A STUDY OF THE ADOPTION OF DIGITAL GOVERNMENT TECHNOLOGY AS

PUBLIC POLICY INNOVATION IN THE AMERICAN STATES

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A STUDY OF THE ADOPTION OF DIGITAL GOVERNMENT TECHNOLOGY AS PUBLIC POLICY INNOVATION IN THE AMERICAN STATES

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Eugene Jeff Akers, son of Wilfred Eugene and Annie Jeff (Atkinson) Akers, was born February 28, 1947 in Sylacauga, Alabama. He graduated from Sylacauga High School as Senior Class President in 1965. He attended Auburn University, Auburn Alabama, as a Cooperative Education student and graduated with a Bachelor of Science degree in Mathematics in June of 1970. While working in the field of information technology in the criminal justice community, he attended Auburn University at Montgomery and received a Masters in Business Administration in June of 1979. He also served as an adjunct instructor with Auburn University at Montgomery teaching undergraduate and graduate courses in computer science. After 20 years experience in the public sector and 9 years experience in the private sector, he entered the Auburn University and Auburn University at Montgomery joint doctoral program, in October of 2000. He is married with two adult children, one an honors graduate of the Auburn University School of Business and the other an honors graduate of Montevallo University and the University of Tennessee graduate program.

DISSERTATION ABSTRACT

A STUDY OF THE ADOPTION OF DIGITAL GOVERNMENT TECHNOLOGY AS PUBLIC POLICY INNOVATION IN THE AMERICAN STATES

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The diffusion of information technology in the public sector presents the opportunity to evaluate the appropriateness of diffusion theory in a combined context of information technology and public policy innovation by studying the diffusion of digital government services within the states. Assuming that existing theory in public policy innovation adequately provides a framework to guide research in technology diffusion in the public sector, this study evaluated commonly tested determinants associated with the diffusion of public policies. Using classical diffusion theory and policy innovation diffusion theory, this study explored the contextual relevance of this theory in examining the adoption of digital government in the states.

Studies in the diffusion of public policy innovations generally focus on three primary models: determinants, regionalism (spatial diffusion), and federal interaction. While many diffusion studies focus on the determinants of the innovation, the majority of the public policy innovation studies focus on the determinants of the state. State determinants are generally classified in two broad areas: socio-economic and political. This study examined the adoption of digital government services in each state using socio-economic, political and policy process determinants while introducing additional determinants associated with the general innovativeness and administrative professionalism of the state.

This study found a limited correlation of socio-economic and political determinants generally associated with the adoption of public policies as hypothesized, including legislative professionalism. The study found a significant correlation associated with the general innovativeness of the state as operationalized by Walker's 1969 innovativeness index. Finally, this study found a significant correlation associated with administrative professionalism and the adoption of digital government as an administrative policy. The findings suggest that a state's tendency for innovation and its administrative professionalism are useful in understanding the adoption of administrative policies and some technology programs adopted on a statewide basis.

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CHAPTER ONE

Organizational Efficiency as a Core Value in Public Administration

Public administration has existed as long as governments. Its purpose is to implement public policy and manage government programs. Public administration has been viewed as a way of getting government to work efficiently while limiting the abuses of government power. The framers of the U. S. Constitution were more focused on the formation of government than the administration of government. Toward the end of the nineteenth century, the Progressive movement viewed a professional government as a way to rein in the threat of corporate control of the political system during the country's drive toward the prosperity of the Industrial Age.

In his 1887 essay "The Study of Administration," Woodrow Wilson argued that public administration should be separate from politics and the study of political science. Separating administration from politics would allow administrators more freedom and less interference in their work and enhance governmental efficiency. Wilson saw the need to further address organizational and management issues. He states,

> It is the object of administrative study to discover, first what government can properly and successfully do, and secondly, how it can do these proper things with the utmost possible efficiency and at the least possible cost either of money or energy (Wilson, 1887:197).

With this statement, Woodrow Wilson established two major objectives of administrative study that framed the discussion on what government can properly do successfully, and how the administration of government can perform with the greatest efficiency and the least cost. Wilson believed that "partisan" politics should not play a role in the efficient operation of a government organization and with this belief established a science of public administration. This politics-administration dichotomy provided Wilson and others a framework to study the principles of public administration devoid of political influences. Free from political influence, Wilson established organizational efficiency as a core value of public administration.

According to Wilson, the purpose for promoting efficiency in government was to enhance the "public trust" (Wilson, 1887:210). Wilson believed that traditional management principles applied to a private organization could also be applied to a public organization. Wilson was not alone in this belief. Beginning with the Industrial Revolution, the "rational-scientific" model of organizational theory was the central focus of management for many years, and in some respects still is.

Beginning in the early part of the twentieth century, Fredrick Taylor constructed his "scientific management" concept and Max Weber developed his theory of the perfect bureaucracy – the primary emphasis of both being operational efficiency. In his well known book *Principles of Scientific Management*, Fredrick Taylor declared that the objective of scientific management was to discover the basic principles of "time and motion" in an effort to determine the "one best way" of performing any task (F. W. Taylor, 1967:25). Classical organization theory was to evolve partly from this concept.

Taylor and others saw "scientific management" theory as a tool to improve organizational efficiency based on hierarchical organizational structures.

Max Weber, on the other hand, was further interested in understanding the concept of authority and decision-making processes in organizations. In his original 1922 work entitled *Economy and Society*, Weber discussed the concept of "rational-legal" authority that involved an organized administrative staff in the form of a bureaucratic structure (Weber, 1947:58). As translated, Weber stated,

> Experience tends universally to show that the purely bureaucratic type of administrative organization – that is, the monocratic variety of bureaucracy – is, from a purely technical point of view, capable of attaining the highest degree of efficiency and is in this sense formally the most rational known means of carrying out imperative control over human beings (Weber, 1947:337).

Weber's model bureaucracy was intended to provide a method for making rational decisions on complex issues by professionals with superior knowledge. Both the theories of pubic administration and bureaucracy defined by Woodrow Wilson and Max Weber were business models of administration designed to promote efficiency in government.

Later, Luther Gulick, somewhat in the tradition of Wilson, Taylor, and Weber, focused on the division of labor and a hierarchical organization structure necessary to coordinate work. Recognized as the "Dean of Public Administration," Gulick continued to promote greater efficiency in public-sector organizations. Gulick stated, "In the science of administration, whether public or private, the basic 'good' is efficiency. Efficiency is thus axiom number one in the value scale of administration" (Gulick, 1969:192). While Gulick shared Taylor's theory on the division of labor and

coordination, he recognized the need for specialized skills, the definitive span of control and strong leadership in a single executive. The problem of technical efficiency was directly related to the homogeneity of the work they performed, the processes they were using and the purpose that guided them leading to greater efficiency (Gulick & Urwick, 1969:9-10).

Gulick departed from Wilson and, in essence Weber, regarding the politics-administration dichotomy. Gulick rejected the concept and believed that the adaptive ability of a government organization fell partly in the field of politics and partly in the field of administration. Gulick stated, "The two are so closely related, however, that the political aspects cannot be ignored completely even here, where we are concerned only with administrative organization" (Gulick & Urwick, 1969:44). Gulick further recognized that "the principle of politics may seriously affect efficiency" in public administration (Gulick, 1969:193). Politics inherently makes government inefficient from a public administration perspective.

Organizational theory began to broaden its theory base in the late 1920s with the work of Mary Parker Follett, Herbert Simon, Chester Barnard, and others. Theories based on the interaction of informal groups, cumulative authority, and behavioral sciences suggested that hierarchical organizations were not the only tool to use in shaping worker actions and gaining efficiency. As part of this behaviouralist trend, Chester Barnard conceptualized the organization as a system of exchange between individuals and the organization that he described as a "cooperative system." Barnard described this "contractual agreement" in terms of what the organization would offer as incentives and what the individual would contribute to the organization. Barnard believed that the

incentives offered to individuals were motive for personal efficiency. To Barnard, organizational efficiency represented the intersection of personal decisions and organizational decisions based on cooperative value systems (Barnard, 1968:56-59).

Herbert A. Simon believed that classical organization theory focused primarily upon processes and methods to get things done. In so doing, it did not address the decision-making associated with what would be done (Simon, Smithburg, & Thompson, 1970:1). He believed that any theory of administration must include the principles of decision-making. Simon recognized the "bounded rationality" of individuals to pick among many complex alternatives and make decisions. Simon believed that the organization provided individuals with fundamental value-premises and the necessary relevant information to make decisions in a more efficient manner (Simon et al., 1970:250). He agreed with Weber that the organization provided a better context for individual decision-making that resulted in greater administrative efficiency (Simon, 1976:271; Weber, 1947:337). Much like the classical organization theorists, Simon considered efficiency to be the most important standard for the decision-making process throughout the organization (Simon, 1976:250-271). Efficiency within the organization was based on the standardized performance of individual workers in their effort to attain established organizational objectives where the individual's goals reflected the vision of organizational management (Simon, 1976:130-140).

This brief review is not meant to be comprehensive; it is intended to establish the critical importance of efficiency in public administration as it extends from classical organizational theory through behavioralism and into current organizational theory. Public administration originated from the merging of the Progressive movement and

scientific management to promote efficiency in public institutions. However, despite the emphasis on efficiency in public administration, practice within an ever growing and complex government has been less than perfect.

The Need for a New Organizational Perspective

Over the past twenty years, the United States has migrated from the Industrial Age to the Information Age. There exists a paradox between the hierarchical structures originally designed for efficiency and the new structural systems of today's networked society (Drucker, 1993; Fountain, 2001; Goldsmith & Eggers, 2004; Ho, 2002; Kettl, 2002). There is an extensive body of knowledge in business, political science and public administration that explores hierarchical organizational structures in decision-making and public administration and how government agencies should be organized and managed to efficiently delivery services (Goodsell, 1994; Gulick & Urwick, 1969; March & Simon, 1993; Osborne & Gaebler, 1992; Simon, 1976; Simon et al., 1970; Weber, 1947; Wilson, 1887). However, the perspectives of this body of knowledge were developed during the Industrial Age before the arrival of the Information Age. Paper, processes, poor communications, and geography required rigid systems to operate in a command-and-control environment with narrow work restrictions and inward looking cultures. Based on work in 1930 by Nobel Prize winner Ronald Coase, the sizes of organizations were generally related to the cost of gathering information (Goldsmith & Eggers, 2004:17). The transaction costs in providing goods and services in an "atomic" environment were expensive before the advent of digital media. With the arrival of the Information Age and its "digital" perspective, organizational structures needed to change. Organizations needed to be reshaped around the new "digital" and "networked" perspectives. The

Information Age reduces the dependence on space and time, and reduces the transactional costs of providing goods and services.

Successful institutions are often the last to change – victims of their past successes (Tapscott, 1996). Industrial Age governments were very successful in the transformation from an agrarian society. Most government institutions around the world were built a hundred years ago as the world created order for an industrialized society. Government appears to be outgrowing these structures, policies and rules designed to govern the growth of the Industrial Age. In his cover story for *The Atlantic Monthly* in 1995, Peter Drucker stated,

> The megastate that this century built is bankrupt, morally as well as financially. It has not delivered. But its successor cannot be "small government" (as the so-called conservatives want). There are far too many risks domestically and internationally. We need effective government – and that is what the voters in all developed countries are actually clamoring for (Drucker, 1995:61).

Charles Goodsell in his book entitled *The Case for Bureaucracy* identified three categories of bureaucratic criticism. One of the criticisms was "delivering unacceptable performance" (Goodsell, 1994:13). Goodsell observed, "Bureaucracies are perceived as inherently rigid, incapable of innovation, and riddled with fighting cliques and scheming careerists" (Goodsell, 1994:14). In fairness to this perception of bureaucracy, Goodsell does point out that while government is expected to be economical and efficient it must also "carry out other statutory intents; observe due process; follow election returns; seek the participation of citizens; pursue justice; and symbolize an open, caring, and honest government" (Goodsell, 1994:61). Government is further defined by a paradox of

preventing executive and administrative abuses while coping with increasingly more complex problems (Kettl, 2002). Goodsell's research found ambiguity in analyzing the productivity behavior of private and public organizations leading to the conclusion that government hierarchal organizations are no less efficient than private hierarchal organizations. Further, Goodsell's research found an area of bureaucratic denunciation is often associated with the application of technology in service delivery (Goodsell, 1994:83). The application of some technology (e.g., voice response systems) leaves citizens cold from an impersonal transaction versus a personal interaction. On the other hand, dealing directly with a faceless bureaucrat can leave citizens irate from the lack of personalized service as well. The application of technology is not a silver bullet for providing better service more economically.

Admittedly, government bureaucracy has not been a total failure and, in most cases bureaucratic institutions, continue to work well. However, current bureaucratic structures seem to work best in an environment that is relatively stable and simple. Some basic entitlement systems still work well along with local government structures that support libraries, parks, public works, and recreational facilities. The challenge of current bureaucratic structures resides in the more complex programs, e.g., health care, criminal justice, human services that demand greater flexibility, and customized services. The challenges of the twenty-first century and the ability to address them are more numerous and complex than those faced a hundred years ago. Problems are now both more global and more local as boundaries become more fluid (Fountain, 2001; Kettl, 2002).

The Transformation of Government in the Information Age

The primary challenge becomes how to make the transition from an industrialized model of big government - centralized, hierarchical, and operating in a physical economy - to a new model of governance, adaptive to a virtual, global, knowledge-based, digital economy, and fundamental societal shifts. The answer partly rests with the diffusion of technologies that promote new service delivery, collaboration, and knowledge networks that promote greater efficiency in complex organizations. Government must simply become more innovative, but the bureaucratic barrier to innovation is reflective of the thickening and rigidity of the structure over time (Light, 1998).

There is evidence to suggest some parallelism between the evolution of technology and the basic structures of government organizations. Thomas S. Kuhn in his book entitled *The Structure of Scientific Revolutions* suggested that political intellectual revolutions occur when there is some sense "that existing institutions have ceased adequately to meet the problems posed by an environment that they have in part created" (Kuhn, 1996:92). Equally, Kuhn suggested that scientific revolutions occur where there is some sense "an existing paradigm has ceased to function adequately in the exploration of an aspect of nature to which that paradigm itself had previously led the way" (Kuhn, 1996:92). Today's communications technologies have created an environment of ubiquitous access, information, and collaboration. There is a clear contradiction between the digital government paradigm that emphasizes coordinated networking, collaboration, and one-stop-shopping versus the bureaucracy paradigm that emphasizes departmentalization, standardization, and the division of labor (Ho, 2002). Acceptance of

the new political and technological paradigms is essential to the future of government institutions if they are to maintain their relevance.

In the early 1990s, reinventing government was a popular movement spurred by the Tom Osborne and Ted Gaebler book of the same name and the National Performance Review initiated by President Clinton. This movement illustrated the need and desire of citizens, elected officials, and public managers to improve the credibility, accountability, and performance of government organizations. This fashionable approach to process improvement was popularized by noted experts in the field of quality management such as W. Edwards Deming, Peter Senge, Philip Crosby, and J. M. Juarn. The purpose was to focus on process, specifically process reengineering. Other models included "entrepreneurial government" where lower level managers were given more authority and autonomy to make improvement changes resulting in a more innovative organization (Osborne & Gaebler, 1992:19-20; Senge, 1990:349-352). The premise was that lower level employees knew more about the processes and structures under which they work and were better able to make improvements. This was somewhat of a return to the behaviouralist theory of organizations that focused on human relations and behavioral knowledge emphasized by Chester Barnard in *The Functions of the Executive* (Barnard, 1968:235; Drucker, 1998:198; March & Simon, 1993; Weick, 1995:75).

The team-based model led to theories of "virtual organizations" and "learning organizations" where employees were encouraged and allowed to move away from the rigid structures and procedures of the bureaucracy. Fluidity was the primary characteristic of new organizational models – competency centers of employees attacking problems, sharing knowledge and devising more efficient methods of providing quality

service at a reduced cost – arguably a precursor of knowledge management theory. The view of organizations shaped by Taylor and Weber was giving way to others characterized as learning organizations, performance-based budgeting, networked organizations, total quality management, teams, collaboration, a telecommuting global work force, and a fundamental redefinition of time and space (Deming, 1986; Drucker, 1998; Senge, 1990; Weick, 1995).

Over the past decade, many states have commissioned performance reviews to study processes and make recommendations to promote greater efficiency and accountability in government grounded in traditional organizational theory, but with mixed success (Peterson, 2005). There is one common theme throughout all of these studies – government should identify and promote the use of technology to enhance the efficiency and effectiveness of critical government services. Earlier, Luther Gulick recognized the importance of integrating new technology developments in to the systems and processes of government (Gulick & Urwick, 1969:32). Gulick further believed,

> If we turn to the future, we are thus compelled to see that systems of organization which we now find to be necessary to produce specific results may become completely archaic and unnecessary with the invention of new administrative machines and techniques (Gulick & Urwick, 1969:33).

While acknowledging the important theories of efficiency associated with hierarchal organizations, decision-making, executive leadership and the policy process, government must begin to focus on new service delivery systems as another approach to organizational efficiency.

Information Technology and the "Productivity Paradox"

Beginning in the 1990s, the concept of "transaction costs" was developed to operationlize the impact of technology on the efficiency of hierarchical structures in the delivery of goods and services. In public administration, transaction cost theory was used to study the cost of delivering public goods and services. Viewed from a digital perspective, this changed the basis of transaction costs and presented opportunities for the reengineering of manual processes for enhanced efficiency (Fountain, 2001; Triplett, 1999). The re-engineering effort of the 1990s prompted the public sector to recognize a change that has become pervasive throughout the private sector.

Much of what drove the demand for technology in the United States was an emphasis on efficiency and productivity – doing more with less (Warren & Weschler, 1999:124). According to studies conducted by the Congressional Budget Office, Federal Reserve Board, and the Council of Economic Advisors, overall productivity gains in the economy over the past 25 years from the use of information technology ranged anywhere from 48 to 72 percent (P. W. Taylor, 2003:9).

However, the empirical linkage between more technology and increased productivity has historically been weak. Roger A. Freeman in his book *The Growth of American Government* argued, "No gauge has been found yet by which we can measure the value of public services that are not sold to consumers but given away" precluding the ability to measure productivity in government, especially as to its comparison with the private sector (Freeman, 1975:47-48). The "productivity paradox" was heightened in 1987 when Nobel laureate economist, Robert Solow, was credited with the adage – "You can see the computer age everywhere but in the productivity statistics" (Brynjolfsson,

1993; Brynjolfsson & Hitt, 1996; Brynjolfsson & Yang, 1996; Lehr & Lichtenberg, 1999; Strassmann, 1990; Triplett, 1999). Solow's opinion was fueled by several empirical studies in the 1970s and 1980s that failed to show significant linkage between investments in computer technology and increased productivity (Brynjolfsson & Yang, 1996).

It was not until the 1990s that studies began to show firm-level evidence of technology investments resulting in significant productivity gains and more evidence to support the premise that investments in computer technology do produce a higher level of productivity. Based on a comprehensive study of the "productivity paradox," Erik Brynjolfsson and Shinkyu Yang with the MIT Sloan School of Management concluded that "Overall, we found computers contribute significantly to firm-level output, even after accounting for depreciation, measurement error, and some data limitations" (Brynjolfsson & Yang, 1996:557). As applied to government, there are questions as to whether investments in computer technology result in the same productivity gains as the firm-level results in the private sector.

In 1999, William Lehr and Frank R. Lichtenberg published the results of their study of computer investments and associated productivity in the public sector – specifically at the federal level. Their study used data from the BLS Federal Productivity Measurement Program designed to specifically track the productivity level of federal agencies. Using these data coupled with agency interviews and surveys, their study "found a strong positive relationship across Federal agencies between productivity growth and computer-intensity growth" (Lehr & Lichtenberg, 1999:277).

In her book *Building the Virtual State*, Jane F. Fountain identified an interesting paradox regarding the use of technology to enhance efficiency in the public sector. In the private sector, efficiency gains are "rewarded through profits, promotions, stock price increases and market share" (Fountain, 2001:13). Whereas, in the public sector, gains in efficiency are "rewarded by budget cuts, staff reductions, lose of resources, and consolidation of programs" (Fountain, 2001:13). This disincentive can be viewed as a major hurdle in the diffusion of technology in government organizations but does not diminish the importance technology can play in the enhancement of organizational efficiency.

The Focus on Service Delivery Systems

It is generally accepted that government cannot be reinvented without reinventing its delivery systems, including information technology (IT) (Fountain, 2001). "IT is now being credited with enhancing program delivery and improving accessibility to information using cyberspace" (Seneviratne, 1999:57). Technology is seen as an enabler of process improvement and efficiency by leveraging scarce resources while removing barriers to citizen access (Fletcher, 1999). "From a governance perspective, greater attention directed toward information technology must be done purposefully. It should improve service delivery, reduce staff resource needs, and improve information delivery. These figure into the efficiency equation" (Warren & Weschler, 1999:125).

Another major shift in public administration recognizes the importance of establishing peer-to-peer networks with service providers. Government is beginning to redefine its core missions from managing people and programs to coordinating resources for producing public value. By changing this inward view, government agencies are

beginning to focus on outcome instead of process. In their recent book *Governing by Network*, Goldsmith and Eggers identify four trends that are altering the shape of the public sector: third-party government, joined-up government, the digital revolution, and consumer demand (Goldsmith & Eggers, 2004:10).

Third-party government is one way that government has met its challenge through increased partnership with nongovernmental entities. This allows government to expand its reach and provide broader services more efficiently without significant investment in capital costs and workforce. One example is the Internal Revenue Service. In 1998, the U.S. Congress mandated that 80 percent of all tax returns should be filed electronically by 2007. The only viable way to meet this goal was to engage private businesses that provide tax preparation services and develop tax software. According to the IRS, the 80 percent goal established by Congress was actually accomplished in 2004 (Goldsmith & Eggers, 2004; *Number of individual income tax returns filed electronically and accepted, by state, fiscal year 2002*, 2003). Web-based technology was a key tenet of these new systems.

Government has recognized the need for more collaboration between agencies of similar practices, such as criminal justice and health and human services. Technology has provided a medium for effective collaboration. Examples of this change can be found in several states such as Alabama, Kentucky and Oregon. These states have established principles that "citizens seeking state-level human services should be able to access help from the first point of government contact – regardless of which agency they contact" (Goldsmith & Eggers, 2004). In 2004, the Governor of Alabama initiated a task force to enhance the delivery system for assistance to families with the focus being on

outcomes rather than outputs. Kentucky's program, KYCARE, recognizes the need to coordinate the efforts of all social service providers in a common goal to move families toward self-sufficiency. In Oregon the program is called "No Wrong Door." These programs represent an outward focus of providing services unbounded from normal bureaucratic structures.

These peer-to-peer networks provide new opportunities for enhanced services through new service delivery models and efficiencies from shared knowledge. The challenge facing government is often more cultural than structural. Government employees accustomed to existing rigid command-and-control systems with strict processes to avoid risk are hesitant to participate in the newly networked environment. However, it is important to understand the impediments to working in a knowledge sharing structure if significant change is to happen.

A recent dissertation by Kurt Stonerock of Auburn University at Montgomery focused on understanding the "significant impediments to inter-organizational knowledge sharing between counterpart Defense contracting organizations" (Stonerock, 2003:xvii). One of his objectives was to determine whether contracting personnel and military personnel would be reluctant to share their knowledge associated with procurement practices. Stonerock believed the ability to integrate peer-to-peer knowledge sharing networks into the immediate work environment was critical to enhancing the efficiency of the Defense Department's procurement processes. While there is a perception that hierarchal organizations are rigid and less likely to be innovative, Stonerock's research provided a different finding. Stonerock asserted,

> The pervasive cultural affinity for teamwork and selflessness can be leveraged into much more robust inter-organizational knowledge sharing if empowered through a thoughtful mix of policies, technologies, incentives, and leadership. This willingness to share knowledge inter-organizationally is a powerful, latent dynamic that is ready to be tapped for the organization's overall benefit (Stonerock, 2003:255).

While somewhat limited in scope, this study does demonstrate that it is possible to modify cultural behaviors within public organizations under certain circumstances. Stonerock concluded that the result is clearly beneficial to the organization and the public from the perspective of efficiency.

A critical component of service delivery is the medium of delivery. There is a growing recognition that new communications and mobile technologies are providing new models of service delivery. A major criticism of government is the public's "demand for more control over their own lives and more choices and varieties in the government services, to match the customized service provision technology has spawned in the private sector" (Goldsmith & Eggers, 2004:9-10). These types of "designer services" in the private sector are beginning to create a similar demand in the public sector. Success by the private sector in enhancing customer service has resulted in the demand for better services from the public sector (Seneviratne, 1999). After years of mass commercial customization, the public is less tolerant of going to public facilities and having to wait in lines for service that is often mediocre at best. Waiting at the bottom of a hierarchical delivery system for "undifferentiated" services is becoming more unacceptable each day (Goldsmith & Eggers, 2004).

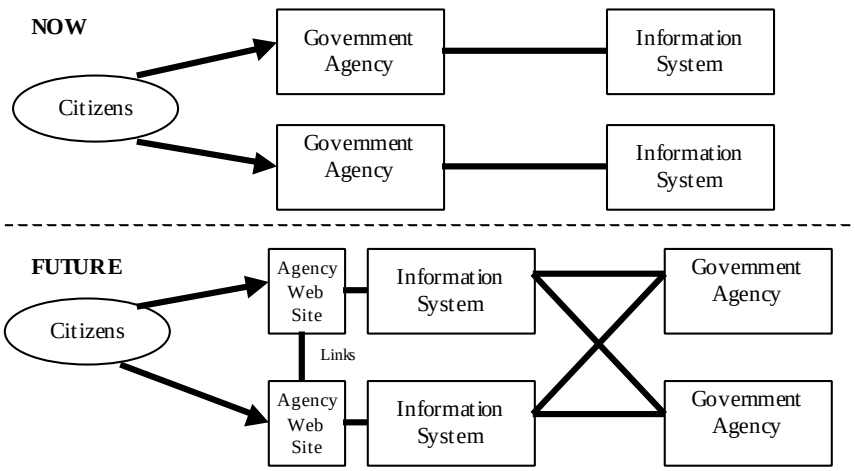
In their book entitled *Reinventing Government*, David Osborne and Ted Gaebler discussed at length the need for government to enhance its service delivery capability thereby making it more competitive. As the private sector has already demonstrated, the Internet can provide a viable alternative delivery medium for services. Agency websites have been designed to provide information and services without the mediation of civil servants. While originally designed to provide information and some interactive transactions, citizens still had to know what they were looking for and what agency provided that information or service. With entities as large and diverse as the federal and state governments, this can be a frustrating effort.

Based on current trends, citizen demand for electronic service and information will continue to expand (Garson, 2003:133). Governments will move more toward distributed models of governance where networks, information storage/retrieval, and software applications will take on an even greater role in how localized, autonomous government units interact with each other as well as with whatever new forms of governance emerge at the national/state/local governmental levels. Whatever form of government interacts with or delivers services to citizens, networks and applications across public networks such as the Internet to the home or public access points are essential and will likely become commonplace.

This represents a significant shift in the structure of information technology within government. Historically, information technology systems were designed to support the services functions of government. The primary interface was government employees who used the information to provide services and support. "Street-level" bureaucrats acted as intermediates between citizens and their government needs. Public

employees acted as the primary interface to automated systems that supported agency critical missions. As seen in Figure 1, access to government systems has been reversed. Original governmental systems were designed as back-end systems to directly support the functions of government employees as they provided services to citizens. Now, a citizen's first contact is likely to be with automated systems, not agency personnel (Ho, 2002). New front-end systems such as websites, portals and kiosks provide citizens direct access to backend systems for basic information and services without the intervention of government employees. Shared technology infrastructures provide the ability for collaborative actions among different governmental agencies and functions by providing multiple access points of interaction among different back-end systems. This provides a virtual perspective of governmental services not bound by brick and mortar.

Figure 1. Future interface of citizens to government through automated systems compared to the more traditional human interfaces.

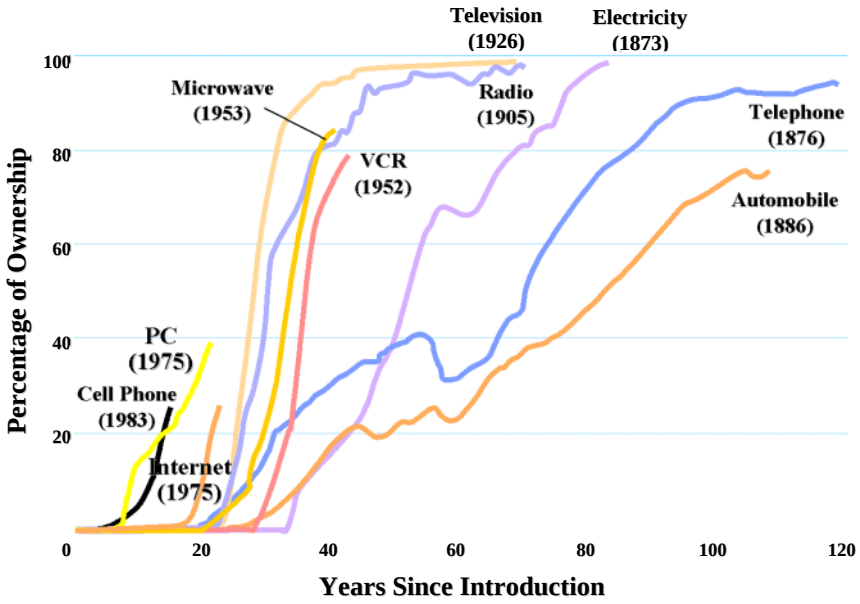


The public is now more likely to seek government information and assistance from automated systems using voice and web interfaces (Horrigan, 2004). Through this automated disintermediation, public employees are able to spend more time providing personalized services and support. Government has begun to migrate to "information-based" organizations where data are transformed into information. These "information-based" organizations provide opportunities for the introduction of new services, the discovery of fraud and abuse, and the ability to re-engineer the old business processes based on process and control. This transformation will eventually have a profound effect on the very organization of government (Drucker, 1989; Garson, 2003).

The Diffusion of Internet Technology as a Social Trend

The United States is at an economic crossroads with the convergence of computing and telecommunications. The growth and expansion of technology has continued to grow exponentially. While technology was originally devised as organizational tools to enhance productivity and efficiency, consumer demand has outpaced organizational demand since the introduction of the personal computer in early 1980s. This was the birth of the digital revolution. As depicted in Figure 2, the Internet, which is a major component of this new digital revolution, is eclipsing all other technology that has preceded it. Radio existed for 38 years before 50 million people tuned in, while television took 13 years to reach 50 million viewers, and 50 million people were using a PC 16 years after its major introduction in 1981. The Internet had 50 million users in only four years (Hughes, 1998; McNeal, Tolbert, Mossberger, & Dotterweich, 2003).

Figure 2. Comparison of Internet diffusion against other significant technology advances over the past 150 years. (Source: Gartner Group, Inc.)



Since 1994, the Graphics, Visualization & Usability (GVU) Center at Georgia Tech has performed annual surveys to accumulate historical information on the growth and trend of Internet usage. The last survey was performed during the later part of 1998 that included 5000 web participants. Seventy-five percent of the respondents state that they were "very comfortable" with using computers, and 31 percent stated they had three or more computers in their household (Kehoe & Pitkow, 1999). Thirty-six percent stated they use the Internet more than nine times a day and 56 percent stated they will spend anywhere from 10 to 40 hours per week on the Internet (Kehoe & Pitkow, 1999). According to a 2004 U.S. Department of Commerce report, 61.8 percent of U.S. households had computers in 2003, and 87.6 percent of those households used their computers to access the Internet. Based on the same survey, 54.6 percent of U.S.

households had some form of Internet connection (Cooper & Gallagher, 2004). Even more amazing over the past few of years has been the rapid diffusion of broadband connectivity to the Internet. The diffusion of broadband connectivity is more rapid than preceding technologies such as computers, VCRs and Internet service. Within a two-year period, the diffusion of broadband connectivity has more than doubled to nearly 20 percent of the households with Internet service (Cooper & Gallagher, 2004). The survey also reflects an increase in Internet usage of digital government services. The highest usage was among the broadband users with over 41 percent. These findings clearly paint a picture of the rapid diffusion of Internet connectivity coupled with increase digital government activity.

The 2004 Pew Internet & American Life Project notes that Internet adoption appears to have flattened out at around 70 percent of households. This leaves some pockets of users that are resisting going online regardless of demographics. In addition, some constituencies that use government services heavily – especially the poor and the elderly – have a much lower rate of Internet usage and adoption than the general public (Horrigan, 2004). While there is arguably some degree of "digital divide," Internet access is slowly becoming pervasive throughout the population. In her book *The Death of Distance*, Frances Cairncross offers a "glimpse of the communications future: a world where transmitting information costs almost nothing, where distance is irrelevant, and where any amount of content is instantly accessible" (Cairncross, 1997:89). By embracing that futuristic concept, the future of government is faced with some new realities of its own.

Digital Government

Digital government is generally viewed as a technology that can drive greater efficiency in government service delivery. In digital government projects, efficiency can take many forms. Some projects seek to reduce errors and improve consistency of outcomes by automating standardized tasks. A related efficiency goal of many digital government initiatives is to reduce costs and layers of organizational processes by re-engineering and streamlining operating procedures. The reinvention process of government organizations will require overcoming the existing bureaucratic forms of governance as well as employee culture (Fountain, 2001; Ho, 2002; Kettl, 2002; Stonerock, 2003). Similarly, some digital government advocates suggest that reducing the amount of time spent on repetitive tasks will give government employees an opportunity to develop new skills and advance their careers.

Digital government has the potential to change the way that government works over the next decade in a profound manner if the Internet is not viewed as just a technology, but more of a "social trend." The Internet is redefining the way in which individuals interact with other individuals, businesses, and even government. A May 2004 report by the Pew Internet & American Life Project shows that 97 million adult Americans, or 77 percent of Internet users, took advantage of digital government in 2003, whether that meant going to government Web sites or emailing government officials. This represented a growth of 50 percent from 2002 (Horrigan, 2004). Governments, elected representatives, and citizens are experimenting in digital democracy with electronic town meetings, voting online, opinion polls, and direct communication with constituencies through web sites, interactive web events, and e-mail. With the Internet,

many more people potentially will get involved in decision-making. Constituencies will have a lot more to say to institutions to which they belong.

Digital government has already generated many changes in existing laws and policies while creating new ones. Digital government can no longer be viewed as just a good idea – it is a necessity. Properly implemented digital government programs enhance a state's relationship with its citizens by making services more accessible to a broader market in a more efficient manner.

The Evolution of Digital Government

The evolution of digital government services through the Internet has followed a logical progression. The first phase basically published information about an agency and its services on a website. There was very little interaction other than e-mail contact information. The next phase recognized the value of some interactive process. This provided the ability for citizens to request specific information or documents, e.g., tax forms, license forms, etc., from the agency without having to go to a government facility. This added additional value in convenience. The majority of the digital government programs are in the interactive phase where transactional processes include a degree of commerce such that money transactions actually take place online. Citizens are now able to pay for taxes, licenses renewals and information. This adds value to the citizen and reduces the transactional costs of providing services to the agencies. However, it does not necessarily do anything to enhance the business processes of government. Most agencies merely handle these transactions as they would manual procedures.

The real value will come when government agencies begin to re-engineer their business processes to integrate these transactions into their back-end technology systems.

This is where the private sector has a distinct advantage over the public sector. With legislatures and political leaders hesitant to provide special funding for digital government projects, it is critical that governments begin to fund electronic service delivery by creating efficiencies within the agency operations. This is the major benefit of the re-engineering phase yet to be undertaken in the public sector with any great success. The lower degree of observability of digital government benefits may explain the slower rate of diffusion within the public sector (Rogers, 1995). However, being behind the private sector in the adoption of digital government does have its benefits. For example, governments can learn from the mistakes of the private sector; they can start with the more mature technologies; and they can take advantage of more economical technologies.

More importantly, governments operate with different goals, constraints and parameters than the private sector. Governments have to provide universal access to all citizens rather than selective service to some. Digital government is a public good. Government's goal is to provide universal public service, not to gain competitive advantage or increased shareholder value. Governments tend to have very limited budgets to invest in digital government initiatives and generally seek other alternatives for funding. Finally, laws and political participants can restrain digital government. Government is generally more focused on "risk aversion" further limiting new initiatives. With the normal turnover in the executive and legislative branches, continuity of vision is difficult to maintain.

A Framework for Digital Government

Digital government offers new opportunities for improving the public's experience of government services – government to citizens (G2C). Existing widespread but simple changes in technology that have improved public service (e.g., tax forms available to download and electronic queuing systems that expedite motor vehicle office visits) demonstrate how integrated and advanced services can bring dramatic changes. Many government sites are implementing "intention-based" portals designed more around citizen needs than existing government organizations. Many of these features are already available in electronic commerce in the private sector, and citizens will soon expect similar conveniences from their governments. They are unlikely to be satisfied with a government that cannot provide them.

The relationship between government and business is multi-faceted – government to business (G2B). Businesses are suppliers to, partners of, customers of, and occasionally competitors with government. In addition, businesses must comply with government regulations while they maintain these other roles. Although access to online services may be more commonplace in the business environment than in the public at large, governments cannot assume that all businesses have ready access to online services. Government to business (G2B) commerce holds perhaps the greatest promise for realizing new efficiencies and economies through digital government.

State and local governments are also embracing G2B transactions such as tax, corporate, and Uniform Commercial Code filings. The greatest advantage realized thus far in electronic transactions with government has been in financial transactions, such as electronic funds transfers and procurement cards for purchases (Purcell, 2004). Other

benefits of G2B include improved accuracy, turnaround time, and better information to support decision-making.

Governments can effectively use an intranet to easily interact with employees concerning human resource information, retirement, news releases and other employee-related issues – government to employees (G2E). G2E is a highly effective way to provide e-learning and to promote knowledge management.

Governments also can communicate effectively with other governments through online services – government to government (G2G). Some of these efforts may require more direct access to databases and applications; other digital government initiatives can be as simple as bulk data transfers, EFT transactions and information access. The G2G services require more direct links through state intranets and will take place between all government levels.

States are adopting many different models for their digital government initiatives. Some states have budgeted monies to develop, implement and support digital government systems using contract services. Other states have adopted "self-funding" models where systems are developed and supported based on convenience fees. Other states have elected to develop and support their own digital government systems. Again, true efficiencies will only be recognized when governments begin to re-engineer their business processes to fully exploit digital government technologies.

Those states that develop a strong vision of digital government, as a critical part of their economic health, will be the same states that develop best-of-bred digital government programs. Those states that fail to recognize the importance of digital

government as a public policy initiative are missing an opportunity to improve the quality of life for their citizens.

The Construct of Digital Government

There is still some degree of confusion within the public sector as to the actual construct of digital government. The terms e-government and digital government are often used interchangeably, and generally, they are common in meaning. However, digital government means different things to different people (Garson, 2003).

Digital government can be defined in terms of specific actions: using a government kiosk to receive job information, applying for Social Security benefits through a web site, or creating shared databases for multiple agencies, as examples. Digital government can be defined more generally as automating the delivery of government services. Digital government is often promoted in terms more associated with governance models and online democracy (e-democracy): online forums and online voting. While perceptions of digital government vary widely, some common themes can be identified that capture its evolutionary nature.

Traditionally, the interaction between a citizen or business and a government agency takes place in a government office. With emerging information and communication technologies, it is possible to locate service centers closer to the clients. Such centers can consist of an unattended kiosk in the government agency, a service kiosk located close to the client, or the use of a personal computer in the home or office. Digital government can enable citizens to interact and receive services from governments 24 hours a day, seven days a week. Digital government initiatives suggest that service

delivery can become more convenient, dependable, and less costly – more efficient in many ways.

First, digital government can represent enhancements to government processes (Fountain, 2001; Kettl, 2002). With the emphasis on collaboration networks, shared data and customer services, digital government is slowly changing the paradigm of existing governance structures (Ho, 2002). Digital government means replacing service lines with accessible information and services, available 24-hours a day, directly from the desktop, using powerful new technologies like digital signatures and electronic forms. A common catch phrase of digital government initiatives is "Get online, not in line." It means offering a "one-stop-shop" to many government services through a state's Internet portal. It means making the process of accessing government services immediate, simple, seamless and intuitive. It means reducing paperwork within government, and reducing costs so those dollars can be used to fund direct delivery of services. It also enables agencies to provide more services to more customers without adding significant administrative operating costs. Finally, it means improving service delivery to all segments of the population, whether connected to the Internet or not, because as more citizens move online, the remaining lines of people at traditional service counters become shorter.

Secondly, digital government can refer to the use by government agencies of information technologies (such as Wide Area Networks, the Internet, and mobile computing) that have the ability to transform relations with citizens, businesses, and other branches of government. These technologies can serve a variety of different ends: better delivery of government services to citizens, improved interactions with business and

industry, citizen empowerment through access to information, or more efficient government management. The resulting benefits can be less corruption, increased transparency, greater convenience, revenue growth, and/or cost reductions.

Finally, digital government is more than just a buzzword for online government services. It is a fundamental shift in government culture, allowing those in public policy and government to respond much more quickly to citizens, while making government services more accessible and understandable to citizens. It is about re-establishing trust in government and improving relationships between those who govern and those who ultimately own government – the people. Digital government is not simply the process of moving existing government functions to an electronic platform. Rather, it calls for rethinking the way governmental functions are carried out today to improve some processes, to introduce new ones and to replace those that require it.

Digital government is not necessarily a shortcut to economic development, budget savings, or clean, efficient government. Digital government is not a "big bang" event that immediately and forever alters the universe of government. Digital government is a process of evolution, not revolution, and often a process that presents costs and risks, both financial and political. These risks can be significant. If not well conceived and implemented, digital government initiatives can waste resources, fail in their promise to deliver useful services, and thus increase public frustration with government. Too often, the lack of resources and technology is compounded by a lack of access to expertise and information.

Digital government also intersects many legislative issues, including privacy, the digital divide (the lack of equal access to computers, whether due to a lack of financial

resources or necessary skills), and public access to government information, service delivery, and information security. The dynamic nature of digital government and its broad sector applications contributes to a lack of a common understanding of its meaning and significance.

Digital Government as Administrative Public Policy

Clearly, digital government can be viewed not only as a technology initiative, but also as a public policy initiative. Frances Berry makes the argument that diffusion research should focus on the "differences between administrative and policy innovation" (F. S. Berry, 1994a:328). The implementation of digital government can generally be considered as an administrative policy that is not associated with specific legislative action in the states. "Efficiency motivations underscore the framing of e-government as an administrative issue" (McNeal et al., 2003:66). However, there are several states that have specific legislative policy associated with digital government. Generally viewed as an administrative policy, as opposed to a moral or economic policy, digital government projects may have many different origins (Hays & Glick, 1997; Jensen, 2004; McNeal et al., 2003). In some states, the driving force behind digital government programs is the executive branch – specifically the governor. Most of the states recognized as having the most successful digital government programs, such as Illinois, Washington, Maryland and Virginia, have a strong vision and management from a central authority – the governor's office or a strong chief information officer (Barrett & Greene, 2001). In this scenario, digital government is arguably an administrative public policy. In other states, digital government programs originate in specific agencies and then diffuse to other agencies without central management.

Of significance in the adoption of digital government is the lack of any federal government initiative to manage the implementation of digital government among the states. There is no effort to centrally manage or fund the adoption of digital government programs at the state level as there is at the federal level. A federalism approach to the implementation of public policy has been shown to seriously stimulate the adoption of public policy in the states (Gray, 1973; Welch & Thompson, 1980), but this is not the case with digital government initiatives. This fact provides an opportunity to study the effect that state determinants have on the adoption of digital government free from federal interaction.

Research Focus and Design

The adoption of digital government in the public sector presents an opportunity to evaluate the appropriateness of diffusion theory in a combined context of information technology and public policy innovation. There exists no comprehensive model that combines public policy diffusion and information technology diffusion. This study assumes that existing theory in public policy innovation provides an initial framework to build a comprehensive model of technology diffusion in the public sector. Using classical diffusion theory and policy innovation diffusion theory, this study will explore the utility of this new theory to explain why some states have adopted digital government programs more than others.

Studies in the diffusion of public policy innovations (e.g., Rogers, 1962; Hagerstrand, 1967; Walker, 1969; Mohr, 1969; Gray, 1973; Collier and Messick, 1975; Welch and Thompson, 1980) focus on three primary models: determinants, regionalism (spatial diffusion), and federal interaction. While many diffusion studies focus on the

determinants of the innovation, the majority of public policy innovation studies focus on the determinants of the state (F. S. Berry, 1994a; F. S. Berry & Berry, 1990;,1992; Cannon & Baum, 1981; G. W. Downs, Jr., 1976; Gray, 1973; Hays & Glick, 1997; McNeal et al., 2003; Mintrom, 1997a; Walker, 1969; Winder & LaPlant, 2000). State determinants are generally classified in two broad areas: socio-economic and political. Later, researchers added additional determinants associated with the policy process, i.e., agenda setting, policy entrepreneurs, policy networks, interest groups, transnational networks, and professional associations (Balla, 2001; Feiock & West, 1993; Mintrom, 1997a; True & Mintrom, 2001).

In 1973, Virginia Gray found some support in her studies to suggest that particular determinants may influence policy adoption by issue area (Gray, 1973:1179). Later, Sung-Don Hwang and Virginia Gray utilized a three-category schema – developmental, allocational, and redistributive – to further examine policy outputs (Hwang & Gray, 1991). In 1994, Frances Berry suggest that diffusion studies should focus on the "differences between administrative and policy innovation" (F. S. Berry, 1994a:328). Scott Hayes and Henry Glick classified their study of living-will laws as a moral policy versus an economic policy (Hays & Glick, 1997). The majority of research in public policy diffusion has either focused on moral (redistributive) policies (Cannon & Baum, 1981; Collier & Messick, 1975; Daniels & Darcy, 1985; Hays & Glick, 1997; Hwang & Gray, 1991; Sigelman, Roeder, & Sigelman, 1981) or economic (developmental) policies (F. S. Berry & Berry, 1992; 1994; Hwang & Gray, 1991). There is little research examining the determinants of administrative (allocational) public

policy, specifically in technology such as digital government (Hwang & Gray, 1991; McNeal et al., 2003).

State Innovativeness Indexes

These indices provide an opportunity to test and build upon the theories regarding digital government innovativeness in the states. Innovation research in public policy originated over 35 years ago with the work of Jack L. Walker (1969). Walker focused on the general innovativeness of state governments. He devised an innovation score based on how quickly the states adopted some 88 programs covering several different policy areas. He then attempted to account for the variation among the states by testing for the significance of various socio-economic and political variables. Walker's work, and later research from others, suggests that states differ in regard to innovativeness across several policy areas and that differences in general innovativeness have endured over extended periods. Other studies (F. S. Berry, 1994b; Daniels & Darcy, 1985; Gray, 1973; Savage, 1978; 1985) have shown that Walker's innovativeness score and the diffusion of public policy are often correlated. This study will examine whether Walker's innovativeness index shows the same correlation to the adoption of an administrative policy such as digital government.

In 1973, Virginia Gray challenged Walker's findings with her conclusion that "some states are innovative at one point in time, but they are not necessarily innovative at another point in time" (Gray, 1973:1184). Gray believed innovativeness in the states was "time and issue-specific." While Gray cast some doubt as to the adequacy of Walker's index because of a sampling problem, Walker felt that any sufficiently broad database of policy innovation would create a representative statistic or index that would not vary

differently from his initial computations (Gray, 1973; Walker, 1973). In a 1977 study Robert L. Savage constructed a new innovativeness index of the states with a broader sampling of policy types. He came to the conclusion,

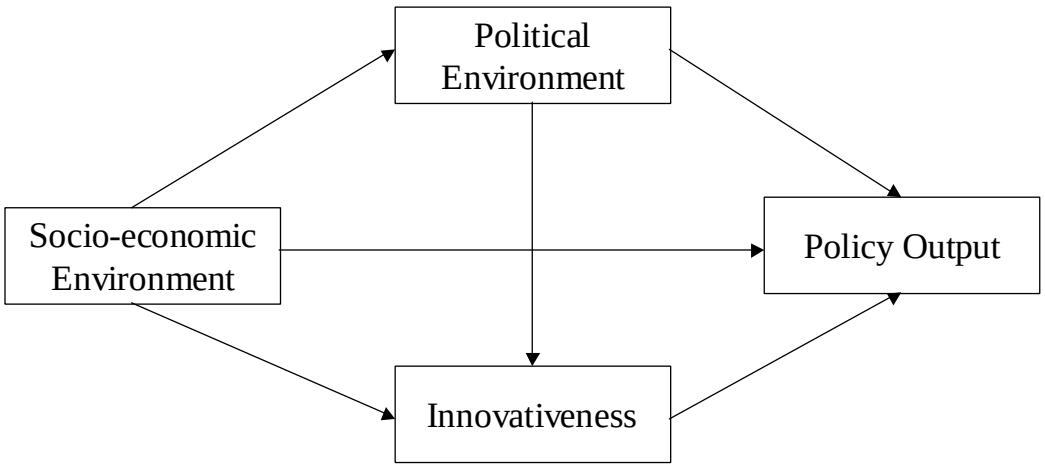
> While the states show more similarity today in rates of policy diffusion, almost half of them exhibit considerable consistency over time in their relative speed of adoption of a wide array of policies. This finding suggests that Gray may have been too hasty in discounting a general innovativeness trait as a variable characteristic of the American States (Savage, 1978:218).

The first hypothesis of this study is that states ranking high on the digital government rankings are significantly correlated to Walker's index of innovation. A test of the innovation scale will require control for other variables, which also can be assumed to affect the extent to which states pursue administrative policies. Walker's original work and others suggest that, generally, the larger, more urbanized, and wealthier a state, the more likely it is to innovate (F. S. Berry, 1994b; Collier & Messick, 1975; Gray, 1973; Rogers, 1962; Walker, 1969). Later studies suggest that the policy process can affect the innovativeness of states as well as the political environment (Balla, 2001; F. S. Berry, 1994a; F. S. Berry & Berry, 1990; 1992; Feiock & West, 1993; Mintrom, 1997b; 2000; Mossberger & Hale, 2002; Rogers, 1962; Walker, 1969).

Innovation is conceptualized as an intervening variable in this study. Therefore the study will examine the adoption of digital government services in each state by controlling for the effects of two different types of prior variables: (a) those reflecting broad economic-social-cultural conditions, and (b) those reflecting the state's political environment. For the sake of convenience, the first set will be called *socio-economic*

variables and the second set will be *political variables*. Innovativeness is assumed to be a product of both types of variables. In addition, the socio-economic variables are assumed to both directly and indirectly affect innovativeness because of their relationship to the political variables. Figure 3 links the various categories of variables in a simple policy adoption framework.

Figure 3. Basic policy adoption framework showing the relationship of socio-economic and political determinants to policy output with innovativeness as a possible intervening determinant.



A path analysis will be particularly useful as a method to gauge the indirect, as well as, direct effects of these two categories. This method can estimate the importance of innovativeness on the policy output variable by its direct relationship to the policy variable when controlled for socio-economic and political variables. Walker found that even though a number of political determinants were closely correlated to policy innovation, the relationship either disappeared or was reduced when socio-economic determinants were controlled (Walker, 1969).

Some studies have found legislative professionalism closely related to the adoption of different public policies areas (Berman & Martin, 1992; F. S. Berry, 1994a;

Kellough & Selden, 2003; McNeal et al., 2003). A prior study questioned whether legislative professionalism represented a more general administrative professionalism of state government (McNeal et al., 2003). The present study will examine the difference between legislative professionalism and administrative professionalism and determine whether administrative professionalism, as operationalized, is more closely related to the adoption of digital government in the states than legislative professionalism.

Digital Government Innovativeness Indexes

The most typical approach found in the literature is to construct a dependent variable (usually some measure of innovativeness) and then relate this measure to a set of independent variables. Rather than construct a new innovativeness variable for this study, research was done to determine if there already existed some viable measure of the innovativeness of digital government within the states. After some review, two highly regarded measures of a state's innovativeness ranking in the use of "digital government" were found. The first is a product of an annual survey by the Center for Digital Government published by the Progress and Freedom Foundation (Lassman, 2002). The Center for Digital Government provides five iterations of their Digital State Survey "to document and assess the progress made by state governments in the adoption and utilizations of digital technologies to improve the delivery of government services to their citizens" (Lassman, 2002:1). The annual survey assesses technologies in eight specific categories: Electronic Commerce & Business Regulation, Taxation & Revenue, Social Services, Law Enforcement & the Courts, Digital Democracy, Management & Administration, Education and GIS/Transportation. The Digital State Survey is based on a comprehensive survey distributed to the Chief Information Officer of each state and is

supplemented by data collected via the Internet through visits to each state's official websites. In some cases, secondary research includes personal site visits, interviews, correspondence and other written material.

The other nationally recognized measure of innovativeness in digital government is the annual Brown Report published by Brown University. The Brown study focuses on the condition of digital government in federal and state agencies. A survey of state and federal chief information officers (CIO) is coupled with a detailed analysis of the agency websites. The Brown study attempts to measure the types of online services offered independent of the CIO responses and the responsiveness to citizen requests (West, 2000).

In summary, state governments have actively attempted to develop digital government programs. In recent years, national organizations, institutions, scholars and public demand have encouraged the adoption of digital government. As such, many states have taken a comprehensive and multifaceted approach to digital government. The extent to which states have done so varies widely. This study will focus on how this variation is related to the general tendency of the states toward innovativeness. In the process, the study will explore theories and findings regarding how a broad range of socio-economic and political variables may have a causal relationship to the adoption of digital government. The study will further examine the relationship of administrative professionalism as operationalized in this study to the adoption of digital government in the states.

CHAPTER TWO

Everett M. Rogers, in the 1st Edition of his book the *Diffusion of Innovation* published in 1962, noted that the diffusion of new ideas had more influence in changing social systems than the sword. Rogers traced the earliest study of social change back to the social sciences of sociology and anthropology. Anthropology constituted the oldest tradition in diffusion research throughout Europe and was based on the concept that social change was the result of the introduction of innovations from one social system to another. The dominant perspective in the anthropology tradition viewed social change as a result of both invention and diffusion. Studies in anthropology later influenced other studies by sociologists in the 1920s and 30s (Katz, Levin, & Hamilton, 1963). A French lawyer and judge in the early twentieth century, Gabriel Tarde, stated, "Socially, everything is either invention or imitation. And invention bears the same relation to imitation as a mountain to a river" (Tarde, 1962:3). As a judge, Tarde observed certain generalizations about how cases were presented in his court and how legal techniques were often imitated by practicing attorneys. Tarde described these generalizations as the "laws of imitation." Tarde was the first to identify the adoption process and its representation as a geometrical progression over time (Tarde, 1962:18). His concept of imitation recognized that others learn about an innovation by copying the adoption process of early adopters (Tarde, 1962).

Ironically, Everett Rogers and others found many different research traditions studying the diffusion process with little interdisciplinary sharing of findings (Katz et al., 1963; Rogers, 1962). Other traditional disciplines that studied the introduction of innovation into a social system included education, economics, history, and psychology. Considered the "bastard child" in the disciplines of social and cultural change, diffusion theory was initially rejected as trivial (Fliegel & Kivlin, 1966). Other disciples using diffusion theory included agricultural economics, communication, geography, industrial engineering, information technology, marketing and management, public health and medical sociology, psychology, statistics, political science and public administration. Rogers estimated the number of diffusion publications increased from 405 in 1962 to nearly 4,000 in 1995 (Rogers, 1995).

Rogers was the first to outline the terminology and concepts of diffusion theory conceptualized from many different disciplines. Therefore, the logical place to begin the study of diffusion theory is his book, *Diffusion of Innovation* (1962). Rogers' first experience in the diffusion of innovation resulted from his studies in the area of new agricultural programs. His initial work left him with more questions than answers, including: Is there some rational process by which a new idea or innovation is diffused through a social system? Are there common characteristics of the adoption process, the innovation and innovation-decision process of individuals involved? Are there common characteristics of the social system that hastens the diffusion of an innovation?

Initial studies showed that the diffusion of new ideas followed a common diffusion process as well as an adoption process. The diffusion process is not to be confused with the adoption process. The diffusion process is the spread of a new idea

from its source of invention or creation to its ultimate users or adopters. A noted scholar in geographical diffusion, Torsten Hagerstrand, described the diffusion process as "one in which a population accepts externally invented and perfected cultural innovations that are not further improved upon locally during the course of their acceptance" (Hägerstrand, 1967:13). Rogers defined diffusion as "the process by which an innovation is communicated through certain channels over time among the members of a social system" (Rogers, 1995:5).

The adoption process is the mental process through which an individual passes from first hearing about an innovation to final adoption (Rogers, 1995:36). Rogers replaced his original adoption process with the concept of an innovation-decision process described as:

> The mental process through which an individual passes from first knowledge about an innovation to forming an attitude toward the innovation, to a final decision to adoption or rejection, to implementation and use of the new idea, and to confirmation of this decision (Rogers, 1995:20).

Early studies identified common characteristics of individuals involved in the adoption process as well as common characteristics of the social systems. Recognizing these basic concepts, Rogers examined other disciplines to determine whether these same characteristics were common to all of them. As an essential part of the process to develop new theory, Rogers established a common language for diffusion theory research.

Elihu Katz, Martin L. Levin and Herbert Hamilton conducted another early study of the diffusion of innovation in 1963. Their definition of the diffusion process was stated from a sociological viewpoint as:

> *The* (1) acceptance, (2) over time, (3) *of some specific* item - *an idea or practice,* (4) *by individuals, groups or other* adopting units, *linked to* (5) *specific* channels *of communications*, (6) to a social structure, *and* (7) *to a given system of values, or* culture (Katz et al., 1963:237).

Purposes of Diffusion Theory

Generally, diffusion theory is employed for three distinct purposes. First, it is used to describe behavioral events such as the adoption process of members of a social system. Second, diffusion theory is used as a normative model to determine how an innovation can be best implemented. Third, the most common application of diffusion theory is to forecast the success or failure of a specific innovation within a social system. For the most part, diffusion theory is used to study objective inputs and outcomes. There also exists the possibility that diffusion theory can be refined to study behaviors unrelated to innovations such as attitudes, perceptions, etc. (Brown, 1981; Mahajan & Peterson, 1985; Rogers, 1962; 1995).

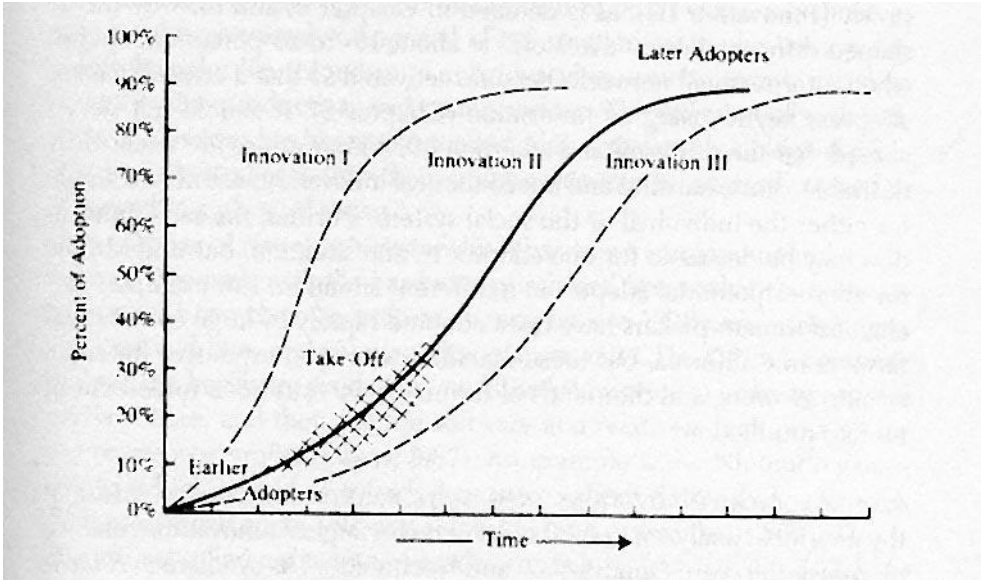
Empirical Regularities in Diffusion Theory

A review of diffusion theory finds three common empirical regularities associated with the diffusion of innovations. These regularities provide the framework for the visual understanding of diffusion theory (Brown & Cox, 1971; Katz et al., 1963; Rogers, 1962).

Temporal Context

Many studies of the diffusion of innovations have shown a common regularity. Figure 4 shows the cumulative adoption time path or temporal pattern of a diffusion process when plotted; the general distribution takes the shape of a S-shaped curve.

Figure 4. Diagram of S-shaped curve associated with common diffusion process. (Copied from *Diffusion of Innovation*, Everett M. Rogers, 1995)



This results from the common characteristics of the diffusion process. Initially, only a few members of a social system adopt the innovation in each time period beginning at the origin. Over time, adopters increase for each time period at a greater rate causing the diffusion curve to have a faster rising slope and reach an upper asymptote. As the diffusion becomes saturated, the curve begins to level off. Even though diffusion patterns may vary in slope and asymptote, they all follow the same general S-curve shape (Brown & Cox, 1971:551; Rogers, 1995; Tarde, 1962). The diffusion curve is generally plotted over time as the cumulative number of adopters or the level of innovativeness of diffusion. Diffusion models were developed to represent the level or spread of an

innovation among members of a prospective social system. The purpose of the diffusion model was to depict the successive increase in the number of adopters or adopting units (innovativeness) over time.

Spatial Context

While the S-curve is the most widely recognized graphical representation in diffusion theory, another familiar graphical representation is a spatial sequence. Spatial representation recognizes that a new adoption is highest in the vicinity of an earlier one and decreases with distance. This is often referred to as the "neighboring effect" (Brown & Cox, 1971; Hägerstrand, 1967; Klingman, 1980). This empirical representation supports the impact of interpersonal communications between homogeneous social systems and adoption rates. Torsten Hagerstrand described spatial diffusion as a "visual cultural landscape." Successive stages of diffusion were described as incremental frames on a roll of film (Hägerstrand, 1967). This diffusion pattern is often referred to as "contagion" diffusion that recognizes the proximity and contact of individuals in the social system.

Hierarchical Context

Finally, there may be a tendency for more important places to adopt earlier than less important places creating a hierarchy effect (Brown & Cox, 1971; Leichter, 1983; Rogers, 1962; Walker, 1969). This effect may also be associated with a federalism (principal-agent) relationship between vertical layers of governments (Feiock & West, 1993:402; Mintrom, 1997a:59). This pattern may have non-contiguous spaces in the spread of the innovation. Hierarchical diffusion generally will flow from an urban area to a rural area and is less dependent on geographical area. As an example, the spread of

AIDS from the urban to the rural area is consistent with hierarchical diffusion. In 1975, David Collier and Richard Messick tested hierarchical diffusion in the spread of social security systems internationally. Their study found substantial support for the hypothesis that hierarchical diffusion was present with "a clear pattern of diffusion down a hierarchy of modernization." In other words, there was a tendency for later adopters to adopt at a lower level of social and economic modernization (Collier & Messick, 1975:1313; Rogers, 1962). Collier and Messick also noted that the earliest adopters reflected an upward hierarchical diffusion rather than downward; and the middle adopters showed a more spatial pattern of diffusion. While this tendency sounds logical, the primary means of evaluation was limited to the visual evaluation of the spatial diffusion on a map. Limited empirical evidence of this tendency has focused on commercial innovations, not social innovations (Brown & Cox, 1971:554).

These three different diffusion regularities can best be described as the "outcome of a different portion of the sequence of behavioral events associated with diffusion of an innovation" (Brown & Cox, 1971:559). As such, all of these regularities are integral to the research of innovation diffusion.

Critical Elements of Diffusion Theory

Rogers began by defining diffusion "as the process by which an innovation spreads" (Rogers, 1962:13). The diffusion process represents the spread of a new idea or innovation from its original sources to the ultimate users or adopters. The innovation may be defined as either a technical innovation or a cultural innovation. The essence of the diffusion process is the human interaction as one person communicates a new idea to another person. The scope of the diffusion process is discussed within the bounds of

some social system. A social system is defined as "a population of individuals who are functionally differentiated and engaged in collective problem-solving behavior" (Rogers, 1962:14).

Rogers identified four critical elements associated with the analysis of innovation diffusion: the innovation, its communication from one individual to another, in a social system over time (Rogers, 1962:12; 1995:10). Several studies applied diffusion theory specifically to organizations as a social system (Becker & Whisler, 1967; G. W. Downs & Mohr, 1976; March & Simon, 1993; Menzel & Feller, 1977; Zaltman, Duncan, & Holbek, 1973). These elements provide the framework for all diffusion studies.

The Innovation

The first element is the innovation itself, whether technical or cultural. Rogers defined innovation as "an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (Rogers, 1995:11). Rogers generally used the words innovation and technology interchangeably. Rogers initially studied the planned spread of new ideas, but later included the spontaneous spread as well (Rogers, 1995).

Rogers' research defined five characteristics of innovation that may explain the different rate of adoption as perceived by individuals. The first was relative advantage defined as "the degree to which an innovation is perceived as better than any previous ideas." The second was compatibility defined as the degree to which "an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters." The third was *complexity* defined as the degree to which "an innovation is perceived as difficult to understand and use." The fourth was trialability defined as the degree to which "an innovation may be experimented with on a limited

basis." And the fifth was observability defined as "the degree to which the results of an innovation is visible to others" (Rogers, 1995:15-16).

Frederick Fliegel and Joseph Kivlin were pioneers in the study of the characteristics of the innovation on the diffusion process where the unit of analysis was the innovation itself. Their analysis of the diffusion of innovative farm practices revealed several conclusions. First, innovations perceived as having the most reward with the least risk were accepted more rapidly. This supported the relative advantage hypothesis in an economic context. Second, communicable attributes and less complexity of the innovation played an important part in the diffusion rate. This supported the complexity hypothesis. Finally, the study revealed some possibility of the relationship between the attributes of the innovation and the existing social values. Fliegel and Kivlin described this as a "halo effect." This supported the compatibility hypothesis (Fliegel & Kivlin, 1966:248). Whether these attributes have general applicability for policy diffusion research has not been addressed in the literature.

There exists the small possibility that an innovation will be limited to a specific social system bound by its norms and cultures. Therefore, an innovation can be diffused within a single social system or it may be diffused from one social system to another. While some research views the innovation and environment continuously changing, the majority of diffusion theory research is bound by the assumption of an unchanging innovation (Brown, 1981). This assumption is later challenged by several other studies (Clark, 1985; Glick & Hays, 1991). Henry Glick and Scott Hays addressed the issue of "policy reinvention" in their 1991 study of the evolution of living wills. Their findings indicated, "It is important to distinguish between original and amended policy and that

amendment should be considered part of the on-going cycle of innovation which affects the final content of policy and the relative position of the states as innovators" (Clark, 1985; Glick & Hays, 1991:847). Studies of policy diffusion that view a modified version of a policy as being the same as the original could overlook real differences that affect a state's ability to implement that policy (Savage, 1985).

The Communication System

The second critical element of innovation involves communication from one individual to another, or one social system to another. The purpose of this communication is to share ideas and reach some form of convergence in order to effect a specific change. How the new idea or innovation is communicated throughout the social structure determines the degree of success of the diffusion process. Communication within the diffusion process is viewed as bi-directional versus a one-way, linear act.

Rogers believed that several important factors affected the impact of communications. First, individuals with a larger degree of similarity (homophily) positively affected the adoption of an innovation within a social system or organization. The primary method of communications was interpersonal. Conversely, more heterophily within the group negatively affected the adoption rate. Second, members within a social system with access to outside sources of information (cosmopolite) tended to have a higher rate of adoption compared to those relying more on inside information (localite) (Rogers, 1962). The use of mass media played a critical role in the communications of innovations from one social system to another. Rogers recognized two primary actors involved in the diffusion process that contributed to the level of adoption in the social structure: "opinion leaders" and "change agents."

The opinion leader is the individual who others within the social system normally seek out for advice and information. The opinion leader is more cosmopolite than other members and tends to rely on sources of information outside of interpersonal communications within their system. Tarde described the course of imitation within a social organization, given equal distances, as flowing from superior to inferior members, often based on nobility (Tarde, 1962:232). Generally it follows that the opinion leader has a higher social status and is more active in social functions. In general, the opinion leader is more innovative or at least demonstrates a shorter adoption cycle than other members of the social system. Even though innovators are often perceived as demonstrating deviant behavior, the opinion leader normally conforms more closely to the norms and values of the system. Tarde summarizes,

> The modern man flatters himself that he is making a *free choice* of the propositions that are made to him, whereas, in reality, the one that he welcomes and follows is the one that meets his pre-existent wants and desires, wants and desires which are the outcome of his habits and customs, of his whole past of obedience (Tarde, 1962:246).

This conformity bestows a more influential role in the communications network of the social system. In his book *Public Policy*, Wayne Parsons mentioned several authors, such as John Stuart Mill, J. M. Keynes, Gabriel Weimann, Elihu Katz and David H. Burton, who observed the influence of key people and their ideas in shaping the opinions of members of a social system (Parsons, 1995:170). John Maynard Keynes stated in his *Essays in Persuasion*, "A study of the history of opinion is a necessary preliminary to the emancipation of the mind. I do not know which makes a man more

conservative – to know nothing but the present, or nothing but the past" (Keynes, 1972:277). Keynes further observed that there were actually two opinion loci – outside opinions of the public voiced by the politicians and the newspapers versus the inside opinions of politicians, journalists and civil servants expressed in limited circles (Keynes, 1972:34-35). Either center can have tremendous impact on change if viewed as "opinion leaders."

The other primary actor in the diffusion process is the "change agent." In the situation where a change organization is seeking to positively influence the rate of adoption of an innovation, it may employ a professional change agent to influence members of the social system to adopt the innovation. A change agent functions in a manner similar to the economic concept of the principal and agent. In this situation, the dilemma is how to get the members (agents) to act in the best interests of the social system (principal). The change agent generally has informational advantages over the members who are used to assist in the adoption process. Change agents recognize the need to tailor the innovation communications to the cultural values and past experiences of the members in the social system. Their primary objective is to improve the potential adopter's evaluation competency by reducing information asymmetry. Change agents will normally focus their attention on opinion leaders in the earlier stages of the diffusion process. Rogers primarily viewed change agents as forces outside the social system, but change agents could as well be inside a social system (Rogers, 1962; Zaltman & Duncan, 1977).

A policy network of change agents can share their interests in a policy area linked by their direct and indirect contacts. In the case of state education reforms, Michael

Mintrom found that "a greater involvement in policy networks significantly enhanced the likelihood of policy entrepreneurs achieving their legislative goals" (Mintrom & Vergari, 1998:126). Mintrom found these same policy networks useful for not only agenda setting, but also for ensuring policy approval (Mintrom & Vergari, 1998:146). Later, transnational networks were shown to have a similar role in the diffusion of public policy on an international scale (True & Mintrom, 2001). In his study of interstate professional associations, Steven Balla confirmed the conventional wisdom about the influence of policy networks and direct communications with other change agents had a positive affect on the diffusion of public policy (Balla, 2001:240).

The Social System

Broadly defined, the domain of the diffusion process is bound within some social system. As previously noted, a social system is defined as "a population of individuals who are functionally differentiated and engaged in collective problem-solving behavior" (Rogers, 1962:14). For the most part, Rogers studied the diffusion process within the scope of a specific social system, whether it was farmers in the Midwest or members of a tribe in a third world. Research in many of the social sciences determined that social norms and values played a significant role in the actions of any group. Tarde states,

> Every *social thing*, that is to say, every invention or discovery, tends to expand in its social environment, an environment which itself, I might add, tends to self-expansion, since it is essentially composed of like things, all of which have infinite ambitions (Tarde, 1962:17).

Groups are equally important in influencing the personality and values of their members. As such, "group experiences give an individual, either directly or by sanctioning or

censoring attitudes and behaviors stemming from isolated individual experiences, a general outlook, or frame of reference, in terms of which he perceives and evaluates events" (Truman, 1993:19). Characteristics of the social system are essential independent variables associated with any diffusion study and cannot be ignored in public policy diffusion. David L. Weimer and Aidan R. Vining (Weimer & Vining, 1999:383) acknowledged that the values and interests of social groups often come into play in the adoption and implementation of public policy. As such, they recognized the importance of strategic thinking in how to gain cooperation in the implementation process.

Anne Schneider and Helen Ingram (A. Schneider & Ingram, 1993:334) argued, "Social construction of target populations is an important, albeit overlooked, political phenomenon that should take its place in the study of public policy." They believed that the social construction of the target population not only influenced public officials, policy agenda and policy design, but it also influenced the dynamics of policy change. This enhances the ability of policy analysts to better understand some of the relative characteristics of policy change.

Rogers identified two characteristics of the social system that affected the adoption of innovation that he defined across a traditional and modern continuum. Traditional systems are less innovative and less likely to deviate from existing values and social norms. The modern systems are more innovative and more likely to deviate from existing values and social norms. There are many different independent variables that may be used to classify these two continuums. Rogers believed that analysis of the social system could be done on the traditional to modern continuum (Rogers, 1962). Others believed that the social system was anchored by its value system that represented key

variables in the diffusion process (Katz et al., 1963). Tarde recognized the urban element, while co-existing with the rural element, has always "distinguished itself by its predominant and widespread spirit of innovation, compared with the conservative spirit of the later" (Tarde, 1962:288).

The Organization

One of the most visible functions of any public organization is the implementation of innovative public policy. The study of this process is generally done within the structure of a public organization providing a basis for researching the determinants of an organization affecting the diffusion of innovative public policy. Understanding the process and determinants of public organization innovations provides a way to not only understand the aggregate output of the policy but also some understanding of the adoption and implementation process. George W. Downs, Jr. discussed two of the most relevant approaches in innovation research – sociological and economic. Innovation research conducted by sociologists should be relevant since the majority of the studies have focused on formal organizations, many of which were public; and they frequently studied programmatic as well as technical innovations. Conversely, Downs found little relevance from the economic research perspective. But he believed that the economic perspective did add knowledge from other determinants of innovation research such as the innovators and the adopters, and a focus on the communications channels through which information is passed from the potential adopter (G. W. Downs, Jr., 1976).

The characteristics of a social system and an organization are interchangeable depending on the unit of analysis: "Policy implementation occurs through public organizations, creating a fundamental linkage between the study of public organizations

and the study of public policy" (Jensen, 2004:110). Lawrence B. Mohr conducted one of the earliest studies of innovation diffusion within an organization in 1969. Mohr focused on the determinants of public health organizations in the diffusion of new public health policies. Mohr considered the determinants of the organization as well as the environment in which the organization existed. He further separated the concept of "inventiveness" from adoption in the analysis of the organization. Mohr stated, "Innovation is suggested to be the function of an interaction among the motivation to innovate, the strength of obstacles against innovation, and the availability of resources for overcoming such obstacles" (Mohr, 1969:111). As operationalized, his study found a weak relationship regarding the negative effect of obstacles and the positive effect of motivation and available resources to adoption. The study showed a strong positive correlation to size of the organization as to its motivation and its ability to overcome obstacles. More importantly, his study supported the multiplicative effect of his original hypothesis (Mohr, 1969:126). This conclusion later becomes a central theme in the development of new analytic methodologies to adequately identify this multiplicative effect (F. S. Berry & Berry, 1992:737).

James March and Herbert Simon discussed organizational innovation as a process where an organization will search for alternatives to existing processes when the present course of action is sensed to be "unsatisfactory" (March & Simon, 1993:194). March and Simon posited that organizations will normally adjust their level of achievement to meet the levels of other organizations perceived to have higher results in their relevant reference group (March & Simon, 1993). This concept correlates with the view of the social system as described by Rogers, Tarde, and others.

A later review of organizational innovation theory by Selwyn Becker and Thomas Whisler sought to make the distinction between innovation, invention and change or adaptation. There continued to be significant confusion coming from equating organizational innovation with organizational change. The primary difference in their opinion was the differential costs of search and risks (Becker & Whisler, 1967:463). Becker and Whisler identified a determinant of diffusion missing from the causes and effects of the innovation process – technology. They agreed with the work of William Evan and Guy Black that technological change within an organization is affected by the rate of technological change in the primary industry in which the organization functions (Becker & Whisler, 1967:464; Evan & Black, 1967). This can best be described as a coupling effect. For example, the diffusion of the Internet and digital government represent a coupling effect of technology diffusion.

In 1973 Gerald Zaltman, Robert Duncan and Jonny Holbek wrote a book, *Innovations and Organizations*, which identified four aspects in which innovation appears in an organization: in the product or services produced; production process innovations; organizational structure innovations; and people innovations (Zaltman et al., 1973:14). Their book presented a theory of organizational innovation that identified the initiation and implementation stages followed by the characteristics of the organization that affected the innovation process.

Donald Menzel and Irwin Feller conducted a study in 1977 on the diffusion of technology in public organizations. Besides validating Virginia Gray's findings that the innovativeness of an organization is time and issue specific, they identified "jurisdictional responsibility" as another determinant (Menzel & Feller, 1977:529). They found that

"diffusion may be as much a vertical process involving different levels of government as it is a horizontal process" (Menzel & Feller, 1977:534). In other words, the behavior of local units of government may encourage or discourage the adoption of a new technological innovation; the behavior of a state government might affect the adoption by the federal government; and the federal government may affect the adoption by local and state governments. This conceptualizes the diffusion process between organizations as both a horizontal and vertical process (Menzel & Feller, 1977:536).

More recently, Jason Jensen incorporated organizational theory with general diffusion theory as another perspective of understanding the diffusion among organizational units. Jensen posited that the clearest linkage of diffusion theory to organizational theory was associated with "organizational birth" (Jensen, 2004:110). He related diffusion in organizations to "isomorphism" defined as, "a constraining process that forces one unit in a population to resemble other units that face the same set of environmental conditions" (Jensen, 2004:112). Jensen posited that this isomorphic process tended to make states similar to each other as characterized by the diffusion of polices through those states.

Jensen defined two basic types of isomorphism: institutional and competitive. The institutional perspective is based on the premise that institutional environment matters. Factors that may affect this perspective included coercive action by the federal government (Gray, 1973). Organizations more institutional in nature tend to implement policies that are more socially defined and derived from the values and norms of the social system. Therefore, internal determinants, i.e., socio-economic and political factors, may have a more coercive affect on diffusion. Whereas, organizations more

technical in nature implement policies that are more about efficiency or production and are affected more by external determinants based on competition among states. Jensen's study showed that federal coercion, institutional-based policies, and technical-based policies did not follow a spatial pattern, whereas competitive pressures among the states did produce a spatial pattern (Jensen, 2004:123-124).

Time

The final critical element of the diffusion process is time. The length of the diffusion process is measured from the date that the first individual is aware of the innovation until it reaches a saturation point of adoption in a given social system. The innovation decision process is a rational procedure used by potential adopters to make a decision whether to adopt or reject an innovation. Time is used as a measure of innovativeness by reflecting how early or how late one member is from another in adopting an innovation. Time is also used to measure the number of adopters over time to reflect the rate of adoption.

Because time is an essential element in any diffusion study, it cannot be ignored in any analysis. The most common method of analysis is cross-sectional using data from surveys. This approach lends itself to one of the most common criticisms of diffusion studies since it is difficult for individuals to know exactly when they decided to adopt an innovation. Generally, the most common methods of obtaining data are recall (an individual dates the acceptance of an innovation from memory), records (time of adoption is a matter of record), and inferences (associated most with archaeological dating methods) (Katz et al., 1963:241). On the other hand, diffusion studies, if

longitudinally structured, have an advantage of being able to study diffusion over time as it happens.

A Synopsis of the Innovation Diffusion Perspectives

The predominant perspective for studies in diffusion theory has been the traditional adoptive approach. The basic tenet of this perspective assumes an unchanging innovation with the rate of diffusion affected by the innovativeness of the adopter and the resistance to change. Lawrence Mohr suggested, "Innovation is the function of an interaction among the motivation to innovate, the strength of obstacles against innovation, and the availability of resources for overcoming such obstacles" (Mohr, 1969:111). However, there are other diffusion perspectives that provide, while developed independently, a more comprehensive view of the innovation process.

Adoption Perspective

Rogers' theory of diffusion was taken from a traditional approach of innovation focused on the demand aspect of diffusion or the adoption perspective. Rogers assumed there was an equal opportunity for all potential adopters to adopt. Therefore, the adoption process was focused on the effective flow of communications from the inventor to the adopter. Hagerstrand recognized that an entire population did not instantaneously adopt cultural innovations. Rather, each individual possessed his or her own delaying mechanisms generally economic or psychological in nature (Hägerstrand, 1967:149). This adoptive perspective emphasized the impact of different communication channels such as personal, mass media, and social networks, and a learning environment where a potential adopter is able to evaluate the subjective and objective characteristics of an innovation before making the decision to adopt. The major problem with research from

the adoptive perspective is that it reveals nothing about the characteristics of the innovation and the changes to the innovation and its social system domain (Brown, 1981; Dolowitz & Marsh, 1996; Fliegel & Kivlin, 1966; Rogers, 1995; Rose, 1993; Walker, 1969). However, based on the literature, this adoptive perspective of innovation diffusion has been the most successful and widely used in the social science research (Brown, 1981:5).

The Market and Infrastructure Perspective

Lawrence Brown described a market and infrastructure perspective that looked at the rate of adoption from the supply side. This perspective was derived from the economic discipline reflecting the market view of innovation and viewed the opportunity for adoption as egregious and unequal (Brown, 1981). Brown noted there were other factors that could affect the rate of adoption of an innovation. He believed that "individual behavior does not represent free will so much as choices within a constraint set and that it is government and private institutions which establish and control the constraints" (Brown, 1981:8). Examining the characteristics of the innovation and the potential adopter is not sufficient to fully examine the factors that affect the rate of adoption of an innovation. Other factors in the relevant public and private domain – such as service delivery, information, transportation, and education system – also have an important influence upon the rate and spatial pattern of adoption.

Going a step further, the market and infrastructure perspective recognizes that the continuity of an innovation can directly affect the temporal and spatial pattern of adoption. Therefore, the market and infrastructure perspective posits that "a great deal of variance in the adoption process could be accounted for by examining the institutional

constraints" as well as the individual and the innovation itself (Brown, 1981:8). The diffusion of digital government can be viewed from the market and infrastructure perspective providing an opportunity to study the impacts that governmental and economic constraints have on the diffusion process.

The Economic History Perspective

The focus on the economic history perspective is the continuous changing status of the innovation and the rationalization of potential adopters that further delay in adoption will result in a better innovation and relative advantage. Lawrence Brown states,

> The economic history perspective posits that innovation is a continual process whereby the form and function of the innovation and the environment into which it might be adopted are modified throughout the life of the innovation, and these changes affect both the innovation and its market (Brown, 1981:3).

Henry Glick and Scott Hays used this viewpoint in their study of the diffusion of "living wills." They rejected the dichotomous conceptualization of the dependent variable and embraced the theory that policies vary in scope and content over the diffusion process. Their study indicated that it is "important to distinguish between original and amended policy and that amendment should be considered part of the on-going cycle of innovation which affects the final content of policy and the relative position of the states as innovators" (Glick & Hays, 1991:847). Downs and Mohr proposed a "benefit-cost" model of diffusion that fits within this perspective as well (G. W. Downs & Mohr, 1979).

The Development Perspective

The development perspective was the first effort to understand the actual impact or consequences of innovation diffusion in such areas as economic development, social change, and individual welfare. This perspective did not automatically assume that innovation diffusion had a positive impact. Consequences of policy implementation are difficult to predict under any circumstances.

In the 1962 edition of his book, Rogers briefly addressed the issue of the "consequences of innovation." His early research classified consequences as either direct or indirect. The direct consequences were predicted changes to the social system and could be recognized. The indirect consequences were latent adjustments to the social system that were neither intended nor recognized often leading to positive or negative externalities (Rogers, 1962:271-275). In the 1995 edition of his book, Rogers dedicated an entire chapter to the consequences of innovations. Rogers now viewed innovativeness, the main dependent variable in diffusion research, as a "predictor of the more ultimate dependent variable, the consequences of innovation" (Rogers, 1995:409). Rogers contended that performing sub-implementation surveys and extended observations had not proven to be effective. Evaluation of consequences could be laden with value judgments and were generally more subjective. Rogers described this as "cultural relativism" (Rogers, 1995:411). Rogers then added additional self-explanatory categories of consequences – anticipated versus unanticipated, and desirable versus undesirable (Rogers, 1995:413-419). These categories could be generalized as follows: "The undesirable, indirect, and unanticipated consequences of an innovation usually go together, as do the desirable, direct, and anticipated consequences" (Rogers, 1995:421).

Robert Savage praised Rogers for including consequences as part of a comprehensive understanding of the diffusion process. Without a full understanding of all the steps in the diffusion process, including generation and consequences, policy analysts could underestimate the issues associated with policy diffusion (Savage, 1985).

A rate of change that is within the bounds of the social system's ability to cope with that change is dynamic equilibrium. No change in a social system is generally described as a stable equilibrium while disequilibrium represents a rate of change with which the social system is unable to deal. Rogers believed that the goal of diffusion should be twofold: raise the level of benefit in a social system but in an equitable manner (Rogers, 1995:441). This follows the economist's general equilibrium theory and results in a Pareto efficient diffusion of change (Weimer & Vining, 1999:61). Disequilibrium has most often been found between the earlier adopters and the later adopter categories. This equilibrium gap is not a necessary certainty and could be reduced by providing greater access to information, peer networks and additional resources (Rogers, 1995:442).

Topology of Innovation Diffusion Research

As part of his research, Rogers identified a typology of diffusion research based on the identification of specific dependent and independent variables associated with a unit of analysis. Looking at the characteristics of members (independent variables) of a social system (unit of analysis), diffusion research studied the "earliness of knowing" (dependent variable) about an innovation by members of the social system. Looking at the attributes (independent variable) of an innovation (unit of analysis), diffusion research studied the "rate of adoption" (dependent variable) of different innovations in a social system. Looking at the characteristics of members (independent variables) of a social

system (unit of analysis), diffusion research studied the "innovativeness" (dependent variable) of members of that social system. This stream of research can be applied to members of a social structure or an organization. Rogers discovered that these streams of research accounted for approximately 58 percent of the research publications by 1995. Looking at the innovativeness and other characteristics of members of a social system (independent variable) by members of a system (unit of analysis), diffusion research studied the types of communication channels used (dependent variable) by the members. Based on content analysis by Rogers, these four types of research accounted for over 71 percent of diffusion research. Other streams of research included opinion leadership, diffusion networks, rate of adoption of different social systems, and consequences of innovation (Rogers, 1995).

Conceptual Work Relevant to Public Policy Innovation

The generally accepted public policy process recognizes several phases of a rational-comprehensive method of development. The most accepted phases of this process begin with the problem, moving to problem definition, consideration of alternatives, evaluation of alternatives, selection of policy options, implementation, and evaluation. The innovation-development process and public policy process are somewhat similar. Using policy life cycle stages identified by Wayne Parsons (Parsons, 1995:77), Table 1 represents a broad comparison of both processes. The first two phases of both processes are very similar in recognizing a problem and seeking to define the nature of the problem. In public policy, there is an effort to identify many different alternatives for evaluation. In the innovation process, there is an effort to develop a specific innovation through the process of basic and applied research. The innovation process then moves to

the development of an innovation while the policy process follows a more "rational-comprehensive" evaluation of the many identified alternatives. Once the innovation is selected, it is commercialized to potential adopters. The next phase of the processes is where the public policy process and the innovation process demonstrate synergy.

Table 1. Comparison of basic public policy process and the innovation-development process.

Public Policy Process	Innovation-Development Process
Problem	Problem
Problem Definition	Recognition of a Problem or Need
Identification of Alternatives	Basic or Applied Research
Evaluation of Alternatives	Development
Selection of Policy Options	Commercialization
Adoption and Implementation	Diffusion
Evaluation	Consequences

Policy implementation can be viewed as a diffusion process. Pressman and Wildavsky's book *Implementation* is generally credited for reviving interest in the implementation of public policy. Policy implementation is about change, how change occurs and what factors enhance the change process (diffusion.) Pressman and Wildavsky noted the total lack of literature on public policy implementation (Pressman & Wildavsky, 1974:166-167). Similarly, while various empirical studies and several books on policy diffusion were in publication prior to 1973 including Jack Walker (1969) and Everett Rogers (1962), there was limited research in this area. Robert Savage's (Savage,

1985:1) survey of the literature found only four policy diffusion studies dealing with the state prior to 1969.

Weimer and Vining viewed the adoption and implementation phase as two different processes in the diffusion of public policy. They viewed the adoption phase as the formulation of public policy until adoption. They viewed the implementation phase beginning at adoption and continuing as long as the policy is in effect (Weimer & Vining, 1999:382). The adoption phase is more about political strategy and understanding the actors and their influence in the formulation of public policy while developing strategies to deal with political contingencies. The implementation phase asked the question, "What factors influence the likelihood of successful implementation" (Weimer & Vining, 1999:396)? Basically, the primary considerations are focused on the political environment without much consideration for other factors that may have an impact on the implementation, i.e., spatial diffusion, federal intervention, and socioeconomic factors. Citing scenario planning and "backward mapping" as effective tools of policy analysis, Weimer and Vining are possibly overlooking key factors in a comprehensive model that may affect the successful implementation of public policies. Diffusion theory models that add knowledge about the determinants of the policy innovation and the social system can only strengthen the policy analyst's anticipation of potential problems in the adoption and implementation of public policy.

The final stage of the policy process is to evaluate the effectiveness of the policy implementation. From the perspective of the innovation process, the final stage is to evaluate the consequences, anticipated and unanticipated, of the innovation's diffusion into a social system.

Historically, the most accepted measure of policy outcome was operationalized by level of expenditures. In looking at past research, George W. Downs, Jr. is critical of the atheoretical studies done primarily by economists with no interest in constructing a theory of policymaking or formulating strategies of policy change. These studies focused on such factors as personal income, urbanization, and political party competition as determinants of policy outcomes with the intent of predictive analysis rather than guiding research (G. W. Downs, Jr., 1976:2-8). While diffusion theory was initially used in several different disciplines, the adoption of diffusion theory as a framework to study policy implementation was not found in the field of public administration until Jack L. Walker (1969) published "The Diffusion of Innovations among the American States." Walker believed there were other important factors that determined policy outcomes besides the generally accepted expenditure model. Based on prior research, Walker found that policy outcomes did not always correlate to state expenditures (Walker, 1969). His research was significant since it became the basis for other public policy innovation studies over the next several decades. It is still one of the most widely referenced materials by subsequent researchers in public policy innovation.

Using the works of Everett Rogers (1963), Elihu Katz (1963) and Lawrence B. Mohr (1969), it was Walker's purpose to "develop propositions which might be used as guides to the study of the diffusion of innovations" that could be applied to public policy innovation" (Walker, 1969:881). Walker initially sought to measure the relative speed with which states adopt new policies or programs. He then sought to determine the principal demographic and political correlates. Walker primarily focused on the characteristic of the organization and decision-making process, in this case the State. He

provided the initial definition of an innovation in public policy "as a program or policy which is new to the states adopting it, no matter how old the program may be or how many other states may have adopted it" (Walker, 1969:881). The focus of Walker's analysis was the diffusion process of new ideas and new services within a political subdivision.

There were some marked differences between the diffusion theories initially developed by Rogers and Walker's study. First, Walker was more interested in the spatial patterns of adoption versus the S-curve depiction of the cumulative affect of adoption. Second, Walker focused on the adoption process and the characteristics of the environment in which the innovation was adopted including the decision-making processes of key decision-makers. Finally, Walker sought to develop some general explanation of the diffusion process gathered from his studies of decision-making, reference group theory, and the diffusion of innovations.

Determinants Model

Walker sought to understand why some states act as pioneers by adopting new programs more readily than others. Then he tried to determine how innovations that were adopted by a few pioneer states as new forms of service or regulation spread among the other American states. Walker began his study by developing an "innovativeness score" for all of the states. He identified a population of policy issues to determine the adoption times for each state and developed an innovation score for each state. This provided Walker with a basis for testing hypotheses associated with different correlates. His first analysis looked at demographic, economic and political factors. Interestingly, Walker did not find significant correlation with several political determinants, but he found sufficient

correlation to support the conclusion that larger, wealthier, more industrialized states adopt new programs somewhat more rapidly than their smaller, less well-developed neighbors. This followed the urbanization factors previously identified by Rogers. Not finding the answers he was seeking, Walker was unable to improve his understanding of the institutions and decision-making processes which cause strong statistical relationships between industrial output and innovation to devise a measure of the relative speed with which states adopt new policies or programs. Walker primarily focused on the characteristic of the organization and decision-making process, in this case the State.

Regionalism Model

Walker then turned his attention toward developing a broader guide and framework to describe how policy decisions were made regardless of the decision-maker. Walker suggested that public officials make most of their decisions by analogy, drawing lessons learned from other states. Richard Rose (Rose, 1993) later documented the principle of lesson drawing in his book *Lesson-Drawing in Public Policy*. States normally look for an analogy between their situation and some other similar situation, perhaps in some other state, where the problem has been successfully resolved. Assuming fungibility, states make a decision to transfer a successful policy to deal with their problems (Rose, 1993). Robert Eyestone believed it was important to "delve into the mysteries of state politics to learn more about the mechanisms of emulation" (Eyestone, 1977:447). States, viewed as an organization, also seek to emulate other states where new processes have shown to enhance existing processes (March & Simon, 1993:204). March and Simon emphasize the importance of including a theory of search with the theory of choice (March & Simon, 1993:194).

Walker focused his attention on the "inter-governmental context", or the horizontal relationships among the states, as the principal influence that regulated the speed of adoption and the patterns of diffusion of innovation. He posited that the "process of competition and emulation, or cuetaking, was an important phenomenon which determines in large part the pace and direction of social and political change in the American states" (Walker, 1969:890). Finding other success stories in a large number of states, states were more willing to adopt existing policy programs. A large number of successful programs produced a level of legitimacy that provided states with a perceived responsibility for adoption. As with individuals, states sought to conform to norms as well as acceptable regional and federal standards for administrative behavior (Rogers, 1962). Walker found that horizontal relationships among the states were a principal influence that regulated the speed of adoption and the pattern of diffusion of innovation, as well as the impact of interest groups and professional organizations (Walker, 1969).

Recognizing this horizontal relationship among the states, Walker sought to examine the effects of regional influences among the states. His research found some evidence to support his theory of regional clustering, and he developed a corollary theory that some states have connections with states outside of their own region. This followed the findings of Rogers where the more cosmopolitan the social system, the more innovative (Rogers, 1962). Walker found that with improved communications and increased contact among the states, the diffusion process was accelerated. This did not necessarily mean that regional clusters were minimized. Walker concluded that "decision-makers in the states seem to be adopting a broader, national focus based on

new lines of communications which extend beyond regional boundaries" (Walker, 1969:896).

Walker's research led him to believe that the perceptions and attitudes of individual decision-makers were critical to policy making. The adoption process was extremely complex and many influences were found to shape decisions to adopt innovations. Walker also believed that "the likelihood of a state adopting a new program is higher if other states have already adopted the idea." The likelihood becomes higher still if the innovation has been adopted by a state viewed by key decision makers as a point of legitimate comparison or they are states contiguous to the state. This hypothesis was later confirmed by numerous studies (F. S. Berry & Berry, 1990; Collier & Messick, 1975; Foster, 1978; Mooney, 2001). Decision makers are likely to adopt new programs, therefore, when they become convinced that their state is relatively deprived or that some need exists to which other states in their 'league' have already responded" (March & Simon, 1993; Walker, 1969:987). Walker's research provided a model for diffusion theory generally described as "regional diffusion." Walker's initial theory did not take into consideration the effect of environmental or political structures that were later found to have an impact on public policy innovation (Daniels & Darcy, 1985; Eyestone, 1977; Foster, 1978).

Walker's work presented an opportunity to focus on the rules of decision-makers rather than their formal group affiliation or relative power of authority. As such, the emphasis was placed on the factors that lead to the establishment decision parameters versus group interests (Walker, 1969).

Some studies have failed to determine the effect of regionalism while others have posited that the increased capability of communications systems have diminished regionalism as a viable explanation in the diffusion process (Cannon & Baum, 1981; Jensen, 2004). In a nationwide study of the diffusion of tobacco lawsuits, David Winder and James LaPlant argued that "geographic location may be a variable of diminishing importance because of expanded channels of communication in state government, the explosion of national conferences and associations at all levels of government; and the proliferation of interest groups" (Winder & LaPlant, 2000:139).

Federalism Model

Several years after Walker's work, Virginia Gray focused her research on further explanations of public policy innovation. Walker noted that the pace and direction of social and political change was affected by competition. Government sought to emulate or take cues from policy innovation in other states. Gray's focus was to develop a model based on this interaction between adopters and non-adopters. Gray noted that Walker did not take into account federal stimulation affecting the adoption rate of public policy. Intuitively, federal mandates and funding have a positive impact on the rate of public policy at the state level (Gray, 1973; Welch & Thompson, 1980). Indeed, Susan Welch and Kay Thompson found evidence in their research to support the hypothesis that federal incentives have a positive impact on the rate of diffusion. They also discovered that fiscal incentives had more impact than indirect incentives in stimulating the rapid diffusion through the states (Welch & Thompson, 1980:727). In his study of school choice in 1997, Michael Mintrom identified the relationship of a policy entrepreneur in the diffusion of public policy in a federal system. Mintrom noted, "There is value in

conceptualizing policy innovation diffusion in a federal system as both a horizontal (that is, state to state) and a vertical (that is, state to local) phenomenon" (Mintrom, 1997b:41).

Gray developed a parsimonious model based on state interaction to predict the rate of innovation using the premise that the population from each state is completely intermixed and there is no federal intervention. Using her linear model, Gray tested policy innovation against the generally recognized diffusion S-curve. She found her linear-interactive model to be a fairly good fit of the adoption of 12 public policies in the area of education, welfare, and civil rights. She concluded that in one-half of her case studies, the diffusion of public policy innovations among the states was affected by their interaction. Further analysis of her policy cases by issue area revealed that the level of federal support affected diffusion. Gray found that the diffusion path depended on the issues and federal intervention. As a result, Gray concluded that innovativeness was "not a pervasive factor; rather, it is issue and time specific at best." This led to the assumption that no state is innovative to a greater or lesser degree and that no state is either an earlier adopter or a late adopter (Becker & Whisler, 1967; Gray, 1973:1185; Savage, 1978). Gray's research provided the third generally recognized model of diffusion theory based on national interaction.

As a matter of interest, Walker and Gray shared rebuttal papers in 1973 based on Gray's review of Walker's work. Walker took issue primarily with Gray's assumption of a completely intermixed population between states. Walker also defended his analysis of innovativeness associated with the study of the agency (macro-level) rather than the issue (micro-level). Gray countered Walker's innovativeness score with her belief that

innovation was time-and-issue specific prohibiting the establishment of a valid innovativeness score.

In 1980, David Klingman outlined a new approach in a general time-series regression model taking into consideration both the determinants and regionalism models incorporating a time-series regression model. As such, Klingman sought to explain the variation over time as a combination of within-system (determinants), across-system (spatial) and across-time processes. His approach considered the level of incrementalism, or within-system temporal diffusion; within-end system development affected by internal determinants; across-system diffusion, or spatial diffusion from one system to another; and global contextual influences. Klingman believed that this methodology provided a more realistic and parsimonious perspective on macro-level social change (Klingman, 1980:134).

Over the ensuing years, innovation studies continued to follow one of these three models. In subsequent research efforts, other variables were added to the determinants model for public administration and political science. Donald Menzel and Irwin Feller added a new independent variable – jurisdictional responsibility – in their study of technology innovation in the public sector (Menzel & Feller, 1977). Their studies of technology innovation verified Gray's belief that innovation was time and issue specific, but the study also found innovation diffusion to be both vertical and horizontal. The interaction of different levels of government was found to have an impact on the diffusion decision process.

Diffusion studies also started to focus on particular policy areas, such as Social Security (Collier & Messick, 1975), technology (Menzel & Feller, 1977), tort reform

(Cannon & Baum, 1981), the Equal Rights Amendment (Daniels & Darcy, 1985), social services (Sigelman et al., 1981), issue evolution (Carmines & Stimson, 1986), state lawsuits against broad industries (Winder & LaPlant, 2000), hazardous waste programs (Daley & Garand, 2002) and living wills (Glick & Hays, 1991). These studies generally used one of the three models while considering the relative importance of different determinants. But none of the studies addressed the "instability" issues raised by Downs and Mohr. Determinants models failed to take into account the effect of regional (spatial) diffusion, and regional diffusion models failed to take into account the effect of innovation characteristics. The challenge of innovation theory was to find some unified model that would not violate the validity of both models. Mohr believed that a unified model could be developed based on his theory that "the propensity to innovate is a function of the motivation to innovate, the strength of obstacles against innovation, and the availability of resources for overcoming such obstacles" (Mohr, 1969:114).

Instability in Diffusion Theory

As a recap, there were initially three distinct models of public policy innovation – determinants of innovation, regionalism (spatial) and federalism. While studies over the next several years used these basic models, there continued to be considerable variances among the findings. George Downs and Lawrence Mohr described instability as a concern in the development of a theory of diffusion. They were troubled with the lack of any cumulative knowledge of the research efforts in diffusion theory described as "integrative theory." Initial studies focused on the primary attributes of the innovation or the organization often overlooking the secondary attributes causing instability in the results. Downs and Mohr sought to develop a theory based on the relationship of the

innovation and the organization, which they described as the "innovation-decision" design (G. W. Downs, Jr., 1976; G. W. Downs & Mohr, 1976). They found numerous operationalization problems associated with the single innovation models used by Rogers and Gray that overlooked the impact of secondary attributes and the interactive relationship of the innovation and the organization. They concluded "any model that attempts to predict the extent and time of adoption must include both characteristics of the organization and the innovation" (G. W. Downs & Mohr, 1976:383). While not necessarily discrediting other models of diffusion, they believed that a theoretical framework that permitted the cumulative impact of research reflected more stability and durability as a model (G. W. Downs, Jr., 1976; G. W. Downs & Mohr, 1976).

In 1979 Downs and Mohr again articulated further conceptual issues toward a more comprehensive theory of diffusion. This time the focus was on building a theory of diffusion with the "innovative decision" as the unit of analysis, rather than the innovation or the adopters. Their aim was to develop a new theory of diffusion that would recognize the complexity and integrative nature of diffusion characteristics. Downs and Mohr posited that any new theory must also recognize that the diffusion and adoption processes are distinctly different and are impacted by different determinants. They argued that the review of past determinants from a cost perspective points to a new theory of innovation in terms of cost and benefits – especially costs. Innovations are not free and resources are necessary to offset the cost of adoption in an organization. Downs and Mohr stated, "Resources of various kinds would logically become even better, more stable predictors of innovation when the associated costs are also considered" (G. W. Downs & Mohr, 1979:391). Therefore, Downs and Mohr proposed a cost-benefit theory as a good

descriptive model because innovation is instrumental – it is supposed to achieve a better state" (G. W. Downs & Mohr, 1979:391). Associated with any model of diffusion determinants is the centrality of resources, i.e., wealth, information, technology, human resources, etc. Therefore, to maximize the cost-benefit theory of innovation diffusion, the models must include costs, benefits, and resources. They identified four factors central to determining the utility functions of an organization: risk, average cost of discontinuing the innovation, uncertainty, and instability in the future stream of benefits (G. W. Downs & Mohr, 1979:399). Downs and Mohr strongly suggested that any progress in the understanding of the determinants of innovation must take place within some empirical framework that allows for a cumulative impact of those determinants within the entire adoption-decision process.

Analytic Methodologies

A review of the literature finds two primary analytic methodologies associated with empirical research of diffusion: normal regression analysis and event history analysis or pooled cross-sectional time series analysis. Originally, regression and multi-variant analysis was used in the focus on the determinants of innovation. Event history analysis changed the focus to probit analysis resulting in the probability of an innovative event at a specific time. Both analytic methods can still be found in the literature.

Regression Analysis

Earlier analysis of diffusion focused on the determinants of the innovation or the social system (organization). This focus will fit well with regression analysis as a method to understand the correlation among the many different determinants and the diffusion of an innovation. Regression analysis that focused on the determinants of the

social system (organization) sought to confirm many of the hypotheses of Everett Rogers and others such as urban versus rural, wealth, education, communication, etc. (Balla, 2001; Becker & Whisler, 1967; Cannon & Baum, 1981; Collier & Messick, 1975; Gray, 1973; McNeal et al., 2003; Mohr, 1969; Walker, 1969).

Event History Analysis

In 1990, Frances Berry and William Berry adopted Mohr's theory to posit a new model of innovation using "event history analysis." They defined event history analysis (EHA) as a "form of pooled cross-sectional time series analysis" (F. S. Berry & Berry, 1990:395). Finding inconsistencies in cross-sectional analysis of determinant studies, factor analysis in regional diffusion studies, and time-series regression in national interaction models, a theory was conceived that allowed for the combination of these models. The basic research question then became "What determines the probability that the adoption event will occur during the time period" (F. S. Berry & Berry, 1990:397)? The objective of event history analysis was to explain some qualitative change (an "event") that occurred in the behavior of an individual or organization at some point in time. The best empirical estimation technique would then become a probit or logit analysis since the occurrence of the event is operationalized as a dichotomy. This technique allowed the research to view discrete times in which an event may be observed.

Using this new model, Berry and Berry sought to determine the factors associated with the adoption of a state lottery. Their study defined the dependent variable as the probability that a state will adopt the lottery in a specific year. The independent variables included fiscal health, per capita income, religious fundamentalism, political party strength, regional influence, and dummy variables representing the election cycle for

governor and off year elections. Without getting into the specific findings, the event history analysis provided the coefficient estimates that could be used to predict the probability that a policy would be adopted in a given year. The importance of the study's findings was its validation of similar findings using the other models. This provided the possibility of having a different empirical model for policy innovation that best fit Mohr's theory.

Event history analysis (EHA) provided one key advantage over the other models. EHA provided a model that was proved successful in testing innovation theory taking into consideration both the determinant and regional diffusion models. While the initial study by Berry and Berry provided evidence to support the significance of using EHA, the authors recognized that to prove the validity of their method, further study was necessary on other issues. Berry and Berry used their model again in 1992 to study tax innovation in the states (F. S. Berry & Berry, 1992). Their findings reinforced the conclusions of their earlier study where "most policy adoptions are rare events" that do not preclude multivariate empirical analysis. However, another important finding was the probability of states adopting tax innovations was "multiplicative" such that an extreme value on one of the variables amplified its impact on other variables. Their conclusion was that event history analysis provided a much superior model for diffusion theory in the public sector (F. S. Berry, 1994b). At issue was the ability of a "single-explanation" model to determine the causal processes underlying state policy innovations. Frances Berry tested these "single-explanation" models using simulated innovation processes with known characteristics to demonstrate the incorrect conclusions

about the diffusion process resulting from the "single-explanation" models (F. S. Berry, 1994b:442).

Indeed, over the next several years other innovation studies continued to use the EHA model to study public policy innovation. Scott Hayes and Henry Glick used EHA to evaluate the link between the process of agenda setting and the diffusion of innovation across the states. They suggested that future innovation studies include agenda setting in event history analysis (Hays & Glick, 1997). Michael Mintrom used EHA to measure the impact of "policy entrepreneurs" (change agents) on public policy innovation. Specifically, Mintrom found that the presence and actions of policy entrepreneurs significantly raised the probability of legislative consideration and approval of school choice as a public policy innovation (Mintrom, 1997b). Policy entrepreneurs affected innovation by developing "a new idea or policy and use the innovation to challenge existing institutional arrangements and the terms of ongoing debate" (M. Schneider, Teske, & Mintrom, 1995:45). Mintrom later sought to measure the impact of policy networks on school choice using EHA. Though highly intuitive, Mintrom found that internal and external policy networks had an impact on the diffusion of policy innovations (Mintrom & Vergari, 1998). True and Mintrom then added the impact of international networks in their study of the influence of international nongovernmental organizations in driving gender mainstreaming on an international level. Their study supported their theory that transnational networks facilitated the diffusion of gender mainstreaming (True & Mintrom, 2001:51). More recently, Dorothy Daley and James Garand used a pooled cross-sectional time series analysis to test a model of hazardous waste programs using internal determinants and regionalism. Their study concluded that

strong hazardous waste programs were affected by internal determinants and regional diffusion (Daley & Garand, 2002).

Summary

Initially, diffusion theory studies proved to be inconclusive and inconsistent. Studies provided no single theory of diffusion with regard to public policy innovation. Its critics found the theory to lack stability. The initial models – determinants, regional diffusion, and federal interaction – did not take into consideration the interaction of various characteristics. Studies began to include other determinants in an effort to enhance the theory. But the research was not able to break away from Gray's theory that diffusion was issue specific and time specific. Later, another diffusion model – event history analysis – was developed to combine the different models without violating their integrity. As this model progressed, researchers began to add additional determinants, i.e., policy entrepreneurs, policy networks and associations. It was speculated that the difficulties of conducting empirical research on the factors that determined the adoption of public policy innovations resulted in a slowdown of diffusion research (Welch & Thompson, 1980). Instability in the research produced no clear diffusion model and policy adoptions appeared to be a rare event (F. S. Berry & Berry, 1992).

Unfortunately, after the publication of articles on diffusion theory by Walker and Gray, the field of public policy innovation diminished during the 1980s. There continued to be a demarcation between political science and administration as viewed by Woodrow Wilson (G. W. Downs, Jr., 1976). The interaction between the political and administrative functions was neglected. The recognition that policy implementation was rarely analyzed was heightened by the work of Jeffrey Pressman and Aaron Wildavsky in

their 1973 book entitled *Implementation* (Parsons, 1995:464). Pressman and Wildavsky noted in the beginning of their book that they were unable, with the exception of one other book, to locate any other through analysis of implementation (Pressman & Wildavsky, 1974:xiii). Later, several studies recognized the importance of focusing on the relationship between the type of policy and the factors that may impact the implementation. Policy implementation studies began to recognize the need to analyze the content of institutional structures composed of different clusters of actors and organizations. This renewed interest in the interaction of different influences on implementation also renewed the interest in public policy innovation in the early 1990s (G. W. Downs, Jr., 1976).

The difficulties described in diffusion theory associated with public policy innovation in no way should diminish the need to develop basic theory. To do so ignores the critical importance of policy implementation. Policy implementation is about change, how change occurs, and how it might be induced. Diffusion theory offers a different perspective to policy implementation from other perspectives, such as incrementalism. Diffusion theory views change from the micro and macro levels and seeks to understand the interaction between the political system, public organizations and social systems. Public policy innovation should be recognized as a "learning process" requiring an understanding of cultural change. The impact of "social learning" theory should not be underestimated in policy diffusion and diffusion theory must take seriously the theoretical basis for social learning (Mooney, 2001).

The application of diffusion theory has had positive and negative results. The most noted negative result is the instability of the findings associated with determinants

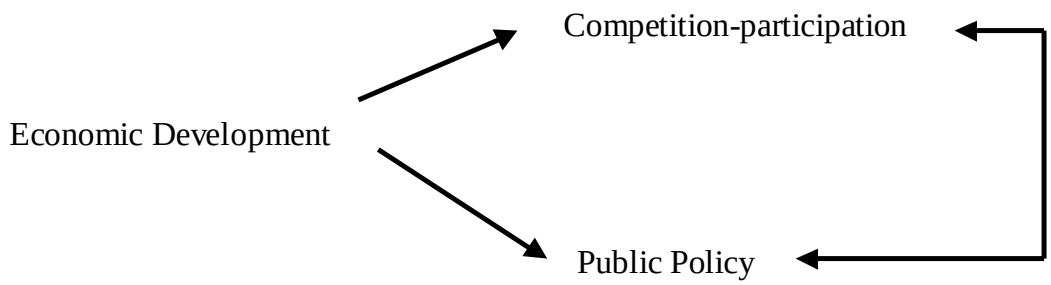
related to the innovation and the organizations. This is generally attributed to the lack of analysis on the interaction of the innovation, the organization and its environment. The application of diffusion theory did result in some interesting positive results. First, the majority of the research demonstrated that public policy innovation behaves similarly to other innovations with respect to their diffusion curves (Brown & Cox, 1971; G. W. Downs, Jr., 1976; G. W. Downs & Mohr, 1976; Gray, 1973). Second, there was substantial evidence to support the belief that patterns of communication and imitation were important determinants of adoption (Mintrom & Vergari, 1998; True & Mintrom, 2001; Walker, 1969). Finally, the applications of these determinants produced certain expectations. This provided researchers with important spillovers in to examine as deviations from those expectations.

The most basic description associated with society is change. In today's society, change is taking place exponentially. The adoption of an innovation by an individual, organization, or political entity generally represents one-half of the dynamic cores of social change. The diffusion process is the other half. Both halves evolve around an innovation. The ability to understand the salient aspects of innovations as perceived by the members of a social system is essential to the success of planned social changes. This is the essence of public policy innovation. Pushing aside the dichotomy of politics and administration, the study of public policy innovation is the study of adoption and diffusion. This relationship is too obvious to be ignored in the field of public administration.

CHAPTER THREE

Over the past 40 years, the determinants tradition has been the primary focus of political scientists in their attempts to analyze the relationships among policy outputs, political systems, and socio-economic systems. Public policy has normally been the dependent variable that political scientists seek to explain while trying to understand the independent and intervening determinants that may account for policy adoption differences. Richard E. Dawson and James A. Robinson conducted one of the early studies seeking to understand the effect that politics had on public policy formulation in 1963. Their primary objective was to investigate how party competition affected the adoption of public policies (Dawson & Robinson, 1963). They found that social welfare policies were more a function of socio-economic factors than political factors: "In short, the evidence points to the relatively greater influence of certain external conditions over one aspect of the political process in the formulation of public policies" (Dawson & Robinson, 1963:289). Their study shows that economic development shapes both the political system and public policy thus making the relationship between the political determinants and public policy spurious (Dye & Robey, 1980:6). This challenged the pluralist ideology of political science and the study of policy. Figure 5 reflects the resulting simple model showing the importance of economic determinants on the policy process.

Figure 5. Simple diagram of policy outcome model showing the interaction of economic and political determinants.



In 1969 Charles Cnudde and Donald McCrone noted that most of the subsequent studies continued to support the conclusion that "politics does not matter" when it comes to the development of public policy. Their review of the literature, including works by Richard E. Dawson and James A. Robinson (1963) and Thomas R. Dye (1966), revealed that "when socio-economic factors are held constant, the impact of party competition largely disappears, while the effects of socio-economic development do not vanish when party competition is held constant" (Cnudde & McCrone, 1969:858-859). These early studies focused on levels of expenditures as a measure of policy output. A later study by Brian R. Fry and Richard F. Winters in 1970, focused on "redistributive" policies versus social policies. Fry and Winters believed that policies designed to redistribute "the burdens and benefits of state government" were more affected by political determinants (Fry & Winters, 1970:508). Their study showed support for the positive impact of politics in redistributive policy. This study changed the focus of policy outcome away from taxes and expenditures. This study also suggested that policy studies needed to recognize that different types of policies might have different causal determinants and some policies are more politicized than others.

During this same time period, Jack Walker devised a non-monetary measure of public policy outcome. Walker's measure of state innovativeness was devised from the rate of adoption within the states of 88 different policies. Walker found that even though a number of political determinants were closely correlated to policy innovation, the relationship either disappeared or was reduced when socio-economic determinants were controlled (Walker, 1969). Most of the studies conducted since Walker's work continued to have mixed results, and some studies were really unable to find any relationships among common adopter characteristics (Savage, 1985).

Most of the research focused on understanding the extent to which political determinants affected policy output, independent of socio-economic determinants using statistical methods of simple or multiple regressions. Socio-economic and political determinants were characterized as internal determinants to a state versus external determinants associated with regional and federal influences. This suggests that regression analysis will provide some general findings for understanding the adoption of digital government. However, what is lacking is any theory based on causal ordering. Causal models use path analysis as a technique to further understand the complexity of the relationships between the economic and social determinants of policy study by combining the direct and indirect effects of causal determinants (Albritton & Bahry, 1980; Berman & Martin, 1992; Dye & Robey, 1980; Klass, 1980; Tompkins, 1975).

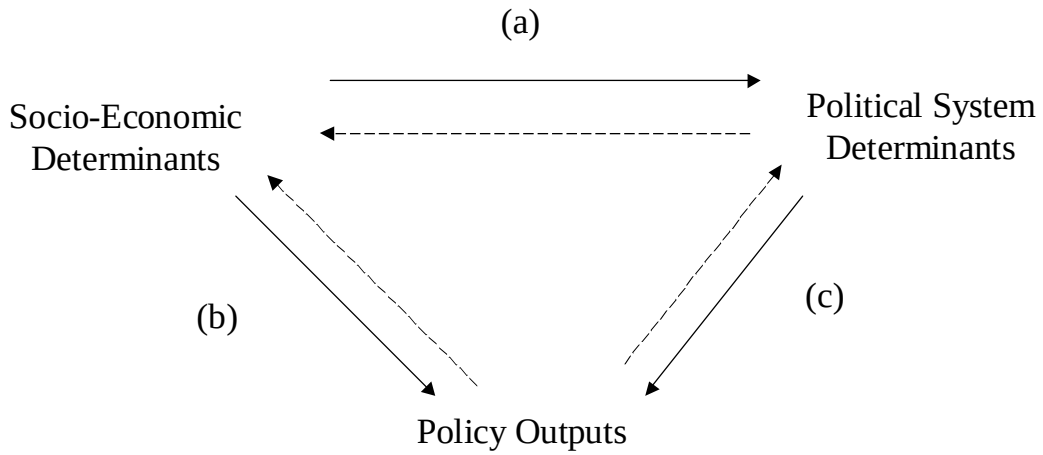
For purposes of this study, the political determinants included characteristics of the political system and the political process. The study adopted the definitions used by Dawson and Robinson. The political system "refers to that group of functionally inter-related variables whose task is the authoritative allocation of values for a given society."

The political process "refers to the activity within the system, the inter-action of the system's sub-variables and sub-components, over time" (Dawson & Robinson, 1963:267). Policy can be viewed as the outcome of the interaction between the internal and external determinants of the social system. More recent comprehensive models of policy change include a broader set of forces. These forces are classified as internal state political factors, external political factors, and policy specific factors (Ringquist & Garand, 1999:270). The internal political factors include the politico-economic factors and interest group factors. The external factors include the impact of federal influence and interstate influences. The policy specific issues include policy-relevant knowledge, focusing events, and issue redefinition (Ringquist & Garand, 1999). Many of these forces lack salience in understanding the adoption of digital government because of its nature with the exception of the policy specific issues. Those forces were not included in this analysis.

Empirical arguments regarding these internal determinants can be summarized into two main thoughts. First, there is no significant independent impact of political determinants on policy innovation in the sense that the causal relationship (*c*) becomes significantly reduced or insignificant when socio-economic determinants are controlled. Secondly, political system determinants have significant independent effects in determining policy innovation in the sense that the causal relationship (*c*) is significant even if socio-economic determinants are controlled (Hwang & Gray, 1991). The broken lines in Figure 6 suggest that policy outcomes can have a reciprocal impact on the internal determinants of policy innovation. This study did not consider the reciprocal

impact of the internal determinants and assumed a unidirectional causal linkage between the determinants.

Figure 6. Direct and indirect causal relationships between socio-economic and political determinants to policy outputs.



As a non-monetary measure of state policy outcome, does Walker's state innovativeness index account for a significant amount of variation among the states for policy innovation across policy areas? Walker and others have shown that his index does account for variation in policy innovation regardless of policy area (Gray, 1973; Savage, 1978; Walker, 1969). In a 1992 study, Walker's state innovativeness index, when controlled for socio-economic and political variables, had the strongest direct effect on the policy outcome – economic development policies (Berman & Martin, 1992). Can this still be assumed true for an administrative policy such as digital government? Hypothetically, does Walker's 1969 state innovativeness index account for a significant variation in the adoption of digital government among the states? These questions establish one of the primary hypotheses of the study: *Walker's state policy innovativeness index will account for a significant amount of variation in the adoption of digital government among the states, controlling for socio-economic and political variables.* To

test this hypothesis, the study controlled for other types of variables that may have an effect on a state's policy innovativeness. Walker's original work and others suggested that, generally, the larger, more urbanized, and wealthier a state, the more likely it is to innovate (F. S. Berry, 1994b; Collier & Messick, 1975; Gray, 1973; Rogers, 1962; Walker, 1969). Later studies suggested that the policy process could affect the innovativeness of states as well as the political environment (Balla, 2001; F. S. Berry, 1994a; F. S. Berry & Berry, 1990; 1992; Feiock & West, 1993; Mintrom, 1997b; 2000; Mossberger & Hale, 2002; Rogers, 1962; Walker, 1969).

This study examined the adoption of digital government services in each state by controlling for the effects of two different types of prior variables: (a) those reflecting broad economic-social-cultural conditions, and (b) those reflecting the state's political environment. For the sake of convenience, the first set was socio-economic variables and the second set was political variables. Innovativeness was assumed to be a product of both variables. In addition, the socio-economic variables were assumed to both directly and indirectly affect the innovativeness because of their relationship to the political variables.

A path analysis was particularly useful because it provided a method to gauge the indirect, as well as, direct effects of variables. This method can estimate the importance of innovativeness on the policy outcome variable by its direct relationship to the policy variable when controlled for socio-economic and political variables by avoiding any misleading conclusions from the confounding effect of the other variables (Bernstein & Dyer, 1992:205).

As in past studies, the socio-economic variables were expected to have a positive effect on the political variables and the policy outcome variable (digital government). The socio-economic variables were also hypothesized to have a positive direct effect on the state's policy innovativeness (Walker's index). What was not known was the strength of the indirect effect when state policy innovativeness (Walker's index) was considered as an intervening variable. It was hypothesized that *the state policy innovativeness variable (Walker's index) will have a stronger direct causal relationship to state policy outcome (digital government) than the direct effect of the socio-economic variables.*

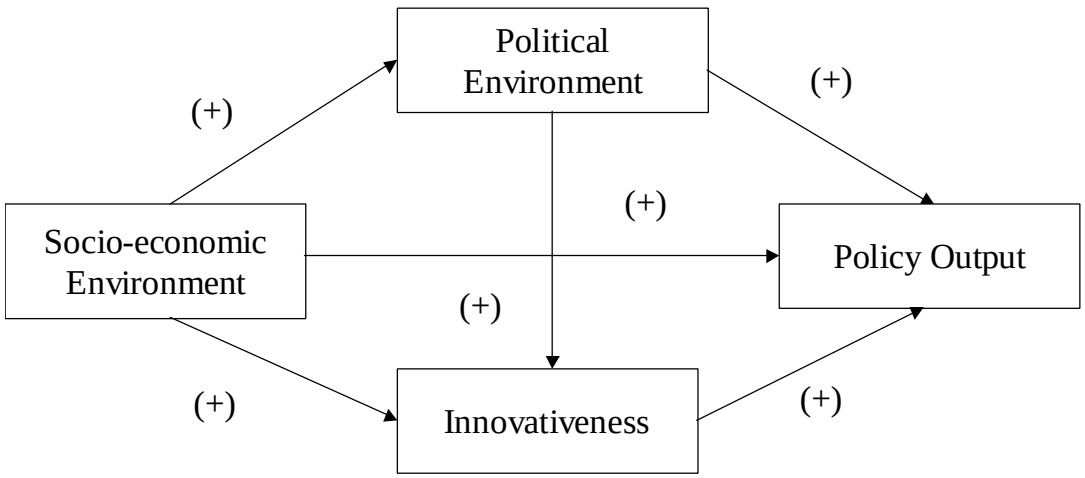
There is no research in the literature that addresses the relationship of administrative professionalism to policy outcome. There is no research to suggest the strength or direction of administrative professionalism on policy outcome. There is no research to suggest the relationship of administrative professionalism especially to administrative policy outcome. There is no research to suggest any spurious or non-spurious relationship between the socio-economic and political variables to administrative professionalism. There is no research to suggest that administrative professionalism is a socio-economic or political determinant. This study hypothesized that *administrative professionalism will have a positive relationship to the adoption of administrative policy (digital government) controlling for all other variables*. For purposes of this study, administrative professionalism was included in the political variables.

Looking at the relationship of the political variables, it was hypothesized that *political variables will have a less direct effect on the state policy innovativeness (Walker's index) and the state policy outcome (digital government) than the socio-*

economic variables; and the indirect causal relationship through the intervening state policy innovativeness index (Walker's index) will be less than the indirect effect of the socio-economic and innovativeness variables. There are no research findings to suggest the relationship of administrative professionalism, directly or indirectly, to the adoption of digital government. It was hypothesized that *administrative professionalism will have a positive direct effect on the state policy innovativeness (Walker's index) and policy outcome (digital government).*

Figure 7 outlines a basic framework of the causal relationships of the primary determinant areas – socio-economic and political – that best describe the overall hypothesis of this study. This basic framework was used to guide the analysis of the causal relationships of policy adoption.

Figure 7. Basic framework for the causal relationship of primary determinants of policy adoption.



Dependent Variables

Everett Rogers stated: "The criterion for adopter categorization is 'innovativeness', the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than other members of a social system" (Rogers, 1995:22).

Walker's 1969 work focused on devising a general innovativeness score for state governments. His score was based on how quickly states adopted 88 policies and programs covering different policy areas. Walker then attempted to account for the variant in scores by trying to understand the significance of variations among socio-economic and political determinants. Walker's work and those of others later suggested that states differ with regard to policy area, but differences in general innovativeness have endured over time (Gray, 1973; Savage, 1978; Walker, 1969).

A test of the innovation scale requires that other determinants be controlled, specifically other determinants that can be assumed to have an effect on the adoption of digital government in the states. Clearly stated, innovation is an intervening determinant which both reflect a direct and indirect causal relationship to policy innovation.

Innovativeness Index

The literature generally reflects three different interrelated methods of operationalization for social systems and organizations. The most widely used method and the easiest to determine is the assignment of an innovation score to the social system or organization (Cannon & Baum, 1981; Daniels & Darcy, 1985; Foster, 1978; Savage, 1978; Walker, 1969). Another easy and common method assigns a dichotomous value to the adoption or non-adoption of an innovation (F. S. Berry & Berry, 1990; Collier & Messick, 1975; Menzel & Feller, 1977). Finally, the third method of operationalization determines the degree to which a social system or organization has implemented an innovation or is committed to the implementation (Fliegel & Kivlin, 1966). This method is the most difficult to determine, yet may be the more desirable to uncover the determinants of variation across the extent of the social system or organization.

This study used the first method of operationalization by assigning an "innovativeness" score for digital government in the states as the dependent variable. Three factors make this the most appropriate method. First, several nationally recognized indexes were available to choose that give a good indication of a state's innovativeness in the use of digital government technology. Secondly, the pooled cross-sectional time series analysis (event history analysis) frequently used by other studies was best suited where the adoption of an innovative policy can be identify by a specific date, i.e., legislative passage of an innovative policy (F. S. Berry & Berry, 1990;,1992; Mintrom, 1997b; M. Schneider et al., 1995). Finally, the focus of this research was on the adoption of digital government by the states rather than the population of citizens. Research necessary to determine the degree to which the citizens of the state have adopted digital government services was outside the scope of this research.

The dependent variable was defined as some measurement of the relative successful adoption of digital government within a state. There existed several nationally recognized measurements of a state's innovativeness ranking in the use of digital government. The most recognized rankings were compiled by the Center for Digital Government, Brown University and the Public Policy Institute (PPI). Each of these indexes attempts to establish the rankings of states on their adoption and implementation of digital government programs. The normal population for analysis would normally be 50 states. However, Walker's index in 1969 did not include Alaska and Hawaii, therefore, the population size for this study was limited to only 48 states. It is important to understand the basic methodology of each ranking to make a determination as to the best overall ranking for the dependent variable.

Center for Digital Government

The first ranking has been performed annually by the Center for Digital Government (CDG) and published by the Progress and Freedom Foundation (Lassman, 2002). The Center for Digital Government has provided five iterations of their Digital State Survey "to document and assess the progress made by state governments in the adoption and utilization of digital technologies to improve the delivery of government services to their citizens" (Lassman, 2002:1). The annual survey assesses technologies in eight specific categories: Electronic Commerce and Business Regulation, Taxation and Revenue, Social Services, Law Enforcement and the Courts, Digital Democracy, Management and Administration, Education and GIS/Transportation. The Digital State Survey is based on a comprehensive survey distributed to the Chief Information Officer of each state and was supplemented by data collected via the Internet through visits to each state's official websites. In some cases, secondary research included personal site visits, interviews, correspondence and other written material. Cumulatively, the state rankings in each category provided a good measure of the "innovativeness" of each state in digital government. The Digital State index has a fairly normal distribution but is skewed to the right side showing high scores for most of the states. The range of scores was considerable approaching nearly 80 points with the mean score of 69 points. The most current rankings were published in November 2002 (Lassman, 2002). For purposes of this study, the rankings published in the 2002 report were used reflecting data based on surveys taken in 2001. All of these reports are available online at www.ppi.org.

Brown University

The Brown University study was conducted for three consecutive years beginning with 2000. This study uses two primary data sources. The first is a comprehensive analysis of over 1200 state websites and a few federal sites. An average of 24 sites per state was reviewed to measure what kinds of features were available online to normal citizens. In addition, e-mail messages were sent to the human services department within each state to test the responsiveness of the agency. All of these measures were used to compute a state score out of a possible 100 points. The Brown University index is normally distributed with a very slight left hand skewing. The mean score was 41 for the sample states with a standard deviation less than five points. The range of index values was less than 21 points. For purposes of this study, the rankings published in September of 2001 were used based on data collected in the summer of 2001 (West, 2001). All of the reports can be located online at www.InsidePolitics.org.

Public Policy Institute (PPI)

Another nationally recognized measure is the rankings established by the Public Policy Institute (PPI). The Progressive Policy Institute's Technology and New Economy Project is a broader study designed "to educate federal, state and local policymakers about what drives the New Economy and to promote policies that encourage technology advances, economic innovation, and entrepreneurship" (Atkinson, 2002:i). The Public Policy Institute study evaluated 21 indicators divided into five categories that looked to evaluate the new economy status of a state. These indicators evaluate the level of knowledge of workers in the workforce, the globalization of the state, the economic dynamism and competition, the transformation to a digital economy and the technological

innovation capacity. One specific indicator examines "the degree to which state and local governments use information technologies to deliver services" (Atkinson, 2002:6).

The PPI measure of digital government was computed from the Center for Digital Government and Brown University studies. The PPI report states, "To calculate the scores for this indicator, the standard deviation scores for each study's final score were combined and then divided by two" (Atkinson, 2002:50). The PPI measure uses the Center for Digital Government 2001 data and the Brown University 2001 data.

Innovativeness Ranking Correlations

Each of these rankings provides a recognized indicator of the successful adoption of digital government within the states. A visual inspection of the three indexes reveals several observations. There are only three states – Michigan, Ohio and Washington – in the top ten of both the Digital State index and the Brown University index. What is surprising is the fact that the ten lowest ranked states in each of the indexes are all identical. When combined into the PPI Index, only three of the Digital State index states are in the top ten while 9 of the Brown University top ten states are in the top ten of the PPI index. How much are each of these rankings correlated considering they each use different collection methodologies and capture different variables? Table 2 provides some insight into that question. The correlations show that the Center for Digital Government and Brown University indexes have a statistically significant correlation of .384 with each other. The composite PPI Digital Government index has a statistically significant correlation of .834 highlighting the collinearity with both indexes as expected since the PPI index is a composite of the other two indexes.

Table 2. Pearson correlations of the three primary ranking indexes of digital government adoption.

	Digital State 2001	Brown 2000	PPI Digital Gov
Digital State 2001	1.000	.384**	.834**
Brown 2000	.384**	1.000	.498**
PPI Digital Gov	.834**	.498**	1.000

N = 48; **Significant at the 0.01 level (2-tailed).

Based on the hypotheses of this study, the study operationalized the innovativeness of a state's digital government program using the Public Policy Institute (PPI) digital government rankings. This ranking provided a broad index based on two different measurement methodologies giving the index further validity than either of the separate indexes.

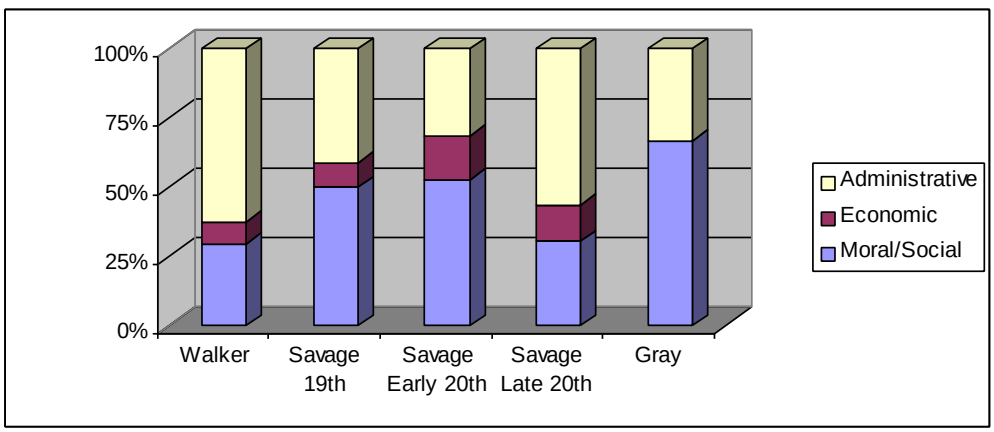
State Policy Innovativeness

A review of the literature identifies two primary indexes of state policy innovativeness. Jack Walker's study in 1969 was the first to develop a comprehensive index based on his study of 88 different policy innovations (Walker, 1969). In 1973, Virginia Gray expressed concern over the sampling problem with Walker's index. However, her findings that state innovativeness was "issue and time specific" were based on a smaller population size of policy areas than Walker (Gray, 1973). Robert L. Savage reviewed the Walker study and conducted further research into a broader scope of policies to develop another index of state policy innovativeness (Savage, 1978). Savage conducted a study using 181 policy measures over three distinct time periods: the

nineteenth century, the early twentieth century and the later twentieth century. His policy measures included areas such as agriculture, business regulation, conservation, crime and corrections, education, electoral regulation, governmental structures and operation, local government, health, professional licensing, race relations, taxation, transportation, and welfare (Savage, 1978:213-214). His findings showed that most states appeared to be relatively consistent across time in their adoption of policy innovations.

Allocating the policies studied by Walker and Savage into three board policy areas – administrative, economic (redistributive), moral/social – Figure 8 compares the policy areas measured across the Walker, Gray and Savage indexes. The graph shows that Walker's index and Savage's index for the late 20th century appear to be similar in the distribution of policy areas reviewed.

Figure 8. Comparative analysis of Walker, Gray, and Savage indexes for three primary policy types (administrative, economic, and moral/social).



The Pearson correlations presented in Table 3 give a better indication of the relationship. The correlations show that Walker's index has a significant correlation to each of the Savage time period indexes with higher statistical significance and correlations with Savage's 20th century index. These correlations also support Figure 8

showing the commonality of Walker's policy areas and those of Savage used in the late 20th century index as having the most similar policy areas.

Table 3. Pearson correlation of Walker's innovativeness index versus Savage's updated indexes for three separate time periods.

	Walker Index	Savage - 19th	Savage - Early 20th	Savage - Late 20th
Walker Index	1.000	.329*	.548**	.574**
Savage - 19th	.329*	1.000	.661**	.273
Savage - Early 20th	.548**	.661**	1.000	.511**
Savage - Late 20th	.574**	.273	.511**	1.000

N = 48; **Significant at the 0.01 level (2-tailed); *Significant at the 0.05 level (2-tailed).

How well do these indexes correlate to the digital government innovativeness index – the PPI Digital Government index? Table 4 shows the bivariate Pearson correlations for all the policy indexes and the digital government index. The table shows a significant correlation between Walker's index and all three periods of the Savage index. The stronger correlations of the Savage index to the Walker index occur for the early and later parts of the 20th century. While there is significant correlation between the Walker index and the late 20th century Savage index, there is little correlation between the Savage late 20th century and the digital government index. There is a high correlation of .422 with a 0.01 significance level between the PPI Digital Government index and the Walker index. Based on the correlations among the different policy indexes in Table 4, this study operationalized a state's policy innovativeness using Walker's index of a state's overall policy innovativeness.

Table 4. Pearson correlation of the PPI digital government index versus the Walker and Savage innovativeness indexes.

	Walker Index	Savage - 19th	Savage - Early 20th	Savage - Late 20th	PPI Digital Gov
Walker Index	1.000	.329*	.548**	.574**	.422**
Savage - 19th	.329*	1.000	.661**	.273	.285*
Savage - Early 20th	.548**	.661**	1.000	.511**	.399**
Savage - Late 20th	.574**	.273	.511**	1.000	.198
PPI Digital Gov	.422**	.285*	.399**	.198	1.000

N = 48; **Significant at the 0.01 level (2-tailed); *Significant at the 0.05 level (2-tailed).

State Determinants

Having established a dependent variable and measure of digital government innovativeness, the next focus was on the operational theme where innovativeness depends on the characteristics of the social system. A significant number of diffusion research studies focus on the characteristics of the social system. As hypothesized, state characteristics were operationalized, or measured, in terms of its socio-economic and political system characteristics. An analysis of the literature identifies five consistent state determinants initially used by Walker, all which have been shown to have a positive relationship to policy innovation. Three are socio-economic characteristics – wealth (per capita income), education (percentage of population with a high school degree), and urbanization (percent of population in an urban area). The other two are political system characteristics – legislative professionalism and unified party control. While other

characteristics have been hypothesized to have a positive affect on a specific policy area, the most relevant to this study and Walker's five determinants were hypothesized to have a positive affect on the adoption of digital government.

Socio-Economic Determinants

In his review of diffusion research, Everett Rogers identified several generalizations about the characteristics of adopters. In the socio-economic area, Rogers determined that earlier adopters had more years of education and were more literate than later adopters. He also determined that earlier adopters had a higher social status and upward social mobility as indicated by the adopter's wealth, standard of living, occupational prestige and wealth and those earlier adopters were associated with larger social systems and organizations (Rogers, 1995:269). Walker found significant correlation between the adoption of new programs and the socio-economic determinants such as a state's size, wealth, education level, and level of urbanization. These determinants are often associated with the state's fiscal health and its progressive attitude toward policy innovation. These determinants have been shown to have an effect on the political system as well. While these determinants can have a direct effect on a state's adoption of a policy innovation, they can also have an indirect effect on the state's innovativeness ranking and political systems.

Wealth

Walker, Rogers and others firmly established wealth as a critical variable in the diffusion of innovation and public policy (F. S. Berry, 1994a; F. S. Berry & Berry, 1990; Feiock & West, 1993; Hays & Glick, 1997; Kellough & Selden, 2003; McNeal et al., 2003; Mossberger & Hale, 2002; Ringquist & Garand, 1999; Rogers, 1995; Walker,

1969). Wealth is an indication of the amount of slack resources available to engage in innovative activities. Slack resources can be either monetary or human resources (Walker, 1969). Depending on the policy innovation, wealth may be viewed as either an obstacle to innovation or a resource to overcome an obstacle to innovation (Mohr, 1969).

In the case of digital government, wealthy states can be expected to have greater fiscal capacity to develop and operate innovative digital government programs. Also, wealth can be an indication of citizen access to computers and broadband access for digital government services. Wealth was operationalized as the state per capita income for the year 2000 (*Statistical abstract of the United States, 2001*, 2001:426). Governmental slack resources was operationalized as revenue per capita for 2000 (*Statistical abstract of the United States: 2003*, 2003:297).

Education

Another important socio-economic variable is the level of education of the citizens of the state (Hays & Glick, 1997; McNeal et al., 2003; Mohr, 1969; Walker, 1969). Education may be shown to have a direct relationship with a citizen's willingness to seek government services over the Internet. Several studies have shown that there is a high correlation between education and early technology adoption (Rogers, 1995). Diffusion studies have shown that attitude and education level are highly correlated to early adoption (Rogers & Shoemaker, 1971). In one study, the hypothesis defined the related characteristics to early technology adoption as age, education level, previous computer training, attitudes toward computers, and feelings of efficacy regarding computer use (Backer & Rogers, 1998). Education was operationalized as the number of

citizens over 25 years of age with at least a high school education in 2000 (*Statistical abstract of the United States, 2001*, 2001:141).

Urbanization

The level of urbanization has been shown to have a positive correlation with policy innovation (F. S. Berry & Berry, 1994; Cannon & Baum, 1981; Collier & Messick, 1975; McNeal et al., 2003; Rogers, 1995; Walker, 1969). Rogers recognized that urban (cosmopolite) areas tended to be early adopters for a couple of reasons. First, potential adopters in an urban area were more likely to have external communication networks and stronger internal mass media capabilities. Individuals recognized as "change agents" were generally from the more cosmopolite areas. However, some studies found little to support the hypothesis that urbanization has a positive affect on the adoption of new programs (F. S. Berry & Berry, 1994; Cannon & Baum, 1981; Collier & Messick, 1975; McNeal et al., 2003). Viewed as a new medium for governmental service delivery, it seems appropriate to expect urban areas to have a greater need for online access. The ability to get government services online eliminates many of the obstacles inherent in a densely populated area – parking, long lines, and compressed workweeks. Also, urban areas can be expected to have greater access to communications technologies for connectivity to digital government services. It would seem appropriate to include the level of urbanization in the model as it relates to an administrative policy like digital government. Urbanization was operationalized as the percentage of the population living in a metropolitan area within a state in 2000 (*Statistical abstract of the United States, 2001*, 2001:30).

Digital Government Demand

A May 2004 report by the Pew Internet & American Life Project shows that 97 million adult Americans, or 77 percent of Internet users, took advantage of digital government in 2003, whether that meant going to government Web sites or emailing government officials (Horrigan, 2004). According to a 2004 U.S. Department of Commerce report, 61.8 percent of U.S. households had computers in 2003, and 87.6 percent of those households used their computers to access the Internet. Based on the same survey, 54.6 percent of U.S. households had some form of Internet connection (Cooper & Gallagher, 2004). This represents a significant demand for digital government services and can contribute to the adoption of digital government programs in a state. Everett Rogers recognized the difficulty of determining the boundaries around multiple technology innovations (Rogers, 1995:14-45). The Internet and digital government can be viewed as a "technology cluster" such that they can be perceived as being closely interrelated. This perception can account for the adoption of digital government in a state. Demand was operationalized as the percent of households within a state with Internet access in 2000 (Hovey & Hovey, 2001:74).

Population Diversity

The implementation of digital government programs can be viewed as another medium for service delivery. As with the diffusion of the telephone, service delivery has expanded into new technologies as they become available. As Rogers points out in his findings, early adopters of innovations tend to be more wealthy and educated. A primary premise of innovation diffusion is that everyone has an equal opportunity to adopt. The argument is often made that the adoption of digital government services is not available

to all on an equal basis. This concern is often described as the "digital divide." The equal ability to adopt new digital government programs can be affected by the disparity of wealth and education within the population of the state. The racial and ethnicity of a state can also have an adverse affect on the adoption of policy areas within a state. In a recent study, it was shown that an increased minority level in a state is associated with lower overall education level and reduced policy outcome (Hero & Tolbert, 1996). Further, an increased minority level can be associated with the disparity of access to Internet services and computers resulting from lesser wealth and lower educational levels. Hero and Tolbert's index of racial and ethnic percentages was used to measure state minority diversity and serve as a control variable (Hero & Tolbert, 1996:858).

Another indication of population diversity is age. While older adults may be more educated and wealthier, they are less inclined to use technology than younger individuals. Surveys have shown that younger adults have a higher adoption of computer technology and are online more often and longer than older adults (Kehoe & Pitkow, 1999). Age was operationalized as the median age of the state in 1999 provided in the *State Fact Finder* published by CQ Press (Hovey & Hovey, 2001:25).

Political Determinants

Using the definitions of Dawson and Robinson as previously mentioned, the political determinants used in this study were executive leadership, unified party control, ideology, legislative professionalism and administrative professionalism (Balla, 2001; Berman & Martin, 1992; F. S. Berry & Berry, 1992; Cannon & Baum, 1981; Gray, 1973; Kellough & Selden, 2003; McNeal et al., 2003; Mossberger & Hale, 2002; Ringquist & Garand, 1999; Walker, 1969).

Executive Leadership

Strong leadership is necessary to establish a vision of digital government as an integral part of a state's service delivery. This determinant can give some indication of the source of digital government programs – top-down or bottom-up orientation. States that have strong leadership in the executive branch may tend to be early adopters of digital government. This determinant was operationalized from an on-going study by Dr. Thad Beyle of the University of North Carolina at Chapel Hill and included in *Politics in the American States: A Comparative Analysis* published by CQ Press (Beyle, 2004).

Unified Party Control

Party control is critical to the ability of a state to adopt new policy innovations. Legislative bodies with unified party control are able to obtain faster consensus for the adoption of new policies. As an administrative policy, it is hypothesized that legislatures with a Republican unified control will adopt new administrative policies quicker than Democratic legislators who tend to focus on moral and distributive polices (F. S. Berry & Berry, 1990;,1992; Feiock & West, 1993; Gray, 1973; Hays & Glick, 1997; McNeal et al., 2003; Mintrom, 1997a; Ringquist & Garand, 1999). Partisanship of state legislatures emerged as a critical causal factor in a prior study on digital government. The study hypothesized that Republican orientation toward smaller government and the application of best practices in the business sector to government may explain this strong causal relationship (McNeal et al., 2003:66). Unified party control was operationalized as 0 for Democratic control and 1 for Republican control of the legislature for each state for 2001 included in the *State Fact Finder* published by CQ Press (Hovey & Hovey, 2001:107).

Ideology

Clearly the private sector was the engine that drove the rapid diffusion of electronic commerce after the Y2K effort. Companies begin to redefine themselves more in terms of their supply chain and customer relationships. While historically lagging the private sector in innovative technology, government has been able to take advantage of their technology advances. Big business has historically been more fiscally conservative and tends to support the ideology of the Republican Party. Digital government represents a focus more on efficiency programs best suited to the ideology of the Republican Party than social programs. Cannon and Baum theorized, "The receptivity to innovation as a general characteristic of state governments is modified by a state's political ideology" (Cannon & Baum, 1981:978-979). State governments with strong Republican or conservative ideology can be expected to favor programs that copy best business practices such as digital government programs. Generally digital government programs are viewed as an effort to make government more efficient without the need for additional broad based tax increases. Government ideology was operationalized using the government ideology measures developed by William Berry, Evan Ringquist, Richard Fording, and Russell Hanson in 1998 (W. D. Berry, Ringquist, Fording, & Hanson, 1998).

Legislative Professionalism

Several studies have identified legislative professionalism as having a significant correlation with policy innovation (Berman & Martin, 1992; F. S. Berry, 1994b; McNeal et al., 2003; Ringquist & Garand, 1999; Walker, 1969). A more professional legislative body is argued to have greater access to resources and staff allowing them to stay more

abreast of new innovations. Jack Walker was the first to recognize the correlation between "legislative professionalism" and the diffusion of policy innovations (Walker, 1969:885-887). Walker surmised that the "presence of competent staff, superior clerical facilities, and supporting services" would tend to make legislative bodies more innovative.

In a 2003 study by J. Edward Kellough and Sally Coleman Selden on the adoption of personnel management reforms, legislative professionalism was used as a characteristic of the political environment based on the same definition as Walker. Kellough and Selden posited that a more professional legislature would be more informed on current trends in personnel management and would have a positive effect on the adoption of new policy (Kellough & Selden, 2003:170). Using an index developed by Peverill Squire in 1992, their study found a "strong positive relationship between legislative professionalism and public personnel reform" (Kellough & Selden, 2003:171). However, their study did not control for broad socio-economic factors. It was hypothesized there is more support for digital government where legislative professionalism is the highest. This determinant was operationalized using the Squire index of legislative professionalism (Squire, 1992).

Administrative Professionalism

In a 2003 study, professors at Kent State examined the adoption of digital government in the states as administrative policy. They posited that legislative professionalism could serve as a proxy for administrative professionalism (McNeal et al., 2003:59). Using the same Squire index, their study suggested that digital government was "driven by legislative professionalism, and to a lesser extent, state professional

networks" (McNeal et al., 2003:65). Many of the determinants that may explain legislative professionalism, e.g., wealth, urbanization, etc., also may explain a certain level of "administrative professionalism." Even though this hypothesis was discussed, there are no studies that reflect a good indication and correlation (McNeal et al., 2003:61; Walker, 1969:886-887). The authors of the Kent State study reflected on the following questions: "Does legislative professionalization represent a more general professionalization of state government? Do professionalized state governments have a more innovative attitude toward administrative reforms more generally" (McNeal et al., 2003:67)? They found some correlation between "legislative professionalism" and the adoption of e-government services in the state (McNeal et al., 2003:62). The authors stated, "An extensive search of the literature failed to reveal a meaningful quantitative measure of administrative or "bureaucratic" professionalism" (McNeal et al., 2003:59). To determine if there is some correlation between "administrative professionalism" and the adoption of digital government, some representative measure of administrative professionalism was necessary.

Two of the leading approaches in the measurement of performance-related capabilities of state governments were selected for analysis. The most noted approach was developed by the Maxwell School of Citizenship and Public Affairs at Syracuse University in conjunction with *Governing* magazine. The Government Performance Project (GPP) was designed to assess five specific areas of administrative performance – financial management, capital management, human resources, managing-for-results, and information technology. The initial study was conducted in 1997 with a follow-up survey in 2001. Using a massive survey instrument, the GPP study included interviews of nearly

1000 governmental managers in all 50 states. The focus on the study was to assess the state's ability to manage for results.

The second approach was a study by the American State Administrator's Project (ASAP) at the University of North Carolina – Chapel Hill. This approach was designed to measure the effectiveness of the "reinventing government" movement. The ASAP survey instrument was sent to more than 3000 state agency heads and top-level managers in all 50 states.

Both of the surveys produce numeric scores that result in a comparable rank ordering for 49 of the 50 states. California was excluded from the 1997 GPP ranking and the 1998 ASAP ranking because of non-responsiveness (Burke & Wright, 2002). The few anomalies are explained by the ways in which the survey instruments were gathered, the target population, and the focus of the questions in the survey instrument. The GPP survey questions primarily focused on performance-related aspects of the state while the ASAP survey was much broader including questions about intergovernmental issues and values. Another explanation is found in the terms of and definition of performance-based administration. The GPP focused on a more "top-down" perspective with emphasis on chain of command structure, management controls, administrative efficiency and information exchange. The ASAP study was directed more toward performance-enhancing changes in the delivery of government services highlighted by the reinventing government movement. This movement highlighted more flexibility and control at the lower levels of operation, more of an "entrepreneurial" form of government championed by David Osborne and Ted Gaebler in their 1992 book – *Reinventing Government* (Osborne & Gaebler, 1992).

This study operationalized executive leadership as a primary determinant of the states with aggressive digital government programs, generally from the Governor's Office, representing a more top-down approach. This suggests that the GPP study would provide the best match for comparison between administrative professionalism and digital government adoption. A Pearson correlation in Table 5 of the ASAP and GPP ratings to the three original digital government indexes – the Center for Digital Government survey, the Brown University study, and the PPI Digital Government Index – shows a positive correlation among all the indexes.

Table 5. Pearson correlation of the three digital government indexes versus the two administrative professionalism indexes.

	ASAP	GPP
Digital State 2001	.270	.299*
Brown 2001	.278	.476**
PPI Digital Gov	.341*	.478**
ASAP	1.000	.487**
GPP	.487**	1.000

N = 49
** Significant at the 0.01 level (2-tailed).
* Significant at the 0.05 level (2-tailed).

The weakest correlations are between the ASAP ranking and the PPI Digital Government index correlation of .341 statistically significant at a 0.05. The GPP and all of the digital government indexes have higher correlation levels. The GPP index has a correlation to the Center for Digital Government index of .299 at a 0.05 significance level and a correlation of .476 with the Brown University index with a 0.01 significance level.

The highest level of correlation of .478 is with the GPP index and the PPI Digital Government index with a 0.01 significance level. These correlations demonstrate a strong relationship between the adoption of digital government and administrative professionalism in the states. The strongest relationship is between the PPI Digital Government index and the GPP rankings. For purposes of this study, the independent variable – administrative professionalism - was operationalized by the 2001 GPP rankings.

McNeal and associates in their study stated that legislative professionalism was a proxy for the overall professionalism of state government. Is there some correlation of legislative professionalism and administrative professionalism as hypothesized? Using the Squire index, a Pearson correlation analysis in Table 6 with administrative professionalism does not validate their assumption. As a validity test, another more recent legislative professionalism ranking by James D. King also was used (King, 2000:331). Both of the legislative professionalism ranking indexes were very weakly correlated with administrative professionalism.

Table 6. Pearson correlation of the Squire and King legislative professionalism indexes versus administrative professionalism.

	Squire Legislative Professionalism	King Legislative Professionalism	Administrative Professionalism
Squire Legislative Professionalism	1.000	.877**	.064
King Legislative Professionalism	.877**	1.000	.086
Administrative Professionalism	.064	.086	1.000

N = 49; ** Significant at the 0.01 level (2-tailed).

Therefore, the administrative professionalism ranking provided a determinant different than legislative professionalism. Based on the initial correlations between the PPI Digital Index and the GPP Index shown in Table 5, *it was hypothesized that administrative professionalism will have a stronger causal relationship with the dependent variable than will the socio-economic and political variables.*

Regionalism

Spatial diffusion of policy innovations has been a consistent theme in research beginning with Jack Walker. How important is spatial diffusion in the adoption of administrative policies? Walker focused his attention on the "inter-governmental context", or the horizontal relationships among the states, as the principal influence that regulated the speed of adoption and the patterns of diffusion of innovation. Walker posited that the "process of competition and emulation, or cuetaking, was an important phenomenon which determines in large part the pace and direction of social and political change in the American states" (Walker, 1969:890). Walker's research found some evidence to support his theory of regional clustering and developed a corollary theory that some states have connections with states outside of their own region. He found that with improved communications and increased contact among the states, the diffusion process was accelerated. This did not necessarily mean that regional clusters were minimized. Walkers concluded, "Decision-makers in the states seem to be adopting a broader, national focus based on new lines of communications which extend beyond regional boundaries" (Walker, 1969:896). Later studies continued to confirm Walker's findings (Cannon & Baum, 1981; Jensen, 2004; Winder & LaPlant, 2000).

Frances Berry's study of a state's adoption of strategic planning found a strong causal relationship in the regional diffusion model for agencies that adopt strategic planning (F. S. Berry, 1994a). Using her event history analysis (EHA) technique, her model viewed socio-economic and political determinants as internal and regional affects as external determinants. Berry later noted a problem with the implicit assumption of the pure internal determinant model that views the state policymaking process as fully independent, so that no state is influenced by any other state (F. S. Berry, 1994b:442).

A cursory review of the top 10 ranked states for digital government showed some regional effects in the Ohio Valley (Michigan, Indiana, Ohio, Illinois, and Kansas) and the northeast (New York, Pennsylvania, Maine, and New Jersey). States such as Washington and Texas have the highest ranking in their respective regions. Without some definitive data to establish regional affects, understanding the spatial diffusion of digital government would be difficult in the model for this study. While there is some evidence to support the effect of regional influences on policy adoption, the object of this study was to examine the basic determinant theory of policy adoption and the intervening relationship of internal determinants to the general innovativeness of a state. Therefore, the study did not apply spatial diffusion determinants to the model in this study.

Federal Interaction

The federal interaction model was not appropriate for this study. Virginia Gray's original study in 1973 raises the issue of federal stimulation either through federal spending or legislative mandates. In her analysis, Gray noted that the "population is completely intermixed" (Gray, 1973:1176). This implies that officials from one state are likely to interact with officials from other states. Frances Berry argued that the national

interaction model is not productive. Regression analysis often produces "false positives" for federal interaction even when the underlying diffusion process is regionally based (F. S. Berry, 1994b).

In this study of the adoption of digital government, the federal interaction model was not applicable. A major reason is that there exists no federal funding or legislative mandate for states to implement digital programs as there is at the federal level. Therefore, no effort was made to include the federal interaction in this study.

Policy Type

In 1973, Virginia Gray's study supported the hypothesis that policy innovation was "time and issue" specific implying that different policy types were significant in understanding policy innovation. This raises the question, "Is the speed of diffusion dependent on the type of policy?" Frances Berry made the argument that diffusion research should focus on the "differences between administrative and policy innovation" (F. S. Berry, 1994b:328). This study recognized that different types of policies might have different causal determinants and some policies are more politicized than others (Hays & Glick, 1997; Hwang & Gray, 1991; McNeal et al., 2003). The implementation of digital government can generally be viewed more as an administrative reform where there is no specific legislative action in the states. Few states have implemented digital government programs statutorily providing some broad causal explanation outside of any salient political determinants.

Research Methodology

Empirical research in diffusion theory of public policy innovation demonstrated several different research approaches depending on the model. Regression analysis and

event history analysis (EHA) were the most common methodologies used. Regression analysis was the most common methodology prior to the early 1990s, whereas, EHA developed by Frances Berry and William Berry (F. S. Berry & Berry, 1992) has been more frequently used over the past decade (F. S. Berry & Berry, 1992; Hays & Glick, 1997; Mintrom & Vergari, 1998; M. Schneider et al., 1995; True & Mintrom, 2001). However, the research approach depends mostly on a specific model used. The most prevalent models for empirical testing are the internal determinant model, diffusion (spatial) model and the federal interaction model. The internal determinant model is generally tested with cross-sectional regression. The regional diffusion model is generally tested with factor analysis and the federal interaction is generally tested with time-series regression. The use of the event history analysis (EHA) was later developed to address the weaknesses of the single-explanation methods by combining both the determinant and diffusion models (F. S. Berry, 1994b:442). Berry believed that the continued reliance on a single-explanation model of policy determination would only provide "false positives" in the understanding of the influences of policy adoption (F. S. Berry, 1994b:454).

What is lacking in the research methodologies is the use of the causal path models. A path analysis will be useful because it will provide a method to gauge the indirect, as well as, direct effects of different categories of determinants found to have an influence on policy adoption. This method can estimate the importance of innovativeness on the policy output variable by its direct relationship to the policy variable when controlled for socio-economic and political variables. The causal path model should be useful in testing the relationship of the administrative professionalism determinant

against Walker's index and policy adoption controlling for the socio-economic and political determinants.

The next chapter tests prior theory of policy adoption by exploring the causal determinants of digital government adoption through the following regression and path analyses:

- The exploratory analysis of all the socio-economic and political determinants as operationalized;
- The correlation between the socio-economic determinants and the state's policy innovativeness;
- The correlation between the political determinants and the state's policy innovativeness;
- The regression analysis of a state's policy innovativeness for all socio-economic and political determinants as operationalized;
- The correlation among the socio-economic and political variables excluding the state's policy innovativeness to the adoption of digital government;
- The correlation between administrative professionalism and the adoption of digital government controlling for socio-economic and political determinants as well as the state's policy innovativeness.

The regression analysis initially provided some guidance for the selection of the variables to be used in the final path diagram analysis. Those variables that were significantly correlated to a state's policy innovativeness and adoption of innovative digital government programs were given primary consideration in an effort to develop a parsimonious path diagram. A simpler path diagram is less complicated as the study

attempts to understand the relationship of administrative professionalism. Therefore, the final step in the analysis was construction of a path analysis to determine which causal determinants have the highest direct and indirect impact on the adoption of digital government. This was another way to test the relevance of a state's policy innovativeness tendency to the adoption of administrative policy in today's context.

CHAPTER FOUR

The application of diffusion theory in the context of policy adoption requires a logical review of several diffusion theory models. A review of each model and its major findings will be followed by development of the final model to be used in this study of the adoption of digital government in the states. The normal population size for analysis is 50 states. The sample size in this analysis is only 48 states. Walker's index of state innovativeness did not include the states of Alaska and Hawaii so this analysis excluded them. The State of California did not have a score for the Government Performance Project (PPI) index so the mean value of the scores was substituted. There was no Helco and Tolbert minority diversity index for the State of Kansas for 2000, so the value 7.2 was used. It was created by averaging the 1999 value of 7.4 and the 2001 value of 7.0. Theoretically, there exists some lag in the adoption of a policy and the states socio-economic and political environment. So, in selecting the data for this cross-sectional analysis, an attempt was made to provide some lag time for the socio-economic and political determinants of the state. The year chosen for the independent variables was 2000 or earlier, while the dependent variable was measured for the year 2001. The year 2000 was also chosen to reflect the renewed interest in the Internet and electronic commerce after the Year 2000 crisis was resolved.

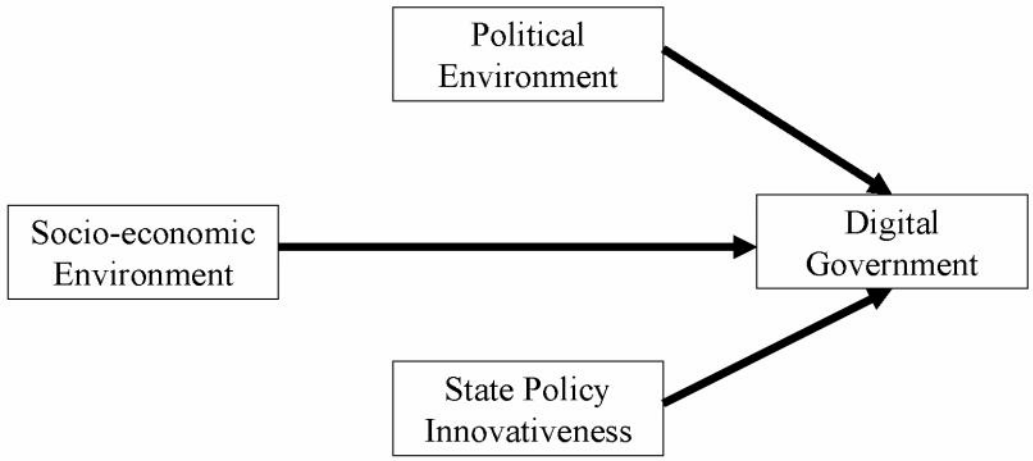
The purpose of the study was to examine the adoption of digital government services in each state by controlling for the effects of two different types of prior

variables: (a) those reflecting broad economic-social-cultural conditions, and (b) those reflecting the state's political environment. The socio-economic variables were assumed to both directly and indirectly affect the innovativeness because of their relationship to the political variables. In addition, the study evaluated the appropriateness of a state's policy innovative tendencies as it relates to administrative policy adoption. Finally, the study evaluated the effect of a new determinant associated with administrative professionalism. The analysis evaluated each part of the path as it developed.

Digital Government Adoption Index Analysis

The first step was an exploratory evaluation of the direct relationship of all the independent variables including a state's policy innovativeness tendency to the dependent variable – PPI index – using regression analysis. The path diagram in Figure 9 reflects the initial path model that includes all of the independent variables. In this comprehensive model labeled "Model One," Walker's state policy innovativeness index is depicted as an independent variable not classified as either socio-economic (i.e., wealth, education, minority diversity, governmental slack, median age, urbanization, and demand) or political (i.e., legislative professionalism, executive leadership, government ideology, administrative professionalism, and unified control of the legislature). Initially, administrative professionalism was associated with the political process. This initial analysis was necessary to validate the selected independent variables and their possible relationship to the dependent variable. There should be sufficient overall correlation to allow further testing of the study's primary hypotheses.

Figure 9. Model One path diagram of the direct relationships of all the hypothesized socio-economic, political, and innovativeness determinants to the adoption of digital government.



The results of the exploratory regression analysis are shown in Table 7. The regression shows that all of the independent variables account for nearly 62% (R^2 = .617) of the variance in the dependent variable, the PPI index. When adjusted for the number of predictors (n=13), the Adjusted R^2 is equal to .470. The analysis identified four variables strongly associated with the dependent variable – education, governmental slack resources (revenue per capita), state policy innovativeness, and administrative professionalism. Education and state policy innovativeness are within a 0.05 level of significance while administrative professionalism is within the 0.01 level of significance. The analysis provided confirmation that the selected independent variables accounted for a significant variance in the dependent variable.

Multicollinearity exists when there is a strong correlation between two or more predictors in a regression model. It is important to ensure that important predictor determinants are not rejected from the model from high levels of collinearity. Multicollinearity between the predictor determinants makes it difficult to assess the

individual importance of a determinant in the analysis and assessing the accuracy of the estimated influence of the independent determinants to the dependent variable. An examination of the data matrix of correlation coefficients for the independent variables suggests some multicollinearity problems. The collinearity statistics reflect two independent variables, wealth and state policy innovativeness, with tolerance levels close to 0.2 indicating a potential problem; however the VIF values for both are less than 10 (Field, 2000:153-154; O'Sullivan & Rassel, 1995:429-430). In terms of collinearity, predictors that have high proportions on the same small eigenvalue may indicate that the variances of the regression coefficients are somewhat dependent (Field, 2000:201-204). The collinearity diagnostics in this model indicates medium proportions for the smaller eigenvalue for some of the socio-economic variables (wealth, education, and urbanization) indicating some level of collinearity. Even though there is some indication of collinearity in the model, there are no statistical grounds for removing any of these variables from the model. It is unreasonable to increase the sample size of the population since the number of states is finite. As a possible forecasting model, the primary concern is with the accuracy of the prediction rather than the accuracy of the specific regression coefficient (O'Sullivan & Rassel, 1995). While the possibility of collinearity may exist in this model, there was no attempt to eliminate any of the variables.

The initial results further confirmed earlier studies of the determinants of diffusion. This is also the first indication that administrative professionalism as operationalized in this study has a possible strong relationship to the dependent variable.

Table 7. Model One exploratory regression analysis of all operationalized determinants to the dependent variable, digital government.

	Standardized Coefficients		
	Beta	t	Sig.
(Constant)		.283	.779
Socio-Economic Determinants			
Wealth	.382	1.583	.123
Education	-.498	-2.499	.017*
Urbanization	-.069	-.299	.767
Demand	-.006	.034	.973
Minority Diversity	.162	.947	.350
Governmental Slack Resources	-.271	-1.940	.061
Median Age	-.050	-.396	.695
Political Determinants			
Legislative Professionalism	-.032	-.185	.854
Executive Leadership	.078	.534	.597
Government Ideology	-.162	-1.042	.305
Unified Control	-.031	-.212	.834
Administrative Professionalism	.490	3.828	.001**
State Policy Innovativeness	.571	2.455	.019*

R^2 = .617; Adjusted R^2 = .470; N=48
F = 4.207**; ** Significant < .01 level, one-tailed test; * Significant < .05, one-tailed test

At this point of the analysis, state policy innovativeness was not viewed as an intervening variable. Of interest is the negative relationship of education, which is statistically significant, urbanization and governmental slack resources to the adoption of digital government. This initial analysis did not follow classical diffusion theory that suggests education, urbanization and slack resources as having a positive relationship to the diffusion of policy innovations (Walker, 1969). None of the political variables were

determined to be significant at the 0.05 levels with the exception of administrative professionalism. This tended to support earlier studies that found political variables to have a spurious relationship to the adoption of public policy when the socio-economic variables are controlled (Cnudde & McCrone, 1969; Dawson & Robinson, 1963; Dye & Robey, 1980).

While not significant, the negative relationship between the adoption of digital government and government ideology as operationalized suggests that majority Republican administrations are more adoptive of digital government initiatives. The analysis further shows a positive relationship of executive leadership to the adoption of digital government programs though not significant. Educational level is significantly correlated to the adoption of digital government but has a negative relationship that is unexpected and does not support prior diffusion theory. A possible explanation could be the age demographic of the state. Older individuals tend to be more highly educated but are often less inclined to use technology such as the Internet (Horrigan, 2004). Using the 1999 median age by state, the regression analysis shows a negative relationship between median age and the adoption of digital government as suspected (Hovey & Hovey, 2001). Further supporting this finding, a similar regression of all the independent variables was run against the Brown University study index resulting in a negative direction of education as well. States with majority Republican government can also reflect a more highly educated environment such that a more diverse population with fewer individuals with college degrees tend to support a more Democratic administration leading to a negative relationship in the adoption of digital government.

Test of the Impact of State Policy Innovativeness

The initial analysis shows three of the four variables – education (-.498), state policy innovativeness (.571) and administrative professionalism (.490) – with a standardized coefficient close to or above .500. The initial analysis further suggests that a state's overall policy innovativeness, with a standardized coefficient of .571, may have the most substantial influence on the variance of the dependent variable. The purpose of the next analysis was to test how much influence state policy innovativeness has on the comprehensive model (Model One). The relationships of the socio-economic and political determinants to the adoption of digital government programs without the intervening state policy innovativeness index indicated a mixed relationship as shown in Table 8 and Table 9.

Table 8. Regression analysis of all socio-economic determinants to the adoption of digital government programs minus the state's policy innovativeness tendency.

	Standardized Coefficients		
	Beta	t	Sig.
(Constant)		2.019	.050
Wealth	.380	1.260	.215
Education	-.174	-.745	.461
Urbanization	.346	1.370	.178
Demand	-.163	-.839	.407
Minority Diversity	-.200	-1.071	.291
Governmental Slack Resources	-.168	-1.069	.291
Median Age	-.166	-1.074	.289

R^2 = .259; Adjusted R^2 = .130, F = 1.999; N = 48

The regression of the socio-economic variables accounted for barely 26% (R^2 = .259) of the variance in the dependent variable. When adjusted for the number of predictors (n=7), the Adjusted R^2 was equal to .130. The ANOVA was less impressive with a F-value of 1.999 with a .079 level of significance. None of the socio-economic variables showed significance within the 0.05 levels.

The regression of the political variables was a bit stronger based on the strength of legislative professionalism and administrative professionalism as seen in Table 9.

Table 9. Regression analysis of all political determinants to the adoption of digital government programs minus the state policy innovativeness tendency.

	Standardized Coefficients		
	Beta	t	Sig.
(Constant)		.659	.514
Legislative Professionalism	.357	2.840	.007**
Executive Leadership	.093	.645	.522
Administrative Professionalism	.418	3.243	.002**
Government Ideology	-.219	-1.446	.156
Unified Control	-.087	-.615	.542

R^2 = .414; Adjusted R^2 = .344; N = 48
F = 5.937**; ** Significant < .01 level, one-tailed test

The political variables accounted for 41% (R^2 = .414) of the variance of the dependent variable. When adjusted for the number of predictors (n=5), the Adjusted R^2 was equal to .344. The ANOVA had an F-value of 5.937 with a .01 significance level. Legislative

professionalism and administrative professionalism showed correlations within a 0.01 significance level. This supports Walker's initial findings and the findings of other studies that found legislative professionalism to have a strong relationship to policy innovation (Kellough & Selden, 2003; McNeal et al., 2003; Walker, 1969). The standardized coefficient for administrative professionalism was still higher than legislative professionalism in Table 8 and further demonstrated the possible strong relationship of administrative professionalism to the dependent variable.

State Policy Innovativeness Index Analysis

One of the major hypotheses of this study is that a state's overall tendency for policy innovativeness is an intervening variable in the adoption of digital government programs. The bivariate correlation of a state's policy innovativeness to the dependent variable showed a strong relationship of .409 with a 0.01 level of significance. As an intervening variable, there should be an expected correlation to the socio-economic and political variables as operationalized in this study. Since the development of Walker's innovativeness index in 1969, has there been significant change in the general innovative tendencies of the states as affected by the socio-economic and political characteristics of the states? Has the state's general innovativeness tendency changed? While inconclusive, an analysis might suggest that general socio-economic and political characteristics of a state do not change significantly over time and neither does their innovative tendencies.

Test of Socio-economic Variables to State Policy Innovativeness

An initial analysis was done to examine the relationship of a state's policy innovativeness tendency to socio-economic variables as operationalized in this study.

The purpose was to determine whether current socio-economic indicators are still correlated to Walker's initial index. Based on the analysis, there continued to be a strong relationship between current socio-economic variables and Walker's index. Table 10 reflects that the socio-economic variables accounted for a little over 67% (R^2 = .671) of the variance in the Walker index. When adjusted for the number of predictors (n=7), the Adjusted R^2 was equal to .614. The regression analysis showed three of the socio-economic variables (education, minority diversity and demand) to have a significant correlation to Walker's index with a 0.05 level of significance and two (governmental slack resources and urbanization) with a 0.01 level. Three of the classic diffusion theory socio-economic variables – urbanization, education, and governmental slack resources – continued to be related to Walker's index. The negative sign for minority diversity supported the findings of the 2003 Kent State study (McNeal et al., 2003:63). This negative relationship also follows an earlier study that noted that diversity makes it difficult for a specific group or interest to control policy-making (Cnudde & McCrone, 1969:858). Minority diversity can further reflect a lower level of wealth and education even though there exists no significant bivariate correlation of either to diversity. There was also a positive bivariate correlation of .491 between urbanization and minority diversity at the 0.01 level of significance. This is a reflection of the diversity of the population in large metropolitan areas. The negative direction of demand was unexpected since it was hypothesized to have a positive effect on the adoption of digital government but follows the initial study by McNeal and associates at Kent State (McNeal et al., 2003). The strongest positive relationships in order of descending impact were associated with the urbanization of the state, its education level, and its governmental

slack resources, as an indication of its overall innovativeness, yet wealth did not show a strong correlation as expected (Walker, 1969:884).

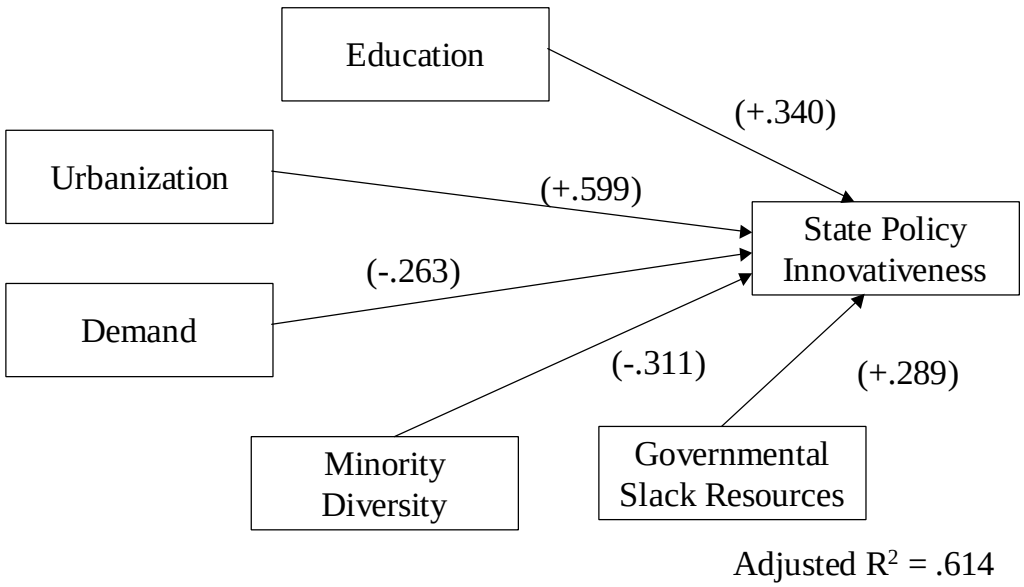
Table 10. Regression analysis of socio-economic determinants to Walker's index.

	Standardized Coefficients		
	Beta	t	Sig.
(Constant)		.345	.732
Wealth	.137	.679	.501
Education	.340	2.185	.035*
Urbanization	.599	3.565	.001**
Demand	-.263	-2.031	.049*
Minority Diversity	-.311	-2.502	.017*
Governmental Slack Resources	.289	2.769	.008**
Median Age	.016	.159	.875

R^2 = .671; Adjusted R^2 = .614; N = 48
F = 11.662**; ** Significant < .01 level, one-tailed test; * Significant < .05 level, one-tailed test

This analysis supported the hypothesis that socio-economic variables continue to explain a significant amount of Walker's 1969 state innovativeness index. Figure 10 is a resultant path diagram of the outcome reflecting only those variables with a 0.05 significance level associated with Walker's index. Each path reflects the standardized coefficient from the regression analysis in Table 10. The path diagram does not show any other possible causal relationships among the independent variables as part of this analysis.

Figure 10. Path model analysis showing direction and standardized coefficient (significant at the .05 level) for the direct relationship between the socio-economic determinants and Walker's index.



Test of Political Variables to Walker's Index

The next analysis examined the relationship between Walker's state policy innovativeness index and political variables as operationalized in this study. The purpose was to determine whether some political indicators are still correlated to Walker's index. Table 11 suggests that political variables accounted for a little less than 56% (R^2 = .559) of the variance in Walker's index. When adjusted for the number of predictors (n=5), the Adjusted R^2 was equal to .507. The regression analysis shows that two of the political variables have a correlation to Walker's index at a 0.05 level of significance. The beta for legislative professionalism was not surprising and was the strongest (Berman & Martin, 1992; Kellough & Selden, 2003; McNeal et al., 2003; Walker, 1969). Executive leadership can be interpreted as an indication of the influence of a governor on a state's

policy innovativeness in conjunction with legislative professionalism. This could provide a good indication of the influence of executive leadership in the adoption of digital government in the states different than legislative influence. What is lacking in this analysis is the confirmation of administrative professionalism, combined with other political variables, as a significant predictor of Walker's index. This suggested that administrative professionalism does not fit within the broad political determinants category since the prior analysis of the comprehensive models shows significant effect by administrative professionalism on the dependent variable – digital government adoption. To omit administrative professionalism as part of the final analysis would create a false impression of no administrative professionalism impact on the outcome of the final model.

Table 11. Regression analysis of political determinants to Walker's index.

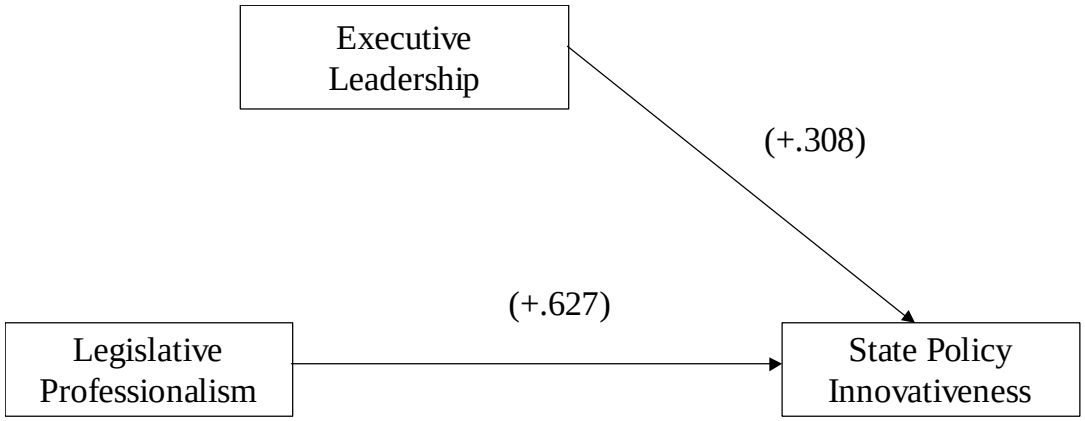
	Standardized Coefficients		
	Beta	t	Sig.
(Constant)		1.746	.088
Legislative Professionalism	.627	5.758	.000**
Executive Leadership	.308	2.473	.018*
Administrative Professionalism	-.111	-.993	.326
Government Ideology	.203	1.547	.129
Unified Control	.163	1.334	.190

R^2 = .559; Adjusted R^2 = .507; N = 48
F = 10.656**; ** Significant < .01 level, one-tailed test; * Significant < .05 level, one-tailed test

Figure 11 reflects the resulting path diagram of the significant relationships of legislative professionalism and executive leadership to Walker's index. The results of

this analysis supported the hypothesis that some political variables continue to explain a significant amount of Walker's index.

Figure 11. Path diagram showing direction and standardized coefficient (significant at the .05 level) for the direct relationship between the political determinants and Walker's index.



Adjusted R^2 = .507

In summary, the result of both analyses provided five socio-economic variables – education, urbanization, governmental slack resources, demand, and minority diversity – as showing a strong relationship to Walker's index of state policy innovativeness. Likewise, the analysis provided two political variables – legislative professionalism and executive leadership. The results also suggested that administrative professionalism was not suited as a political determinant and may in fact be more of an intervening variable to policy outcome. This possibility was tested later.

Based on the strength of the relationships of the socio-economic and political variables as operationalized in this study, there was evidence to support the view that Walker's state policy innovativeness index is a viable intervening variable reflecting the

causal relationship of a state's policy innovativeness tendency toward digital government programs. These relationships further supported original diffusion theory and the influence of socio-economic and political determinants on state policy innovativeness (Walker, 1969). Unlike the findings of the comprehensive Model One in Table 6, the direction of the associations supported existing diffusion theory.

The usage of seven variables in a path diagram presented significant difficulty in evaluating all of the direct and indirect relationships. Further analysis was needed to identify a simpler model.

Test of Socio-economic and Political Variables to State Policy Innovativeness

While the direct relationships of socio-economic and political variables supported original diffusion theory, how will the relationship change when both variables are controlled? Will controlling for socio-economic variables as past studies have shown diminish the relationship of the political variables to state policy innovativeness (Cnudde & McCrone, 1969; Dawson & Robinson, 1963; Walker, 1969)? This analysis shows the direct relationship between socio-economic and political variables to a state's policy innovativeness tendency controlling for all variables.

Table 12 shows the combination of socio-economic and political variables accounted for nearly 79% (R^2 = .792) of the variance in the dependent variable – state policy innovativeness. When adjusted for the number of predictors (n=12), the Adjusted R^2 was equal to .721. The regression analysis in Table 12 shows four variables with a significant correlation to a state's policy innovativeness – education, urbanization, minority diversity, and legislative professionalism. Minority diversity continued to show a negative relationship to a state's policy innovativeness. When controlled for socio-

economic variables, the strength of the legislative professionalism was slightly reduced while the relationship with executive leadership was weakened. However, urbanization had the greatest impact on the equation, followed by legislative professionalism, minority diversity, and education in that order. The results suggest that administrative professionalism in this model has no significant causal effect on a state's policy innovativeness.

Table 12. Regression analysis of socio-economic and political determinants to a state's policy innovativeness.

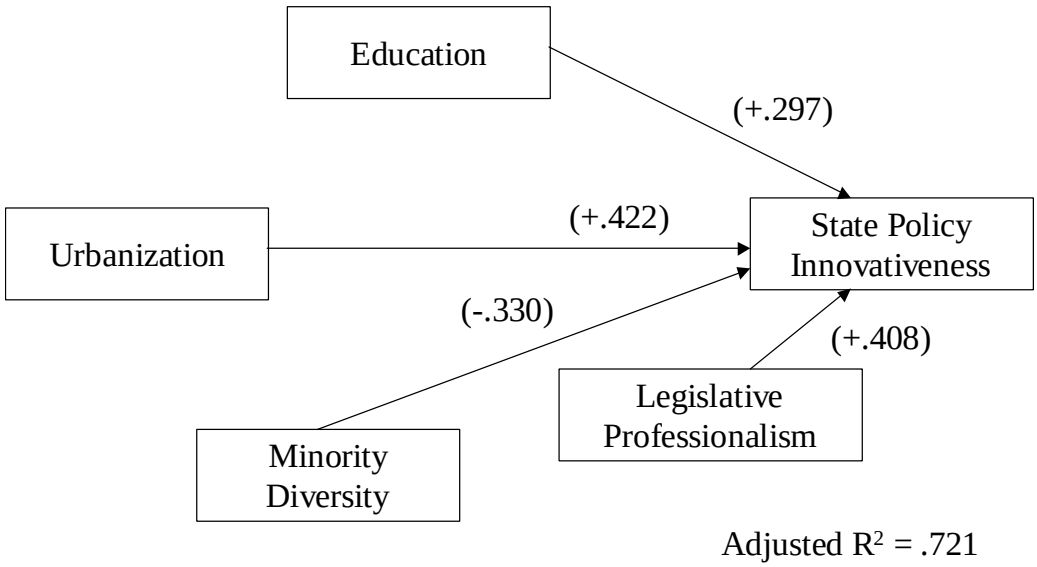
	Standardized Coefficients		
	Beta	t	Sig.
(Constant)		.941	.353
Socio-Economic Determinants			
Wealth	.034	.192	.849
Education	.297	2.188	.035*
Urbanization	.422	2.790	.008**
Demand	-.150	-1.216	.232
Minority Diversity	-.330	-2.961	.005**
Governmental Slack Resources	.174	1.796	.081
Median Age	-.033	-.362	.719
Political Determinants			
Legislative Professionalism	.408	3.918	.000**
Executive Leadership	.129	1.240	.223
Government Ideology	.039	.344	.733
Unified Control	.070	.670	.507
Administrative Professionalism	-.138	-1.533	.134

R^2 = .792; Adjusted R^2 = .721; N = 48

F = 11.098**; ** Significant < .01 level, one-tailed test; * Significant < .05 level, one-tailed test

Figure 12 reflects the path diagram showing only those significant relationships among the socio-economic and political variables to a state's policy innovativeness. The insignificant paths are not shown and neither are the other causal relationships among the independent variables.

Figure 12. Path diagram showing direction and standardized coefficient (significant at the .05 level) for the direct relationships between the socio-economic and political determinants to a state's policy innovativeness tendency.



This analysis revalidates the classical diffusion theory as to the relationship between certain socio-economic and political determinants and state policy innovativeness as operationalized by Walker's 1969 index. This also supports the hypothesis that a state's policy innovativeness is a possible intervening variable in a model that best describes the adoption of digital government.

Analysis to this point of all of the independent variables including a state's policy innovativeness provided strong results. The analysis of socio-economic and political variable relationships to a state's policy innovativeness continued to show a strong

relationship of classical diffusion theory variables. It further showed the effect of a state's policy innovativeness tendencies to policy adoption. However, does the elimination of a state's policy innovativeness significantly reduce the findings of the comprehensive model (Model One)?

The regression analysis in Table 13 suggests that the elimination of a state's policy innovativeness as an intervening variable reduces the strength of the model.

Table 13. Model Two regression analysis of the socio-economic and political determinants to the adoption of digital government programs without the state's policy innovativeness tendency.

	Standardized Coefficients		
	Beta	t	Sig.
(Constant)		.633	.531
Socio-Economic Determinants			
Wealth	.402	1.556	.129
Education	-.328	-1.643	.109
Urbanization	.172	.773	.444
Demand	-.080	-.439	.663
Minority Diversity	-.026	-.158	.875
Governmental Slack Resources	-.171	-1.199	.239
Median Age	-.069	-.511	.612
Political Determinants			
Legislative Professionalism	.201	1.313	.198
Executive Leadership	.152	.991	.328
Government Ideology	-.139	-.843	.405
Unified Control	.009	.061	.952
Administrative Professionalism	.411	3.103	.004**

R^2 = .549; Adjusted R^2 = .394; N = 48

F = 3.546**; ** Significant < .01 level, one-tailed test; * Significant < .05 level, one-tailed test

However, when the state's policy innovativeness was eliminated, the resulting model labeled "Model Two," showed the only significant variable as administrative professionalism thus reducing the salience of the other socio-economic and political variables. The results clearly show the significance of a state's policy innovativeness tendency in affecting the dependent variable. Based on this analysis, a simpler model labeled "Model Three," was tested using the three significant variables identified in Model One and governmental slack resources since it reflected a strong standardized beta (-.271) and was close to significant with a .061 level. Table 14 shows that the same three variables found to be significant in Model One were still significant in Model Three.

Table 14. Model Three regression analysis of the four variables with a statistically significant relationship to the dependent variable, digital government.

	Standardized Coefficients		
	Beta	t	Sig.
(Constant)		1.525	.135
State Policy Innovativeness	.697	5.096	.000**
Administrative Professionalism	.489	4.576	.000**
Education	-.326	-2.412	.020*
Governmental Slack Resources	-.321	-2.930	.005**

R^2 = .537; Adjusted R^2 = .494; N = 48
F = 12.450**; ** Significant < .01 level, one-tailed test; * Significant < .05 level, one-tailed test

Model Summary

The three models include all of the independent variables as operationalized in two specific categories - socio-economic and political. Table 15 reflects the findings of

the three different models. In the comprehensive model – Model One, a state's policy innovativeness tendency was included. This model accounted for approximately 62% of the variance in the dependent variable. Model Two was the same regression, minus the state's policy innovativeness tendency, reflecting a reduced regression of approximately 55% with only one significant variable, administrative professionalism, at the 0.01 level of significance. When adjusted for the number of predictors (n=12), the Adjusted R^2 for Model Two was equal to .394. Model Three was a simpler model with only four independent variables from Model One; it accounted for approximately 54% of the variance in the dependent variable. When adjusted for the number of predictors (n=4), the Adjusted R^2 of Model Three was equal to .494. While the R-square for Model Three was somewhat less than in Model One and Model Two, the Adjusted R-square for Model Three was stronger than Model One or Model Two and provided a stronger model with fewer variables. Model Three further provided a reduced number of causal variables (education, governmental slack resources, state innovativeness, and administrative professionalism) for the subsequent path analysis, yet included all of the significant variables found in Model One. Model Three best satisfied the search for a more parsimonious explanation of the adoption of digital government programs in the state as administrative policy.

Table 15. Summary of three primary models to the dependent variable, digital government.

	Model One		Model Two		Model Three	
Independent Variables	Comprehensive Standardized Coefficients	Sig.	Minus State's Policy Innovativeness Standardized Coefficients	Sig.	Simplified Model Standardized Coefficients	Sig.
(Constant)		.779		.531		
Socio-economic Determinants						
Wealth	.382	.123	.402	.129		
Education	-.498	.017*	-.328	.109	-.326	.020*
Urbanization	-.069	.767	.172	.444		
Demand	.006	.973	-.080	.663		
Minority Diversity	.162	.350	-.026	.875		
Governmental Slack Resources	-.271	.061	-.171	.239	-.321	.005**
Median Age	-.050	.695	-.069	.612		
Political Determinants						
Legislative Professionalism	-.032	.854	.201	.198		
Executive Leadership	.078	.597	.152	.328		
Government Ideology	-.162	.305	-.139	.405		
Unified Control	-.031	.834	.009	.952		
State Innovativeness	.571	.019*			.697	.000**
Administrative Professionalism	.490	.001**	.411	.004**	.489	.000**
R^2	.617		.549		.537	
Adjusted R^2	.470		.394		.494	
F	4.207**		3.546**		12.450**	

N = 48; ** Significant < .01 level, one-tailed test; * Significant < .05 level, one-tailed test

Administrative Professionalism

All of the prior models show a strong relationship of administrative professionalism to the dependent variable. The relationship of socio-economic and

political variables to a state's policy innovativeness tendency was significant. Did there exist a similar causal relationship between these two sets of variables (socio-economic and political) and administrative professionalism? Figure 13 reflects the path diagram for the analysis of socio-economic and political variables to administrative professionalism, and Table 16 reflects the associated regression analysis.

Figure 13. Path diagram for relationship of the socio-economic and political determinants to administrative professionalism.

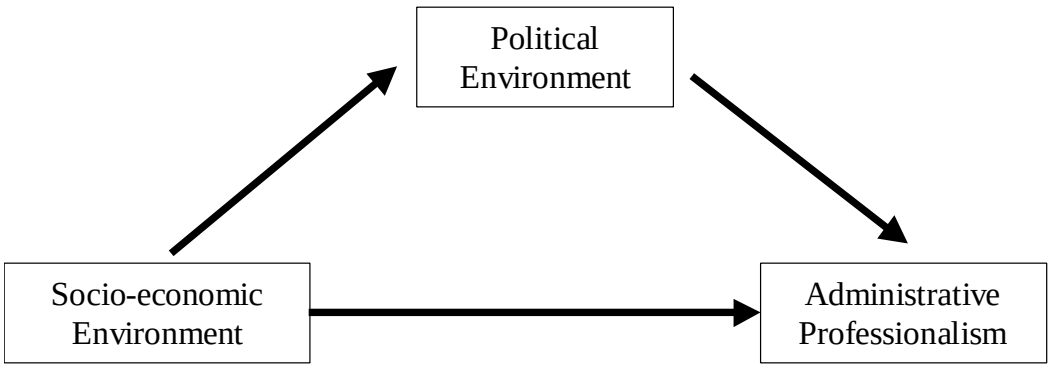


Table 15 shows that none of the variables were significantly related to administrative professionalism. The only variable found to be of statistical significance was executive leadership. This again suggests the importance of executive leadership in the causal impact of administrative policy innovation. There was no evidence to further suggest the causal relationship of executive leadership to a more professional workforce. The one surprise was the negative direction of the correlation between wealth and state policy innovativeness to administrative professionalism. Other than this unexpected relationship, the other variables had the same positive or negative relationship to the state's policy innovativeness tendency.

Table 16. Regression analysis of the socio-economic and political determinants to administrative professionalism.

	Standardized Coefficients		
	Beta	t	Sig.
(Constant)		1.845	.074
Socio-Economic Determinants			
Wealth	-.185	-.584	.563
Education	.308	1.193	.241
Urbanization	.291	.970	.338
Demand	-.084	-.367	.716
Minority Diversity	-.302	-1.368	.180
Governmental Slack Resources	-.058	-.316	.754
Median Age	-.229	-1.413	.166
Political Determinants			
Legislative Professionalism	.253	1.136	.264
Executive Leadership	.399	2.211	.034*
Government Ideology	.292	1.473	.150
Unified Control	.324	1.767	.086
State Policy Innovativeness	-.456	-1.533	.134

R^2 = .312; Adjusted R^2 = .076; N = 48
F = 1.323; * Significant < .05 level, one-tailed test

In summary, the results of Model One and Model Three indicate that a state's policy innovativeness tendency and administrative professionalism (GPP), as operationalized in this study, have a strong relationship to the adoption of digital government. The analysis further supports the hypothesis that a state's policy innovativeness tendency continues to have a positive relationship to the adoption of innovative public policy and works well as an intervening variable. Alone, state policy

innovativeness and administrative professionalism accounted for approximately 38% of the total variance in the adoption of digital government in the states as shown in Table 17 with an Adjusted R^2 equal to .353.

Table 17. Regression analysis of administrative professionalism and state policy innovativeness to the adoption of digital government programs.

	Standardized Coefficients		
	Beta	t	Sig.
(Constant)		-.699	.488
State Policy Innovativeness	.397	3.378	.002**
Administrative Professionalism	.452	3.844	.000**

R^2 = .381; Adjusted R^2 = .353; N = 48
F = 13.827**; ** Significant < .01 level, one-tailed test

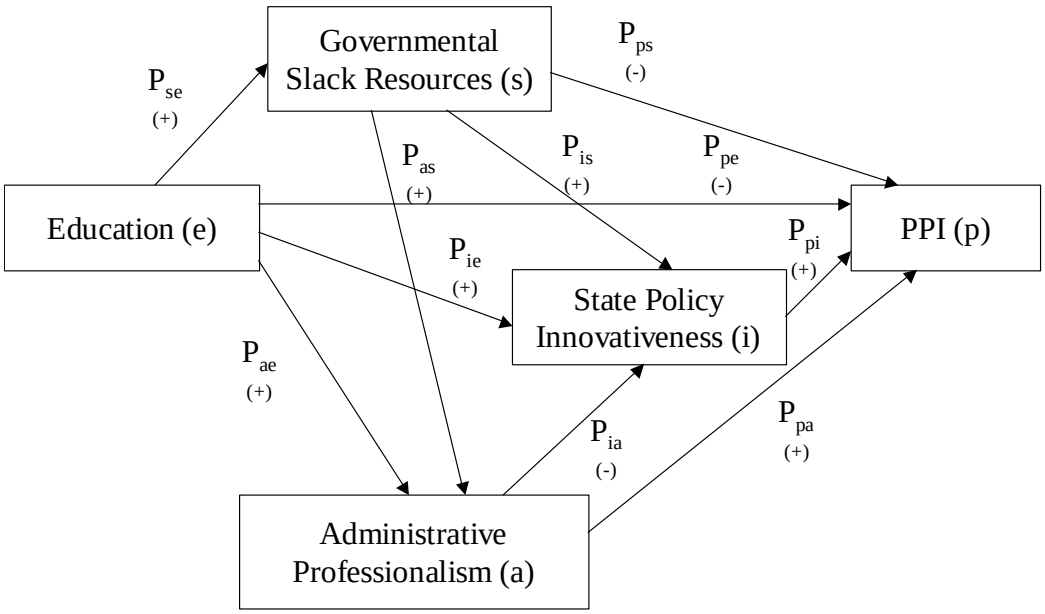
Path Diagram Analysis

The identification of four statistically significant variables in the prior analyses of Model One and Model Three provided the foundation for a subsequent path diagram analysis. Figure 14 shows the initial path diagram using those four independent variables. The directional arrows show all of the possible causal relationships between the four independent variables and dependent variable. There are generally two major assumptions associated with causal ordering. First, path models assume a certain temporal sequence (ordering) among the variables. Second, path models assume a unidirectional causal linkage (Tompkins, 1975). As a result, this model does not provide for any reciprocal causation among the variables.

For purposes of this study, each path was denoted with a P with two subscripts. The subscripts referred to the variables on each end of the path; the first subscript is the

dependent variable and the second subscript is the independent variable. Each subscript is equal to the path coefficient and was reflected as the standardized coefficient of the regression analysis. While there is generally some amount of residual value associated with each path, the residual values are not denoted in the path diagram.

Figure 14. Diagram of hypothesized path model for the four statistically significant determinants of the dependent variable.



The analysis of the model is shown in Table 18. The first regression was of the socio-economic (education and governmental slack resources) and administrative professionalism identified in Model Three to state policy innovativeness shown in Figure 13 as an intervening variable. The second regression analysis shows the direct relationships of education and governmental slack resources to administrative professionalism. The final regression analysis shows the direct relationship of education to governmental slack resources.

Table 18. Regression analysis of the significant socio-economic determinants and administrative professionalism to state policy innovativeness.

Dependent Variable		Standardized Coefficients Beta	t	Sig.
State Policy Innovativeness	(Constant)		1.121	.268
	Education	.590	4.945	.000**
	Governmental Slack Resources	.203	1.736	.090
	Administrative Professionalism	-.060	-.514	.610
	R^2 = .425; Adjusted R^2 = .385			
	F = 10.824 **			
Administrative Professionalism	Constant		3.428	.001**
	Education	.224	1.517	.136
	Governmental Slack Resources	-.087	-.590	.558
	R^2 = .051; Adjusted R^2 = .008			
	F = 1.199			
Governmental Slack Resources	Constant		5.331	.000**
	Education	.188	1.298	.201
	R^2 = .035; Adjusted R^2 = .014			
	F = .1.686			

N = 48; **Significant at 0.01 level, one-tailed

The data from Tables 14 and 18 result in the estimated coefficients found in Table 19.

The table shows there are only five (5) paths that are significant at the 0.05 level.

Table 19. Summary table of the direct and indirect path standardized coefficients for path diagram analysis.

Path	Path Standardized Coefficient	t value	Sig.
P_{ps}	-.321	-2.930	.005**
P_{pe}	-.326	-2.412	.020*
P_{pi}	.697	5.096	.000**
P_{pa}	.489	4.576	.000**
P_{ie}	.590	4.945	.000**
P_{is}	.203	1.736	.090
P_{ia}	-.060	-.514	.610
P_{ae}	.224	1.517	.136
P_{as}	-.087	-.590	.558
P_{se}	.188	1.298	.201

** Significant at < .01 level, one-tailed test
* Significant at < .05 level, one-tailed test

There were no indirect relationships from state policy innovativeness to the dependent variable. However, there were several indirect paths to the dependent variable from the following independent variables – education, governmental slack resources and administrative professionalism as shown in Figure 14. The indirect path computations were calculated as follows:

Education (Indirect) = $(P_{se} * P_{ps}) + (P_{se} * P_{is} * P_{pi}) + (P_{se} * P_{as} * P_{ia} * P_{pi}) + (P_{se} * P_{as} * P_{pa}) + (P_{ae} * P_{ia} * P_{pi}) + (P_{ae} * P_{pa})$

Education (Indirect) = (.188 * -.321) + (.188 * .203 * .697) + (.188 * -.087 * -.060 * .697) + (.188 * -.087 * .489) + (.224 * -.060 * .697) + (.224 * .489)

Education (Indirect) = (-.060348) + (.026600) + (.000684) + (-.007998) + (-.010204) + (.109536)

Education (Indirect) = +.0583

Governmental Slack Resources (Indirect) = (P_{is} * P_{pi}) + (P_{as} * P_{ia} * P_{pi}) + (P_{as} * P_{pa})

Governmental Slack Resources (Indirect) = (.203 * .697) + (-.087 * -.060 * .697) + (-.087 * .489)

Governmental Slack Resources (Indirect) = (.14149) + (.003638) + (-.04254)

Governmental Slack Resources (Indirect) = +.1026

Administrative Professionalism (Indirect) = (P_{ia} * P_{pi})

Administrative Professionalism (Indirect) = (-.060 * .697)

Administrative Professionalism (Indirect) = -.04182

The resultant path diagram with the computed standardized coefficients is shown in Figure 15.

Figure 15. Path diagram of reduced model (Model Three) showing direct and indirect standardized coefficients.

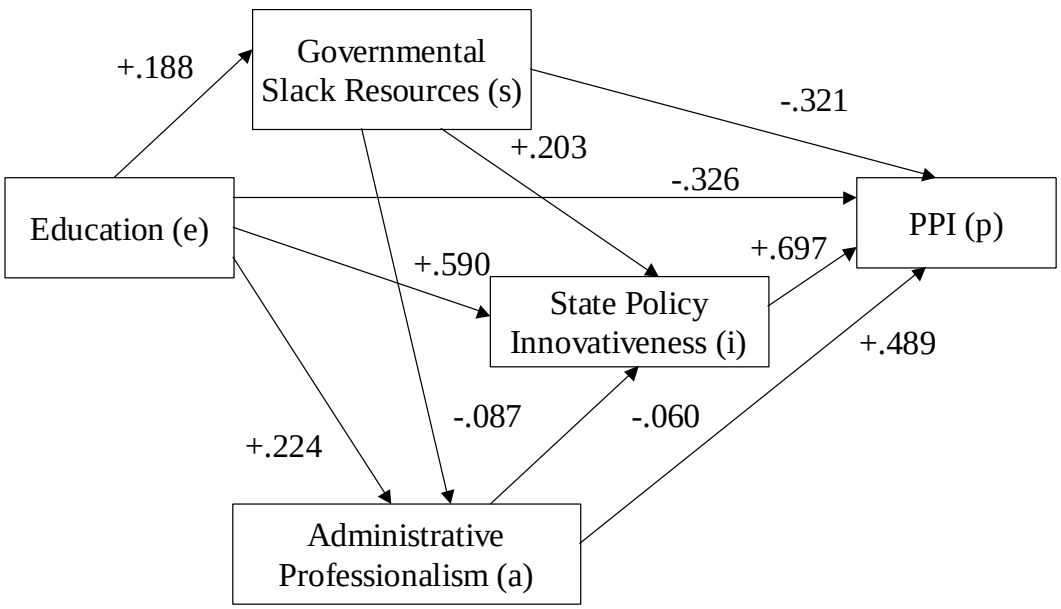


Table 20 summaries the direct, indirect, and total impact computations of each of the independent variables.

Table 19. Summary of direct and indirect path computations.

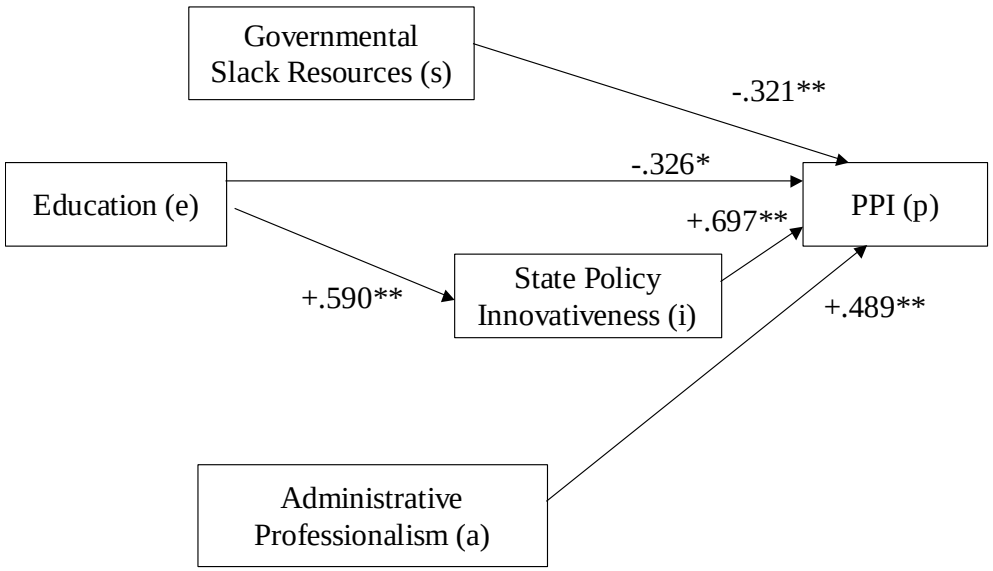
Variable	Direct	Indirect	Total
Education	-.326	.058	-.268
Governmental Slack Resources	-.321	.103	-.218
State Policy Innovativeness	.697	.000	.692
Administrative Professionalism	.489	-.042	.447

The computations show that a state's policy innovativeness tendency is still a strong predictor of policy innovation in a state as operationalized in this study. State policy innovativeness, as operationalized by Walker's index, continues to hold up well when controlled for the socio-economic and political variables (Berman & Martin, 1992).

The full model defined in Figure 14, represents several relationships that are not statistically significant and add little to the causal path model. The summary path analysis in Table 18 shows only four variables at a 0.05 level of significance.

Figure 16 shows a reduced model where path coefficients above the 0.05 level of significance are actually eliminated. This simpler model shows only one indirect path from education to the dependent variable, digital government adoption.

Figure 16. Reduced path diagram of significant determinants to the dependent variable (Model Three).



** Significant < .01 level, one-tailed test
* Significant < .05 level, one-tailed test

Table 21 is a computation of the direct, indirect and total contributions of the selected variables in this reduced model.

Table 21. Reduced path model of significant paths only.

Variable	Direct	Indirect	Total
Governmental Slack Resources	-.321	.000	-.326
Education	-.326	.411	.085
State Policy Innovativeness	.697	.000	.697
Administrative Professionalism	.489	.000	.489

This model does not change the strength of relationship of state policy innovativeness tendencies and administrative professionalism to the dependent variable. The strength of the indirect relationship of the education variable changes the direction of the relationship

from a negative relationship to a positive relationship due to the strong influence of the intervening variable – state policy innovativeness. This final path diagram provides a basic model of the determinants and their causal relationships to the state's adoption of digital government as administrative public policy. Overall, state policy innovativeness held up well when controlled for the various socio-economic and political variables. Out of all of the determinants, state policy innovativeness had the strongest direct effect on the policy adoption variable (digital government) followed by administrative professionalism.

Findings

The combination of the regression analysis and path analysis in this study represented different perspectives of the adoption of digital government in the states; however, the results were consistent. The analysis suggests there are four determinants (education, governmental slack resources, state policy innovativeness, and administrative professionalism) that significantly contribute to the adoption of digital government programs. The analysis supports one of the primary hypotheses of this study that *state policy innovativeness accounts for a significant amount of variation in the adoption of digital government.* The analysis further supports the hypothesis that *state policy innovativeness has a stronger direct causal relationship to state policy outcome than the direct effect of socio-economic variables.* There was no research to suggest the strength or direction of relationship between administrative professionalism and the dependent variable (digital government). As operationalized in this study, the analysis supports the hypothesis that *administrative professionalism has a positive relationship to the adoption of administrative policy (digital government)* and there is significant strength of the

causal relationship as well. The analysis did not support the hypothesis that *administrative professionalism would have a positive direct effect on the state policy innovativeness.* The analysis suggests a negative causal relationship between administrative professionalism and state policy innovativeness. Overall, the findings of this study support the primary hypotheses associating the strength and direction of administrative professionalism and state policy innovativeness to administrative policy outcome.

The findings further suggest there are two distinctive paths to policy outcome. The overall model suggests the lack of direct salience of the political process. However, the model does show the salience of the political process to the state's policy innovativeness as found in Walker's initial research (Walker, 1969). The political process path also supports the positive causal relationship found in Walker's research.

CHAPTER FIVE

Based on the literature review of public policy innovation within the context of classical diffusion theory, there is sufficient evidence to support the conclusion that existing theory in public policy innovation provides a basic framework to build an initial model of technology innovation in the public sector as administrative policy. This study supports the utility of diffusion theory for understanding the adoption of administrative public policy and further demonstrates that the context of public policy diffusion theory matches well within the context of classical diffusion theory (F. S. Berry, 1994a; F. S. Berry & Berry, 1990;,1994; Gray, 1973; Walker, 1969). There are few studies associated with the diffusion of information technology in the public sector to evaluate the appropriateness of diffusion theory in a combined context of information technology and administrative policy innovation. However, there are several studies that focus on the adoption of administrative policy that further supports this conclusion (F. S. Berry, 1994a; Kellough & Selden, 2003). With the exception of the Kent State study, diffusion studies relating to digital government services in the public sector were not found in the literature (McNeal et al., 2003). The findings of this study suggest that classical diffusion theory provides a framework to understand the adoption of some technology in the public sector as administrative policy associated with executive or professional leadership.

Determinants of Diffusion

As in past studies, socio-economic variables (wealth, education, urbanization, demand, minority diversity, median age and governmental slack resources) were expected to have a positive effect on the political variables (legislative professionalism, executive leadership, government ideology, unified control and administrative professionalism) and the policy outcome variable (digital government). The socio-economic variables were also hypothesized to have a positive direct effect on the state's policy innovativeness as operationalized by Walker's 1969 policy innovativeness index. Unknown was the strength of the direct and indirect effects of the socio-economic and political variables when state policy innovativeness was considered as an intervening variable. It was hypothesized that the state policy innovativeness variable would have a stronger direct causal relationship to state policy outcome than the direct and indirect effect of the socio-economic and political variables.

Socio-economic Determinants

The inclusion of several socio-economic determinants resulted in some unexpected findings. The comprehensive model found education and governmental slack resources to have a significant negative influence on policy adoption. None of the other typical socio-economic determinants of innovativeness were significant. With the exception of wealth, demand, and minority diversity, all of the other socio-economic determinants had a negative relationship to the adoption of digital government. When the socio-economic variables were tested minus state policy innovativeness, their relationship was even weaker. The final model again reflects the negative influence of education and governmental slack resources on policy outcome contradictory to normal diffusion

theory. This suggests the implementation of digital government programs as an internal initiative not driven by citizen demand but by executive or administrative leadership. The direct and indirect strength of the socio-economic variables were less than those of the state's policy innovativeness and administrative professionalism. While the causal relationships of the socio-economic and political determinants lack some salience in the final model, their importance to the general policy innovativeness of a state cannot be ignored entirely.

Political Determinants

The inclusion of political determinants in this study again tests the past studies of policy adoption associated with the diffusion of digital government. The political determinants used in this study were limited to basic political activities of earlier studies. Dawson and Robinson's study found that social welfare policies were more a function of socio-economic factors rather than political factors. "In short, the evidence points to the relatively greater influence of certain external conditions over one aspect of the political process in the formulation of public policies" (Cnudde & McCrone, 1969; Dawson & Robinson, 1963; Dye & Robey, 1980). The results of my study validate earlier findings that question the salience of political determinants in understanding the adoption of public policy innovations. When controlled for socio-economic determinants, political determinants are shown to have no significant impact on the adoption of administrative policy as operationalized in this study. The regression analysis of the full model shows the diminished influence of the typical political determinants as expected, and the final model does not include any political determinants.

However, the regression analysis of the political determinants without controlling for socio-economic determinants shows significant influence on the dependent variable. The most significant contribution is from legislative professionalism. The assumption that a key driver of digital government is executive leadership is not validated by the results. While legislative professionalism accounted for some variation in the adoption of digital government, the final model suggests that other determinants closely associated with administrative professionalism enhance the overall model.

The prior research on the adoption of digital government reflects a strong relationship of legislative professionalism as noted by a Kent State study (McNeal et al., 2003). This study confirms a strong relationship of legislative professionalism and executive leadership to Walker's innovativeness index, but does not show the same relationship to the dependent variable as operationalized in this study. This suggests that the adoption of administrative policy is not directly affected as much by the political process when combined with a state's policy innovativeness tendency. The use of a state's policy innovativeness provides a parsimonious substitute for the political process.

State Policy Innovativeness

In an effort to strengthen the explanation of the adoption of digital government in the states, a state's tendency toward public policy innovation, as operationalized by Walker's 1969 innovativeness index, was included as an intervening determinant of adoption. The findings suggest the importance of a state's tendency toward policy innovation as an intervening variable that reflects broad socio-economic and political determinants. The findings show that innovativeness appears to be directly linked to several socio-economic and political factors, i.e., education, governmental slack

resources, legislative professionalism and political ideology. As to the specific policy area of this study, this study finds state policy innovativeness to be of particular importance in understanding the adoption of digital government among the states. The inclusion of Walker's state policy innovativeness index as an intervening variable represents a new perspective that results in significant improvement of the overall model. Even though Walker's index was created before the introduction of digital government and has not been updated since 1969, its inclusion as an intervening determinant in the model adds further to the understanding of the adoption of digital government. Rather than a confirmation of Walker's index, the results show that innovative states, as operationalized by Walker's index, continue to be more innovative in the adoption of public policy. In this study, innovativeness is associated with the adoption of administrative policy – digital government programs – confirming the hypotheses that state policy innovativeness has a stronger direct and indirect causal relationship to state policy outcome than the direct effect of either the socio-economic or political determinants.

Administrative Professionalism

The results of this and earlier studies suggest the importance of legislative professionalism on public policy innovation (Berman & Martin, 1992; F. S. Berry, 1994a; Kellough & Selden, 2003; McNeal et al., 2003). Prior studies on the adoption of digital government, suggest the importance of legislative professionalism on administrative policy innovation. In that study, the authors raised the questions, "Does legislative professionalization represent a more general professionalization of state government? Do

professionalized state governments have a more innovative attitude toward administrative reforms more generally" (McNeal et al., 2003:67).

As part of this study, a new variable associated with policy outcome, administrative professionalism, is included in an effort to answer the questions posed by the Kent State study regarding administrative professionalism. The regression analysis finds a stronger association between administrative professionalism and the adoption of digital government when controlled for socio-economic and political determinants. This suggests that administrative professionalism is also strongly associated with the adoption of innovative administrative policies. The path analysis implies a non-spurious relationship of administrative professionalism to the adoption of digital government. This is an obviously misleading conclusion. The analysis of socio-economic and political determinants to administrative professionalism results in no significant causal relationships. However, the study supports the initial hypotheses that administrative professionalism has a positive relationship to the adoption of administrative policy when all other socio-economic and political determinants are controlled. Further study is needed to conceptualize and measure relevant causal determinants to administrative professionalism other than those operationalized in this study, if they exist.

Diffusion studies over the past several years have added different socio-economic and political determinants, i.e., policy entrepreneurs, policy networks and associations, in an effort to develop a more integrative model of diffusion theory. This study is the first to operationalize administrative professionalism as a specific determinant in the diffusion of public policy innovations and shows the salience of such a determinant. The findings of this study support the argument that future research on the explanation of policy

outcome should combine determinants of the socio-economic, political and bureaucratic environment (Downs, Jr., 1976:10-11).

Causal Path Analysis

The use of regression analysis generally yields some percentage of variation in a dependent variable that is explained by some independent variable(s). Analysis generally concludes that the most important variable is the one that explains the most variation. However, it is important to understand the causal ordering of the independent variables. The regression analysis only has meaning in some specified causal context in which each variable is treated as both cause and effect of relevant variables. In this study, the causal model provides some theoretical justification for the introduction of the control variables – socio-economic and political. The initial regression analysis included thirteen (13) independent variables. The advantage of path analysis is that it facilitates the search for a more parsimonious model with high exploratory capability. Some of the relationships in the initial model were weak and were eliminated without much loss to the model. A major objective of the study was to explain the most variation in the dependent variable with the least number of independent variables. Model Three meets that objective. Model Three is able to explain 56% of the variation of the dependent variable with only four independent variables. More importantly, the causal model supports the hypotheses of the study associated with the intervening innovativeness variable and the relationship of the administrative professionalism variable. The political variables have a less direct effect on adoption than the socio-economic variables.

Comparative Review

The results of the analysis suggest that four of the independent variables (education, governmental slack resources, state policy innovation, and administrative professionalism) explain a significant amount of variation in the adoption of digital government in the states. It seems appropriate to review a small sample of the states as to whether the findings accurately describe the state environments. Two of the top five highest ranked states (Michigan and Pennsylvania) on the PPI Digital Government Index and two of the lowest ranked states (Alabama and Oklahoma) were selected for review. Table 22 reflects a summary of those four states with their associated rankings in each of the significant determinants of the final model – Model Three.

Table 22. Summary of two highest and lowest scoring states in the adoption of digital government.

	Michigan	Pennsylvania	Alabama	Oklahoma
Digital Government Adoption	1	5	42	44
Education	28	20	35	31
Governmental Slack Resources	13	24	35	37
State Policy Innovativeness	5	7	29	40
Administrative Professionalism	4	6	25	21

The summary table suggests the same relationships as the analysis. The highest scoring state, Michigan, has top five rankings in state policy innovativeness and administrative professionalism while Pennsylvania has top ten rankings in each. The educational and governmental slack rankings of both states are middle of the pack. The lowest scoring

states, Alabama and Oklahoma, are consistently low in their rankings in all areas, most specifically the state policy innovativeness and administrative professionalism. This summary provides some simple validity to the findings of this study.

Future Research

The current study is limited to cross-sectional regression analysis. Other studies have shown this type of analysis to be incomplete in fully understanding the diffusion of policy innovations (F. S. Berry & Berry, 1992). Frances Berry's use of the event history analysis (EHA) provided the additional benefit of using longitudinal analysis. One of the primary characteristics of diffusion is its temporal behavior. Research in diffusion theory can be greatly enhanced by examining the diffusion of an innovation over time by capturing cross-sectional data on regular intervals. In those cases where there are specific dates of adoption, such as legislative action, longitudinal analysis then provides a more comprehensive analysis of diffusion events (F. S. Berry & Berry, 1992; Rogers, 1962). Unfortunately, event history analysis (EHA) is not really compatible with regression analysis. The adoption of digital government does not lend itself to this type of analysis based on the determinants of this study. However, future research on specific types of digital government activities most certainly could use this method. For example, the implementation of a specific application, i.e., online motor vehicle registrations, online hunting license, or specific agency websites, i.e., the Governor's website, the revenue department website. It should be possible through surveys or manual tracking to determine the exact time of adoption for many of these events. Event history analysis only focuses on the probability of the occurrence of an event, but it does not provide the ability to study the causal relationships of the determinants of the event as regression

analysis. While the design of an EHA model allows for the inclusion of cross-sectional and temporal variables, it does not allow for the ability to build a causal model of their relationships. Path analysis is generally limited to specific statistical techniques, such as standardized multiple regression. Even though regression analysis does not prove causal relationships among the dependent variables, it does provide the ability to analyze causal models.

Comprehensive Model of Technology Adoption in the States

The adoption of digital government in the states presented an opportunity to evaluate the relevance of diffusion theory in a combined context of public policy innovation and information technology. The study shows that there is empirical evidence to support the applicability of diffusion theory in understanding the adoption of digital government in the states. This study did not provide the opportunity to evaluate the temporal and spatial diffusion of digital government. As operationalized in this study, the adoption of digital government was not a single event that could be measured over time, but a score that represented the diffusion of digital government functionality. What is still lacking is a comprehensive model that includes the characteristics of the technology itself. The final model in this study only includes the determinants of the state without consideration for the determinants of the innovation. This is generally recognized as a problem with research from the adoptive perspective in that it reveals little about the characteristic of the innovation and changes to the innovation and social system over time (Brown, 1981; Dolowitz & Marsh, 1996; Fliegel & Kivlin, 1966; Rogers, 1995; Rose, 1993; Walker, 1969). Any comprehensive model must include both components. Further research is needed to develop a diffusion model of digital

government as a technology by studying the five characteristics of innovation developed by Everett Rogers – relative advantage, compatibility, complexity, trialability and observability (Rogers, 1995:15-16). The adoption model developed in this study for digital government may not apply to other types of technology adoptions, such as geographical information systems (GIS), enterprise resource planning (ERP) systems, and data warehousing. The adoption of these technologies in the states may be based more on the characteristics of the innovation than the state determinants.

The attributes of an innovation itself are a basic factor in explaining difference in the rates at which various innovations are adopted (Fliegel & Kivlin, 1966:247). This presents another stream of research in the adoption of digital government services. Extensive research has been done on the characteristics of the innovation, but there is no research that specifically evaluates the adoption of digital government on the basis of relative advantage, compatibility, complexity, trialability and observability as defined by Rogers (Rogers, 1995:208).

Public Sector Technology Adoption Index

The use of Walker's innovativeness index supports the hypothesis that a significant portion of the variance in the adoption of digital government can be explained by an index of a state's broad policy innovativeness tendencies. Walker's index was established in 1969 and has not been significantly updated during that period. In 1985, Robert Savage expanded the population of policies to test the significance of Walker's original index and found no significant change in the policy adoption tendencies of the states. There is little statistical evidence to suggest that a more current index, based on the relationships in the final model, would have any greater impact on the final results.

That does not imply that a current policy innovativeness index is not a necessary research project and could enhance the salience of future studies.

However, there is a sense that a similar index needs to be developed that would identify the tendencies of states to adopt new technologies. After building a state technology innovation index, analysis of the index would follow the methodology of Walker's index by testing it against the socio-economic and political determinants of the state. Understanding the tendencies of states to adopt new technologies can be greatly enhanced by the construction of a model that at minimum contains the following indexes: administrative professionalism, state policy innovativeness and state technology innovation. This study has shown the ability of the prior indexes to explain a significant variance of the adoption of digital government. The development of a state technology innovation index would provide additional opportunities for research.

Conclusion

The results of this analysis do not identify any significant differences in the initial studies of diffusion theory and the findings of this study. This study identifies broad socio-economic and political determinants necessary for the diffusion of policy innovation that continue to be salient. When controlling for socio-economic determinants, political variables continue to be less salient. This study is the first to view a state's general tendency toward policy innovativeness as an intervening variable in the adoption of administrative policy. The generally innovative tendency of a state is shown to be a strong explanatory determinant for policy adoption in a state. New models should consider the relevance of such a determinant. This study is the first to study the causal relationships of the determinants through path analysis. Finally, this study is the first to

identify a measure of administrative professionalism to be highly correlated to the adoption of administrative policy. The significant influence of administrative professionalism suggests that future research on policy outcome should recognize the importance of policy formulation by bureaucratic actors.

There appear to be no natural enemies to the implementation of digital government reducing the impact of organized interest groups. However, there are enemies of the implementation of digital governance services - online voting, voter registration, online forums, etc. And, there are significant constraints to the diffusion within the social system – broadband usage and computer usage. The adoption of digital government is best viewed from the market and infrastructure perspective of diffusion where the constraints created by governmental institutions affect the adoption rate. From a normative perspective of policy implementation, a more professional government – legislative and administrative – tends to create fewer constraints for the adoption of digital government and create an environment accessible to more potential adopters and more innovative programs.

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