proposed that computerized data sharing would be greater in organizations that encouraged computer exchanges between

individuals either inside or outside an agency. But, having an agency email address was not correlated with computerized data sharing between agencies.

Having technology is critical, but it is not sufficient to encourage computerized data sharing. An agency that implements SOPs and email monitoring should be more mature in using information technology. However, it would not be reasonable to think that creating SOPs and implementing email monitoring would automatically make organizations share computerized data. The SOPs and monitoring should exist as guidelines to restrict the unofficial use of IT in public agencies. The presence of email monitoring and SOPs should indicate the employees are skilled in using IT applications such the Internet and file sharing. Two skills critical to facilitating computerized data sharing between public agencies.

Although the presence of SOPs and email monitoring is more restrictive than Hypothesis 6 originally proposed, it would be instructive to understand when a public agency determines it needs restrictions on using computers. For example, do agencies create restrictions based on actual use or do they create them because they believe they are supposed to have them? Additionally, are the restrictions indicative of technological skill among employees?

Because email monitoring and SOPs were correlated with computerized data sharing, it may also indicate the agencies have developed a formalized method for sharing with the public. Based on frequent requests for data, the local law enforcement agencies may have developed protocols for sharing data in the same manner as the federal government's Electronic Freedom of Information Act (EFOIA). For example, a request for an electronic list of crime incidents in a particular format is provided to the requestor in that format.

Using Internet Applications

Another aspect of Hypothesis 6 (Email and Internet) meriting further study is the correlation of Internet applications with computerized data sharing. Originally, Rocheleau (1996) hypothesized that participation in local and wide area networks, electronic mail, and bulletin board systems would be correlated with computerized data sharing. When this hypothesis was developed, these channels were the primary technical means of electronic communication.

Since Hypothesis 6 (Email and Internet) was proposed, the distinction between local and wide area networks has been subsumed by Internet connectivity. Electronic mail (email) has become ubiquitous and in addition to bulletin boards, listservs are widely used for professional communication. Because this study found that skill with Internet applications was correlated with computerized data sharing, future research should seek to understand which applications are important and at what skill level does a user become proficient at data sharing.

Controlling Data

Respondents in this study indicated that controlling the interpretation of their data was important to the agencies. This particular finding may be a critical aspect of computerized data sharing between agencies. Most public agencies are somewhat “image conscious”, and law enforcement data, just like other types of data, is open to subjective interpretation.

An example of subjective interpretation is found in the area of crime mapping. Depending on the level of analysis, a series of crimes could be interpreted in two ways. One

interpretation is made at the area level in which a series of crimes is interpreted as affecting an entire area such as a census block, tract, or an entire city or county. Another interpretation could be made at the incident level in which certain crimes are placed within the context of their occurrence. This interpretation shows the crimes more precisely by where they cluster in relation to other variables.

Neither interpretation is technically inaccurate, however, one interpretation could be considered less flattering than the other. In Chapter Four, it was noted that 68.8 percent of the respondents would not enter into any data sharing agreement that would result in losing control over the respondent's interpretation of the data. Since interpretation transforms data into information, respondents want to control this aspect. One question arising from this finding is, what is the good of information sharing if everyone is only sharing "good news?"

Davenport, Eccles, and Prusak (1992) noted that when information becomes a currency of exchange, private sector managers are reluctant to give it away for free. It is reasonable to expect that public managers may have a similar outlook. Public sector agencies are rewarded for their expertise and in an era of tight budgets, managing the interpretation of data may be key to continued survival.

Future research should examine the effect of secondary interpretation on computerized data sharing. Will agencies refuse to share totally because of secondary interpretation? Or will they selectively share data that cannot negatively affect the releasing agency? In an atmosphere where governments at all levels want more data sharing, what degree of sharing will agencies tolerate? Especially if sharing the data has a negative impact on the agency.

Implications for Public Policy

Data sharing is an issue that has been continually revisited in the public sector. Even before personal computers were widespread, data sharing was viewed as one method for reducing the “burden of government” on citizens as well as business. In the past, the “burden of government” was measured by how many forms a citizen had to complete to accomplish a task or the length of time to complete them.

One effort at legislating data sharing, the Paperwork Reduction Act of 1980 (1980 PRA), specifically noted that agencies should not collect information that was available from other government agencies. The 1980 PRA also required agencies to tabulate information in a manner that maximized its usefulness to other agencies e.g. convert the data to information (Paperwork Reduction Act, 1980).

One of the primary reasons for large investments in information technology by the public sector was to decrease the burden of collecting information from citizens. Unfortunately, paperwork reduction has not lived up to its name. Despite the Paperwork Reduction Act and investments in information technology, the GAO reported that the information collection burden on citizens were increasing rather than decreasing (Government Accounting Office, 2002).

One issue limiting the effectiveness of information technology is the “stand alone” nature of systems that agencies developed in their acquisition phases. Scholars as well as practitioners have noted that data collected by public agencies often ends up in data “silos”, isolated from other organizations and sometimes isolated from other departments within the same agency (Industry Advisory Council, 2002). Despite at least thirty years of emphasis, data silos remain and eliminating them became a major objective of President George W.

Bush's E-Government strategy. Based on past performance, it is likely that future administrations will still be struggling with the horizontal data sharing issue.

During the course of this study, an interesting policy issue emerged from the literature. The issue was clarifying the definition of data and information. Many scholars, practitioners, and organizations such as the GAO often use the terms interchangeably. For example, when the GAO studied federal government data mining applications, it defined data mining as the application of database technologies to uncover hidden patterns and relationships in data. However the GAO defined information only in the context of personal information i.e. data items that could be used to identify a particular individual were defined as information (GAO, 2004).

Although the distinction between data and information is subtle, it was a critical aspect of this study and an important distinction to add to the small amount of collective literature regarding public sector information systems. This subtle distinction has the potential to become a stumbling block as government strives to improve both horizontal data sharing between agencies and vertical data sharing between levels of government. One could imagine a scenario in which two agencies agree to share information yet one agency actually desires data and the other is only willing to exchanged processed data in the form of information. The lack of clear distinction between data and information potentially limits cooperation between the two agencies and the utility of the sharing.

The information and data-sharing concept has received a great deal of focus for the past thirty years in the public sector. Both concepts have always been in the background especially in regards to the "burden of government" and efficiency issues. The terrorist attacks of September 11, 2001, made information and data sharing a major issue for the new

Department of Homeland Security. After reviewing information sharing within the Department of Homeland Security (DHS) in 2003, the GAO noted there were still challenges in:

- Facilitating information sharing on critical infrastructure
- Developing productive information sharing relationships between the various levels of government and the private sector
- Providing incentives to increase information sharing with the federal government (GAO, 2003)

Although there is no official measure of turbulence for the public sector, it would be reasonable to expect that many of the national events from September 11, 2001 through 2003 were turbulent enough to significantly affect interdepartmental and interorganizational data sharing.

Although this study could never isolate all of the variables associated with computerized data sharing, the positive findings affecting data sharing should be informative to public policy makers. First, the interest of top management (Hypothesis 4) in computerized data sharing is important to its success. Scholars and practitioners have consistently highlighted this as a critical factor. For public sector agencies in this study, the most critical manager was the head of the agency. Political leaders may encourage computerized data sharing, but the agency's top management must support it.

Second, two other related factors were important to computerized data sharing. Sharing core functions (Hypothesis 1) i.e. law-enforcement, intelligence, etc. and having common goals (Hypothesis 1) were significantly associated with computerized data sharing. It is reasonable that similar type agencies would collect similar data. However, in order for

data sharing to achieve success across domains, having common goals (Hypothesis 1) facilitates the multi agency collaboration that citizens frequently demand.

Third, agencies in this study were focused on their survival (Hypothesis 2) and their autonomy (Hypothesis 7). Regarding survival, (Hypothesis 2) agencies in this survey were willing to share data if failure to do so threatened the survival of the agency. Threatening survival by absorption, modification, consolidation, or funding constrictions is one possible tool or technique that policy makers could use to facilitate computerized data sharing.

Agencies in this study were adamantly against any data sharing agreements that threatened their autonomy (Hypothesis 7). This included ownership, control, and outsider interpretations of their data. It could be argued that threatening an agency's survival (Hypothesis 2) could mitigate its resistance to data sharing from an autonomy position (Hypothesis 7). However, the better solution would be to use memorandums of understanding (MOU) to forge data sharing agreements between agencies that do not threaten their autonomy and allows the agency to maintain some aspects of data control.

Finally, agencies in this study that shared computerized data possessed a certain level of technological knowledge. Although having basic Internet connectivity was not correlated with computerized data sharing (Hypothesis 6), using Internet "chat", professional listservs, and downloading electronic data was indicative of the technical skills required to share computerized data with other agencies.

As noted before in this study, during the 1980s and 1990s all levels of government invested heavily in information technology (IT). Another suggestion for public policy makers from this study would be to first focus on "why" information technology before focusing on "what" information technology (Caudle, 1990).

From the beginning when the public sector began using automated data processing (ADP) and continuing through to networking and enterprise computing, information and data sharing has been a consistent efficiency goal. And as Weiss (1987) and others have noted, the public sector has been scolded for not achieving this efficiency. Both information and data sharing are easier to advocate than implement. Scholarship in the area of public sector information systems is very limited (Kraemer & Dedrick, 1997) and some of the concepts discussed in public sector literature were actually developed in the study of private sector agencies.

Chapter Seven: Conclusions

The purpose of this study was to empirically determine factors that affect the extent to which one public agency electronically shares its data with other public agencies. As part of this research, this study tested nine hypotheses Rocheleau (1996) developed regarding electronic data sharing and public sector agencies.

Chapter One described electronic data sharing and why it is important to public sector. Additionally Chapter One introduced two existing models for information sharing between public sector agencies. Dawes (1996) developed one model and Landsbergen and Wolken (2001) developed their model based the previous work by Dawes’.

Dawes’ model starts with a public problem or issue suitable for information sharing. Next, the participants enter the relationship with preconceived ideas about the benefits and risks of information sharing. Finally, information sharing produces actual benefits and risks that influence managerial expectations and attitudes about information sharing in future projects (Dawes, 1996).

Landsbergen and Wolken (2001) developed a progressive three-stage model with Dawes’ (1996) model representing stage one. Stage two of the Landsbergen and Wolken (2001) model proposes a three-part infrastructure of technical issues, interoperability policy architecture, and institutional concerns. Landsbergen and Wolken (2001) noted, as have others, the technical “plumbing” issues of hardware and software have been largely solved. Stage three of the Landsbergen and Wolken (2001) model envisions that information sharing will be enabled by the architectures of stage two as well as the policy environment. In stage three, agencies at different levels of government are fully interoperable with information sharing occurring between agencies.

Finally, Chapter One also discusses the importance of computerized data sharing to the proposed e-government paradigm. Without computerized data sharing, e-government, at least at the federal level, will not be able to draw from the many data silos that government has collected over the years.

Chapter Two reviewed the available research literature about public sector information technology. Public and private sector information systems are developed for different purposes. Public sector information systems exist to improve service delivery rather than gain a competitive advantage over industry rivals. Chapter Two also reviewed the literature associated with Rocheleau's (1996) nine hypotheses.

Chapter Three discussed the research methodology of this study including the internal and external validity issues. Chapter Three also discussed the operationalization of the dependent and independent variables. Surveys were mailed to each police department and sheriff's office address provided by the North Carolina Governor's Crime Commission. To encourage more respondents, a website was also developed which was an exact replica of survey that was mailed.

Chapter Four presented the univariate descriptive findings from this study. The respondents' demographic data was compared to data found in the Census of State and Local Law Enforcement Agencies (CSLLEA).

Chapter Five presented the results of the bivariate analysis of the independent variables and their effect on computerized data sharing. The independent variables were placed in context of the nine hypotheses. Chapter Five also examined computerized data sharing through the lenses of Classical Organizational Theory, Systems Theory, and Interorganizational Relations Theory.

Chapter Six highlighted opportunities for future research and explored implications for public policy making. Chapter Six also highlighted some of the unexpected findings of the study. For example, having email standard operating procedures was more correlated with computerized data sharing than having email addresses.

Summary of Research Findings

One of the critical reasons governments invested so much information technology was to achieve greater efficiency and economy in delivering government services. Information technology did improve government service delivery prior the Internet but mostly within the sphere of an agency boundaries and its clients. Only when computers became connected via networks did government agencies have the opportunity to easily reach across their boundaries for unique data they did not have already.

In many ways, computerized data sharing is something that everyone recognizes when they see it but otherwise find it hard to explain. Also, it is something that citizens want governments to do unless it intrudes on their privacy. This study differentiated the terms, “information sharing” and “data sharing” from each other. The term “data” implies a more granular form of “information” that is essentially unedited and close to its original form.

To examine the concept of computerized data sharing between public agencies this study tested nine hypotheses about data sharing developed by Rocheleau (1996). The following section summarizes the research findings that were discussed in detail in other parts of this study.

Hypothesis One

Hypothesis One stated that interdependency of functions and common goals lead to information sharing when the sharing is perceived by the organizations as assisting them with their core functions. Very few of the law enforcement agencies reported that they were interdependent with another agency to perform their primary mission. However, the relationship between common goals with the respondents and electronic data sharing was found to be statistically significant at a moderate level.

Hypothesis Two

Hypothesis Two stated that the degree of interorganizational information sharing would be positively associated with the extent to which sharing is viewed as being necessary to organizational survival. Since public agencies are legislated into existence, budget activity was used as a proxy for an organization's survival strategy. It was noted in this study that electronically sharing data with budget departments was significantly and strongly correlated with sharing requests for data electronically.

Also, the relationship between sharing data to *supplement* agency budgets and electronically sharing requests for data electronically was significant. The quest for organizational survival does affect electronic data sharing between public agencies. As Coe and Wiesel (2001) noted, "In competing for limited resources, police departments can play an ace in the hole; crime" (p.718).

Hypothesis Three

Hypothesis 3 proposed that interdepartmental data sharing is most likely in organizations that exist in competitive environments with rapidly changing products/services. Most public agencies do not exist in an environment where they are rapidly changing their products and services. Rather than change their services, they strive to deliver their services more equitably, efficiently, or in some combination of both.

For this study, events with the potential to induce competition between agencies were defined as environmental turbulence. From public sector literature, this study used three general event types as indicators of environmental turbulence: financial stress, changes in political or administrative leadership, and implementing some form of performance-based management.

This study did not confirm any relationship between the turbulence measures and computerized data sharing. It is possible there are other measures of environmental turbulence that were not used in this study.

Hypothesis Four

Hypothesis 4 stated that interorganizational and interdepartmental information sharing is positively associated with the interest of top management in encouraging the sharing. One of the oldest observations in public and private sector management studies is that organizations align to the interest of their leaders. The interest of top management has been frequently cited as a contributing factor in all phases of information technology (IT) projects.

Data in this study indicated that the interest of top management (police chiefs) in police departments in data sharing was strongly correlated with the agencies' propensity for

sharing data electronically. Using data imputation, there was also a significant correlation between top management (sheriff) interest in sheriffs' offices and the agencies' propensity for sharing data electronically. Analyzing the data for the political and appointed leaders suggested a proximity factor in Hypothesis 4.

Police departments and sheriffs' offices traditionally function as quasi-military, hierarchical organizations with police chiefs and sheriffs occupying the top of the hierarchy. The top management, chiefs and sheriffs, exert a great deal of influence on the police officers and deputies.

Hypothesis Five

Hypothesis 5 stated that hardware and software compatibility between organizations was influential in electronic data sharing. Technically speaking, compatible hardware and software would be a critical first step for successful electronic data sharing. Desktop computing has entered a phase of networked interconnectivity and file sharing via the Internet. Even files originally created in either the Windows or the Macintosh operating systems are now shared with applications in either operating system.

During the 1990s, open standards between commercial software formats also reduced potential data sharing problems between agencies due to software conflicts. For example, most word processing as well as database software began to provide options for translating and creating files into other formats.

When these items were studied, software issues were significantly and moderately correlated with electronic data sharing. However, the software issues were predominately clustered in the "Sometimes" selection. Hardware issues were not significantly correlated

with computerized data sharing. These findings suggested that software and hardware have evolved since Rocheleau (1996) first developed these hypotheses.

Hypothesis Six

Hypothesis Six stated that interdepartmental and interorganizational data sharing would be greater in organizations that encouraged computer exchanges by individuals (e.g. through establishment or participation in local and wide area networks, electronic mail, and bulletin board systems). Since this hypothesis was originally developed, there has been a significant change in applications used for exchanging computerized information. The sharp distinction between local and wide area networks has been blurred by increased Internet connectivity.

For Hypothesis Six, basic email connectivity was not sufficient to significantly influence electronic data sharing between agencies. However, the presence of employee management controls such as the standard operating procedures (SOP) and email monitoring were significantly and strongly correlated with sharing electronic data between agencies. Also, the use of Internet applications to download professional, statistical, and other information had a significant and moderate relationship with electronic data sharing. Based on analysis of this data, only the Internet applications aspects of Hypothesis Six were supported.

Hypothesis Seven

Hypothesis Seven stated that organizations would resist external data sharing that threatens their autonomy. Oliver (1990) noted that private sector organizational autonomy had two aspects; control of the company resources and the relative freedom from satisfying external demands. However, public sector agencies have never been totally free from

satisfying the external demands of citizens or political leaders who also ultimately control their resources.

The instrument measured two autonomy issues. First, the respondents were asked to determine the probable effect on agency autonomy of entering into a data sharing agreement. The second autonomy item measured the likelihood that the responding agency would enter into a data sharing agreement where it would lose the ability to control its data. Overall, the respondents (n = 112) did not think that computerized data sharing would affect their autonomy.

Also, a majority of respondents (n = 95) indicated they would resist at some level any data sharing agreement lessening the agency's freedom to organize data as they fit. The bivariate analysis of their experience with past data sharing agreements and the probable impact on their autonomy was neither significant nor strong. Hypothesis Seven was supported by this study.

Hypothesis Eight

Hypothesis 8 stated that the degree of data sharing is likely to be higher between organizations that perceive symmetry of benefits and costs. In the instrument, symmetric benefits were not defined. Each respondent was free to determine the value of a "benefit." This hypothesis was explored in two parts. One part did not discriminate between law enforcement and non-law enforcement agencies. The second part differentiated between law enforcement and non-law enforcement.

When there was no discrimination in the agency domain, symmetric benefits between agencies was not significantly correlated with the frequency of sharing electronic data. The second part of the analysis was to assess whether the domain of the requestor was a factor

when the respondent shared electronic data with a requesting agency. When there was discrimination in the agency domain, the relationship was strongly significant. As Dawes (1996) noted, managers are more favorable to information sharing to solve domain level problems. Based on this analysis, Hypothesis Eight was not supported in its general form.

Hypothesis Nine

Hypothesis 9 asserted that when data sharing occurred despite an asymmetry of costs and benefits to the participants, there was a greater likelihood of data quality problems. In the instrument, asymmetry was defined as one agency benefiting from electronic data sharing and another not benefiting. The respondents determined whether a computerized data sharing relationship was asymmetrical or not.

Data quality was defined as data that is both complete and usable to the recipient. It was evaluated under two conditions, mandated sharing and non-mandated conditions. Under either condition, respondents, overall, did not report significant data quality problems. Hypothesis Nine was not supported by this study.

Summary

This study tested Rocheleau's (1996) nine hypotheses regarding computerized data sharing. The following independent variables were positively and significantly correlated with computerized data sharing with other agencies: core functions, common goals, organizational survival, the interest of top management, using Internet applications, and concerns for organizational autonomy. As public agencies are urged into more data sharing by legislators and the public, it is important to better understand the variables and theories that will make data sharing a more successful effort.

Two of the hypotheses seemed inappropriate for application in the public sector. It was interesting to note that Hypothesis Eight (Symmetric Benefits) and Hypothesis Nine (Data Quality) were developed from private sector literature. However, in this particular study, the respondents choose to share data despite the benefits to the agency and the quality of data shared was at least “usable” even if there was no benefit for sharing it. This finding suggests there is further research to be done regarding the motivations operating in public agencies and private organizations.

Additionally in this study, Classical Organizational Theory, Systems Theory, and Interorganizational Relations (IOR) Theory were explored for their relevance to computerized data sharing. Classical Organizational Theory and Systems Theory are traditional to the field of Public Administration. Interorganizational Relations (IOR) is a composed of six sub-theories that seek to understand why organizations in the private sector form partnerships.

Weber’s Bureaucracy is the best and most familiar example of Classical Organizational Theory in public sector agencies. This type of organization is hierarchical, directed from the top, and inwardly focused. In Classical Organizational theory the environment as well as relationships to other agencies is not directly addressed. Weber’s Bureaucracy would best anticipate and explain only interdepartmental data sharing.

Systems Theory considers organizations to be either open or closed systems. A closed system resembles Weber’s ideal type bureaucracy. Systems Theory accepts the influence of the external environment on the whole organization and expects the open system will react and adapt to changes in its surrounding environment. Also, Systems Theory acknowledges

that the organizational imperative drives organizations to remain viable at the expense of individuals or other organizations.

Reaction to the environment as well as the “organizational imperative” suggests the organization has the capacity to communicate internally and externally. At the macro-level, Systems Theory explains computerized data sharing better than Weber’s classical organizational theory. It also accommodates internal and external computerized data sharing.

Systems Theory was able to generally predict all of the hypotheses, however it does this from a self-serving perspective. In “pure” Systems Theory, the organization is seeking to maintain its status quo against the disorganization of entropy. Any internal or external data sharing serves the purpose maintaining its equilibrium. In terms of granularity, Systems theory does not explain why the organization would want to expand beyond its boundaries except to say “it” desires to interact and control the surrounding environment.

Interorganizational Theory (IOR) is comprised of six theories. Each of these theories contributes a different perspective to computerized data sharing. The question of why the organization would seek an external relationship can be answered from a multidisciplinary perspective. The six perspectives are: transaction costs economics, resource dependence, strategic choice, stakeholder theory, learning theory, and institutional theory.

Interorganizational Theory (IOR) provides the granularity that Systems Theory does not and was proposed as a useful theory to understand interorganizational and interdepartmental data sharing.

All the respondents in this study were law enforcement agencies in North Carolina. Their unique function has placed them at the cutting edge of computerized data sharing. At the local level, the shift to community oriented and problem oriented policing has driven

their need to understand the operating environment. New tools such as geographic information systems (GIS) also require data sharing if they are to provide effective support to law enforcement agencies seeking a “bigger picture” of crime. Greater emphasis on homeland security has also generated the need for computerized data sharing between law enforcement and other agencies at different levels of government.

However, for this greater emphasis on data sharing to be successful, research should also focus on the types of data that should be shared and at what level of government. For example, at the local level it may be appropriate for law enforcement agencies to share data with social service agencies as well as school administrations while they are pursuing solutions to juvenile crime. Data sharing about this local problem potentially flows more easily across the different agency boundaries.

But, can this type of data sharing arrangement remain cohesive as one moves above the local level? For example, the third level of Landsbergen and Wolken’s (2001) model envisions data moving seamlessly between and among the various levels of government. On the federal level, sharing data often becomes more problematic because of national security issues. In contrast, at the local level of government, it would be rare to store or share data that may have national security relevance. Data shared at the local level may involve issues of privacy, which are important, but affect fewer people if it is mishandled or compromised.

If computerized data sharing is to truly assist in the goals of doing more with less, then it should be understood in more detail and explored with theories more appropriate for the public sector. This study asserts that Rocheleau’s (1996) nine hypotheses are a significant step in the development of data sharing research that is unique to the special environment of the public sector.

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**Appendix – Computerized Data Sharing Survey Sent to North Carolina Law
Enforcement Agencies**

Electronic Data Sharing

Agency Demographics

1. Which category best describes your agency:

<input type="checkbox"/>	General purpose municipal police department
<input type="checkbox"/>	General purpose county police department
<input type="checkbox"/>	Sheriff's Office
<input type="checkbox"/>	Sheriff's Office with jail responsibilities only
<input type="checkbox"/>	Other. Please Specify. _____

2. What is the approximate population size of the jurisdiction this agency serves?

The following two questions, numbers 3 and 4 refer to fulltime employees and does not include any part time sworn officers, retirees, reservists, or interns.

3. What is the total number of **full time** sworn personnel?

4. What is the number of full time **non-sworn** personnel?

5. What is your agency Bureau or Division?
(Example: Administrative Division, Field Operations, etc.)

6. What is your Section within number 5?
(Example: Management Information Systems)

7. Does your agency have an information technology (IT) department?

<input type="checkbox"/>	Yes (skip Question 8)
<input type="checkbox"/>	No (Go to Question 8)

8. If your agency does not have an IT department who provides your IT support? For example: city, county, or private agency?

Information Technology (IT) Resources

Please indicate whether your agency owns the following IT assets.

9. **Hardware / Computers.** Please check all that apply.

<input type="checkbox"/>	Mainframe Computer
<input type="checkbox"/>	PC/Desktop
<input type="checkbox"/>	PC Network
<input type="checkbox"/>	Laptop
<input type="checkbox"/>	Mobile Data Terminals
<input type="checkbox"/>	Other. Please Specify.

10. **Software.** Please check all that apply.

<input type="checkbox"/>	Database Management (Access, Dbase, and etc.)	<input type="checkbox"/>	Internet Browsers (MS Explorer, Netscape, etc.)
<input type="checkbox"/>	Statistical Software	<input type="checkbox"/>	Group / Info email
<input type="checkbox"/>	Spreadsheets	<input type="checkbox"/>	Individual email
<input type="checkbox"/>	Word Processing	<input type="checkbox"/>	Network Management
<input type="checkbox"/>	Computer Aided Dispatch	<input type="checkbox"/>	Project Management
<input type="checkbox"/>	Multimedia (PowerPoint, etc.)	<input type="checkbox"/>	Records Management Systems (RMS)
<input type="checkbox"/>	Desktop Publishing	<input type="checkbox"/>	Geographic Information System

11. Does this agency use the Internet in any official capacity (e.g. research)?

<input type="checkbox"/>	Yes
<input type="checkbox"/>	No

Data Types and Sharing

This section contains a list of general types of data collected and used in police departments or sheriff's offices. Please use the table to indicate which types of data are stored electronically in Record Management Systems (RMS), exist in any electronic format, are shared in electronic format with any other law enforcement agency or correctional agency, are shared in electronic format with any other government agency (non-law enforcement), and / or are shared with the public via the World Wide Web

12. For each type of data defined below, please check if **any** part of the data:
- is converted to electronic format (for example, paper to digital) includes scanning photographs or fingerprints.
 - is stored in a computerized record management system (RMS)
 - is stored in any other electronic format (for example, MSAccess, Excel, etc.)

Type of Data	Stored electronically in Record Management System (RMS)	Exists in any electronic format	Shared in electronic format with any other law enforcement or correctional agency	Shared in electronic format with any other government agency (non-law enforcement)	Shared with public via the World Wide Web	Not Applicable
E911 – Any aspect of calls received through the E911 system converted to digital format and stored in a record system or database.						
Other than 911 – Calls received through <i>other than E911</i> that becomes a call for service.						
Field Reports – Any part of an officer's field report.						
Warrants – Warrants received or transmitted in electronic <i>format</i> . Includes warrants received or transmitted using North Carolina's Criminal Justice Information System (CJIS).						
Arrest Reports – any part of an arrest record, including fingerprints.						
Be On the Lookout For (BOLO) – Any aspect of BOLO messages received. This does not include fax machine messages.						

Type of Data	Stored electronically in Record Management System (RMS)	Exists in any electronic format	Shared in electronic format with any other law enforcement or correctional agency	Shared in electronic format with any other law enforcement agency (non-law enforcement)	Shared with public via the World Wide Web	Not Applicable
Incidents/Offense Locations - Any information regarding incidents and offenses collected from police/sheriff reports. Incidents and offenses include but are not limited to: Robbery, Homicide, Rape, Motor Vehicle Theft, Vandalism, Prostitution, DUI/DWI, Traffic Collisions, Burglary, Forgery/Fraud, Drug Offenses, Firearm Violations, Common Assault, Disorderly Conduct, etc.						
Jail Records (Sheriff Only) – any aspect of an inmate record including photographs and fingerprints.						
Civil Papers (Sheriff Only) – writs, summonses, subpoenas and civil warrants received electronic format from the court system to be served by sheriff's offices.						
Sex Offenders (Sheriff Only) – Information about registered sex offenders transmitted electronically (Email, Internet) from a sheriff's office to the North Carolina State Bureau of Investigation Department of Criminal Information. This <i>does not</i> include information sent by fax.						
Tax Information (Sheriff Only) – Information regarding the non-payment of taxes received in or converted to electronic format.						

E-

E-Mail and the Internet Usage

Please consider your entire agency as you answer the questions below.

13. Please estimate the percentage of employees in this agency with an **agency** email address.

<input type="checkbox"/>	76% – 100%
<input type="checkbox"/>	51% – 75%
<input type="checkbox"/>	26% – 50%
<input type="checkbox"/>	10% – 25%

Interest of Political and Top Management in Sharing Electronic Data

19. *Please consider your entire agency as you answer the questions below.*
 How frequently has any leader listed in the table below publicly expressed an interest in sharing electronic data between public agencies with different functions and missions?
 Please check all leaders to which this applies.

	Very Frequently	Frequently	Occasionally	Only Once	Never	Don't Know
Mayor						
City Council						
County Commissioners						
City Manager						
County Manager						
Police Chief						
Sheriff						

20. How frequently has an **agency head**, such as the police chief or sheriff, expressed an interest **within this agency** about sharing electronic data between different departments of this agency?

- Very Frequently
- Frequently
- Occasionally
- Only Once
- Never
- Don't know

21. Have any of the leaders, politicians, or managers considered in this section ever **directed** or **ordered** this agency to share electronic data with another agency, *even one time*? If so, which leader? **Please check all that apply**

- Mayor
- City Councilperson or County Commissioner
- City or County Manager
- Police Chief

Sheriff

Data Quality and Mandates

For the next set of questions, please refer to the following definitions:

- *Mandate is a law or administrative directive requiring agencies to share electronic data with each other or the general public.*
- *Mandates may also originate within an agency and direct one part of the agency to share data with another.*
- *Data quality is the completeness of the data as well as its usability.*

25. When your agency routinely receives electronic data from **other public agencies** how complete, is the data?

<input type="checkbox"/>	Always Complete
<input type="checkbox"/>	Usually Complete
<input type="checkbox"/>	Sometimes Complete
<input type="checkbox"/>	Never Complete
<input type="checkbox"/>	Not Applicable – This agency never receives electronic data from another public agency.

26. When your department receives electronic data from **another public agency** as part of a mandate, how complete is this data?

<input type="checkbox"/>	Always Complete
<input type="checkbox"/>	Usually Complete
<input type="checkbox"/>	Sometimes Complete
<input type="checkbox"/>	Never Complete
<input type="checkbox"/>	Not Applicable – This agency never receives electronic data from another public agency.

27. When your agency receives electronic data from **another part of your agency** as part of a mandate, how complete is this data?

<input type="checkbox"/>	Always Complete
<input type="checkbox"/>	Usually Complete
<input type="checkbox"/>	Sometimes Complete
<input type="checkbox"/>	Never Complete
<input type="checkbox"/>	Not Applicable – This agency never receives electronic data from another public agency.

Computer Software and Hardware Compatibility

Please consider your entire agency as you answer the questions below.

28. How often does your agency have difficulty using electronic data from another agency due to software issues?

For example, incompatible programs, versions, and even operating systems.

<input type="checkbox"/>	Always
<input type="checkbox"/>	Almost Always
<input type="checkbox"/>	Frequently
<input type="checkbox"/>	Sometimes
<input type="checkbox"/>	Never

29. How often does your agency have difficulty using electronic data from another agency due to differences between data definitions? For example using two different definitions for an incident or offense?

<input type="checkbox"/>	Always
<input type="checkbox"/>	Almost Always
<input type="checkbox"/>	Frequently
<input type="checkbox"/>	Sometimes
<input type="checkbox"/>	Never

30. How often does your agency have difficulty using data from another agency due to incompatible hardware issues?

<input type="checkbox"/>	Always
<input type="checkbox"/>	Almost Always
<input type="checkbox"/>	Frequently
<input type="checkbox"/>	Sometimes
<input type="checkbox"/>	Never

Common Functions, and Common Goals

Please consider your entire agency as you answer the questions below. For the statements below, the term “depends” means your agency must have some input from another agency to do its primary mission.

31. Are there other law enforcement agencies this agency depends on to perform its primary mission? For example, another police department, sheriff's office, state or

federal law enforcement agency.

- Yes
- No (Go to Question 33)
- Don't Know (Go to Question 33)

32. If the answer to question 31 is Yes, how often does this agency share electronic data with this agency or agencies?

- Very Frequently
- Frequently
- Occasionally
- Only Once
- Never
- Don't know

33. Are there **non-law** enforcement agencies your agency depends on to perform its primary mission?

- Yes
- No (Skip to Question 35)
- Don't Know (Skip to Question 35)

34. How often does this agency share electronic data with other **non-law enforcement** agencies on which your agency is **dependent** for performing your primary mission?

- Very Frequently
- Frequently
- Occasionally
- Only Once
- Never
- Don't know

35. How often does your agency share electronic data with other **law enforcement agencies** on which your agency is **not dependent** to perform its primary mission?

- Always

- Almost Always
- Frequently
- Sometimes
- Never
- Don't know

36. How often does your agency share computerized data with other **non-law enforcement agencies** on which your agency is **not dependent** to perform its primary mission?

- Always
- Almost Always
- Frequently
- Sometimes
- Never
- Don't know

36. How often does your agency share computerized data with other **non-police organizations** that support your agency goals? For example Community Watch, Victim Advocacy groups, Neighborhood Associations, private corporations, etc.

- Always
- Almost Always
- Frequently
- Sometimes
- Never
- Don't know

Frequency of Data Sharing

For our purposes, data sharing is transferring a file maintained in electronic format. The file must contain data organized by single or multiple information fields: for example, a database record or a data base field. The data may be shared in an electronic (Internet, email) or physical (data disks) medium.

37. How frequently does your agency share electronic data with the following groups? Please consider your entire agency and check all that apply.

	Daily	Weekly	Monthly	Annually	Never	Don't Know	Doesn't Apply
City Council							
County Commissioners							
City Manager							
County Manager							
City Emergency Services							
County Emergency Services							

38. How frequently does your agency **receive requests** from **other agencies** for data maintained in any **electronic format**? Includes law-enforcement and non-law enforcement.

<input type="checkbox"/>	Daily
<input type="checkbox"/>	Weekly
<input type="checkbox"/>	Monthly
<input type="checkbox"/>	Annually
<input type="checkbox"/>	Never
<input type="checkbox"/>	Don't know

39. How often are these **requests granted**?

<input type="checkbox"/>	Always
<input type="checkbox"/>	Almost Always
<input type="checkbox"/>	Frequently
<input type="checkbox"/>	Sometimes

- Never
- Don't know

40. How often are granted requests shared in **electronic format**?

- Always
- Almost Always
- Frequently
- Sometimes
- Never
- Don't know

Agency Environment

Please consider your entire agency as you answer the questions below.

41. In the past five years has your city or county experienced any of the following circumstances? Please check all that apply.

- Budget Cuts
- Leadership Change from One Political Party to Another
- Change in City or County Manager
- Change in your Agency Command Staff (Chief, Sheriff, and etc.)
- Implementation of Computer Statistics (COMPSTAT) in some form

Please consider interactions within your entire agency and other groups listed as you consider the statement below. Check all that apply.

42. In the past five years electronic data sharing between **departments within in your agency** has _____ due to the following changes?

Changes	Increased Significantly	Increased	Not Changed	Decreased	Decreased Significantly
Budget Cuts					
Different Political Party assumes Mayors Office					
Different Political Party assumes Sheriff's Office					
Change in City Manager					
Change in County Manager					
Changes in Command Staff					
Implementation of Results Based Management Program					

Agency Autonomy

For our purpose here, agency autonomy is an agency's ability to maintain a distinctive identity. Please consider your entire agency as you answer the questions below.

43. When you think of data sharing with other agencies, what do you feel the probable effect on your agency's autonomy is?

<input type="checkbox"/>	Increased Autonomy
<input type="checkbox"/>	Same Autonomy
<input type="checkbox"/>	Decreased Autonomy
<input type="checkbox"/>	Don't Know

44. If a data sharing arrangement was to lessen this agency's freedom to organize data as it sees fit, what is the likelihood this agency would resist entering into such an arrangement?

<input type="checkbox"/>	Resist Strongly
<input type="checkbox"/>	Very Likely Resist

- Probably Resist
- Would Not Resist
- Don't Know

Benefits

Please consider your entire agency as you answer the questions below.

45. In the last five years has your agency shared data with another agency based on the following circumstances? *Please check all that apply.*

- To gain new information technology
- To gain access to new data
- To validate existing data
- To gain access to professional advice not otherwise available
- To solve a problem that was common to you and another agency
- Other. Please Specify. _____

The following questions concern unequal benefits between this agency and another. Unequal benefits occur when this agency does not perceive a benefit from sharing data with another one, however, the other agency benefits from your sharing with them. Benefits are measured in many ways both tangible and intangible. Please consider your entire agency as you answer the questions below.

46. In the last five years has your agency entered into any agreement to share electronic data with another agency? If 'yes' please answer 47-50. If 'no' please go to question 51.

- Yes
- No (Go to Question 51)
- Don't Know (Go to Question 51)

47. In thinking of any data sharing agreements this agency has had over the last five years would you say that data sharing?

- Has cost this agency more than it has received in benefits
- Cost and benefits have been the same
- Benefits outweigh the costs
- Don't Know

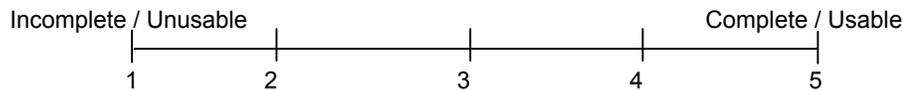
48. Except when directed by law, how often has this agency ever shared data with another agency when there was no perceived benefit for doing so?

- Very Often
- Often
- Sometimes
- Rarely
- Never (Go to question 51)
- Don't Know (Go to question 51)

49. What type of agency did your agency share data with in this situation?
For example social services, emergency management, and etc.

Think of a time when your agency received useful and beneficial data from an agency that did not benefit from providing that data. How would you rate the data quality in terms of completeness and usability?

50. Indicate on the following scale the quality of the data within a range of 1 (data was incomplete) and 5 (complete and usable).



Please consider your entire agency as you answer the questions below.

51. During your agency's budget process, how frequently does your agency share electronic data with an outside budget agency in order to justify equipment and personnel?

For example your city or county budgeting department.

- Very Often
- Often
- Sometimes
- Rarely
- Never

52. How frequently has your agency shared electronic data with another agency in order to supplement its annual budget?
For example sharing electronic data with federal, state, local, not-for-profit, and private organizations who grant additional funds.

<input type="checkbox"/>	Very Often
<input type="checkbox"/>	Often
<input type="checkbox"/>	Sometimes
<input type="checkbox"/>	Rarely
<input type="checkbox"/>	Never

Proximity

In the following questions, indicate whether there is a law enforcement agency located nearby with whom you share electronic data. Please consider your entire agency as you answer the questions below.

53. Are there other law enforcement agencies located nearby with whom you share electronic data? If the answer is 'Yes', please complete the following

<input type="checkbox"/>	Yes (go to Question 54)
<input type="checkbox"/>	No
<input type="checkbox"/>	Don't Know

54. Which item below **best** describes where the other agency or agencies are located? Please check **only one**.

<input type="checkbox"/>	In the same building
<input type="checkbox"/>	In the same town
<input type="checkbox"/>	More than 25 miles away but in the same county
<input type="checkbox"/>	Less than 25 miles away but in the same county
<input type="checkbox"/>	No more that 50 miles away but in another county

Thank you for participating in this survey. Please return it in the self-addressed stamped envelope included with this survey.