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RESEARCH UTILIZATION IN PUBLIC ADMINISTRATION: A COMPARATIVE ANALYSIS OF WASTEWATER PRACTITIONERS' UTILIZATION OF TECHNICAL RESEARCH VERSUS ADMINISTRATIVE RESEARCH

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ABSTRACT

Research Utilization in Public Administration: A Comparative Analysis of Wastewater Practitioners' Utilization of Technical Research Versus Administrative Research

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Purpose. This study compares the utilization of technical research to the utilization of research that is focused on administrative functions and management. This research effort characterizes the differences and also identifies factors that may cause the differences. In brief, the problem examined in this study is the gap between theory and practice in specialized fields. There has been concern over connectedness between theory and practice not only in public administration, but other fields as well. Due to the connection between theory and practice in the scientific fields, the wastewater industry was chosen as a test field to compare practitioners' activities related to scientific or core business areas to administrative activities.

Theoretical Framework. Epistemology and theories of action are at the core of this research influencing how the practitioner learns and works with new knowledge. Knowledge management is also critical in acquiring or manipulating information. The theoretical basis for the transfer of knowledge is epistemology. Theories of collaboration and networking also influence this work.

Methodology. Twelve participants from wastewater agencies were interviewed by telephone. Agencies were chosen from across the United States and of varying size and governmental structure. The participants were asked 23 semistructured questions about their organization, their professional characteristics, and their actions related to technical and administrative information to assess knowledge production, transfer, and utilization.
Findings. Differences were observed between technical and administrative research. A reliance on upper management and human resources was observed for the source of administrative information. Overall, practitioners interviewed saw their organizations as more supportive of technical research over administrative research.

Conclusions and Recommendations. Implementation of administrative research depended on if it made sense to the receiver. Researchers should begin with the end user in mind and consider the nuances of different fields. In addition, it would be beneficial to take practitioner case studies across many fields and synthesize the information. Practitioners should be open to alliances with administrative associations and technical associations.

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CHAPTER I

INTRODUCTION

There is a common concern within the public administration field about the quality of research as well as the value of a connection between academics and practitioners. Research produces knowledge and can be performed by academics, practitioners, or professional researchers. The need for a strong connection between public administration theory and practice is especially strong in more specialized public organizations and professions. Training may emphasize technical skills rather than increasing understanding about the nature of public organizations and leadership, potentially resulting in less effective supervision and management in these fields.

There is significant research on knowledge production, knowledge transfer, and utilization in the public and private sectors. Challenges with technical knowledge as well as managerial concerns exist in specialized fields. Topics investigated include barriers to utilization of policy research, benefits of codifying knowledge, knowledge capacity in businesses, knowledge production in collaboratives, and evolving approaches to knowledge production (Cohendet & Steinmueller, 2000; Corwin & Louis, 1982; Dalkir, 2005; Duncan, 1974; Fukugawa, 2005; Gann, 2001; Gibbons et al., 1994; McNabb, 2007).

In this study, the wastewater treatment area was chosen as an example of a specialized area of public service. Although there are a few social science studies

published on water treatment organizations, there are many more articles published each year, mostly in professional publications, on the technical aspects of water supply and wastewater. On the technical side of the wastewater industry, there is extensive production, transfer, and utilization of knowledge. Technical aspects of wastewater would include biological, chemical, and physical treatment methods, as well as design and construction of treatment facilities.

Purpose of the Study

This study compares production, transfer, and utilization of technical research to the utilization of research that is focused on administrative functions and management. This research effort characterizes the differences and also identifies factors that may cause the differences. This chapter focuses on describing the wastewater industry, the problem, research questions, the significance of the study, an overview of the methodology, and key terminology.

Statement of the Problem

The problem examined in this study is the gap between theory and practice in specialized fields, in general, and in wastewater management, in particular. More specifically, the gap refers to practitioners utilizing and putting into practice the theory identified by researchers, as well as practitioners having an understanding of the theory underlying their actions and decisions. This is a multifaceted problem and requires some history of public administration and dialogue within the field to fully explain the issues, which include the theoretical foundation, the building of cumulative research, and the

link between practitioners and academic researchers. Both academics and researchers have criticized the quality of public administration graduate research and many have critiqued the connection between public administration academics and practitioners (Johnson, Williams, Wavell, & Baxter, 2004; Pearce, 1999; Van Dyck, 2002; Wright-Isak & Prensky, 1993). In addition, practitioners do not appear to be utilizing academic administrative research. A more detailed discussion of the problem follows.

There has been considerable discussion in *Public Administration Review* (PAR) about the gap between theory and practice as well as the quality and purpose of doctoral research (Box, 1992). Newland (2000) highlights the struggle for connectedness between public administration theory and practice and offers encouragement for the future. The concern over connectedness between theory and practice is also evident in other fields including business administration, marketing, financial management, and library science (Johnson et al., 2004; Pearce, 1999; Van Dyck, 2002; Wright-Isak & Prensky, 1993). In addition, Marini expresses "unease about a theoretical unification" as a concern within the public administration community (as cited in Ott & Russell, 2001, p. 11). There are also concerns over connectedness, the quality, and focus of doctoral dissertations in public administration (Adams & White, 1994; Brewer, Douglas, Facer, & O'Toole, 1999; Douglas, 1996; Felbinger, Holzer, & White, 1999; McCurdy & Cleary, 1984). Perry and Kraemer (1986) critique three areas of public administration research: lack of theory testing, lack of building upon previous research, and minimal funding by outside parties.

Very few researchers posit that the current state of research in public administration adequately links theory and practice. The traditional belief in social

sciences is that the role of doctoral research should develop and disseminate knowledge. If public administration is striving for these same goals, White, Adams, and Forrester (1996) argue, the goal is not being achieved. In addition, Denhardt (1993) stated that theory should serve not only the purpose of explanation, but to enable people to perform their work more effectively. These authors surmise that academic research should be directed at one of two objectives, or both: furthering the knowledge of the field or enabling practitioners to change their actions and to improve their function.

Background of the Problem

Research in public administration has traditionally been applied, meaning that the goal is to address a problem faced by a practitioner. Public administration research has often focused on solutions to practical problems with very little theoretical research. There have been recent efforts to build a theory of public administration through research. This approach seeks not to find a resolution to a practitioner problem, but to develop basic research. Researchers are now delving into theoretical or pure topics striving to develop an explanatory theory of public administration. Stivers (2000a) states that this has not been entirely successful to date.

McNabb (2008) relays that the field is moving toward a combined approach using both quantitative and qualitative methods to allow depth and description to enhance data gathered from purely qualitative approaches; however, there is still a philosophical divide between those that believe one or the other approach is the right way.

Drawing generalizations is often challenging because every situation is unique. However, without generalizing, building theory is difficult (McNabb, 2008). The

scientific approach (inductive) involves facts, form theory, test theory, develop laws, predict, and control (Daneke, 1994). The scientific approach to research entails the belief that nature is orderly, one can acquire knowledge of nature, natural occurrences have natural causes, and knowledge claims must be shown objectively through observation (Frankfort-Nachmias & Nachmias, 2000). Scientific research may be validated through logic and observations.

There are often different approaches to work and research by academic and business organizations. These differences revolve around (a) benefits, pay, and perks for conducting research; (b) schedule and tempo of work; (d) employee background and education; and (d) agency environment and organization (Wright-Isak & Prensky, 1993). These factors contribute to the gap between academic and business/practitioner organizations.

Basic research risks a faulty foundation if not challenged through applied research. An example is presented by Wright-Isak and Prensky (1993) about problems in conducting applied research related to sampling and interview methods in the field of marketing. Simultaneously and independent of each other, academics and practitioners were studying sampling and interviewing methods in the 1930s. After the results became known, the academics criticized the practitioners' results for serious flaws in methodology, and the practitioners would not have found the results from academic research sufficient to satisfy their needs, which were field level and practical. Had the two sectors been in better communication with each other, the applied research may have been of higher quality, and the academic researchers may have been better able to

develop methodologies based on practice. A field with strong links between theory and practice provides a "more clearly defined professional identity for future generations" and a more positive perception by society that could eventually lead to funding for research, funding of academic departments, attraction of top students, and acceptance for conducting research (Wright-Isak & Prensky, 1993, p. 23).

Bolton and Stolcis (2003) identify useful research as "(1) the outcomes must increase practitioners' understanding of organizations and lead to improvements in practice; and (2) the outcome must contribute to the theory and general body of knowledge of the academic discipline" (p. 627). A "lack of congruence between academic research and practice in the field of public administration" (p. 626) also exists. Criticisms of academic research are "research takes time and may not be ready when" issues need to be addressed, should "simplify problems to make them amenable to study, and conceptualize problems to fit methodologies, rather than fit the nature of the questions or needs of the decision makers" (p. 629). General reasons for not using academic research include: (a) slow preparation, (b) use of outdated methods, and (c) use of a technical jargon. This leads to the question of whether the research is useful. There is also a problem with a common definition of useful. Another concern is that practitioners and researchers do not prioritize the same issues (Bolton & Stolcis, 2003).

To summarize, practitioners are looking for improved methods for both technical and administrative operations; however, the often slow and methodical pace of completing academic inquiry may not meet the needs of practitioners (Graffy, 2008).

Research Questions

The focus of this study is on the production, transfer, and utilization of public administration research within the public sector, specifically public wastewater agencies. The following questions guided the study:

1. Are there differences in the perceived utilization of technical-focused research versus administrative-type research within wastewater treatment organizations?
2. Are there differences in collaboration on technical versus administrative issues within wastewater treatment organizations?
3. Does the quality of research influence utilization?
4. Do the characteristics of managerial leaders in wastewater treatment organizations affect the utilization of administrative-type research?
5. Do characteristics of wastewater treatment organizations affect the production, transfer, and utilization of administrative-type research?
6. What are the prevalent knowledge transfer mechanisms within wastewater treatment organizations for administrative-type research?
7. What criteria enable utilization of research?

Significance/Contributions From This Study

Researchers have criticized the quality of public administration graduate research and many have critiqued the connection between public administration academics and practitioners. The findings from this research effort will serve to better understand the reasons for the perceived lack of connection between academics and practitioners in public administration. The research results will also identify if wastewater practitioners

perceive issues of quality in academic research from public administration or if there are suitable avenues to reach or "transfer" the knowledge to practitioners in the wastewater industry. There may also be a problem applying the research, which could be hindered by many factors including organizational characteristics or individual traits. Since the interviewees were asked to compare research quality, exposure to, and utilization of technical wastewater research with administrative research, findings may present opportunities and recommendations for changes to enhance research utilization.

Methodology Overview

This section provides a brief overview of the methodology used in this research. A full description of the methodology is provided in Chapter IV. The study utilized interviews as case studies to evaluate the research questions. The interviews provided information for two different units of analysis: the individual and the organization as it was not known which is more influential to the transfer and utilization of knowledge.

Instrumentation

Survey questions were used for 12 telephone interviews. The questions were predetermined but allowed for flexibility during the discussion if something new or unique arose during the conversation. The survey questions included several Likert-scale questions. The method of analysis for each question was predetermined to allow for a methodical and consistent analysis.

Limitations of the Study

This research study was limited to individuals within publicly owned treatment works in the United States; therefore, the findings are not likely generalizable to other public sector organizations. The findings, however, provide insight into reasons why research is or is not utilized for other fields that can be further explored in other research. Since the research instrument was an interview, the findings are based upon individuals' perceptions, not observation, of behavior. This is important to note since perception and reality may not always be precisely the same. The study also focused on those solely in management. Therefore the results may not be able to be extrapolated to individuals not in management. Finally, a chosen interviewee may have a different view from another person within the same organization and may not be representative of the larger population.

Background on the Wastewater Industry

Wastewater Management and Ownership

In the United States more than 16,000 publicly-owned wastewater treatment plants serve nearly 190,000,000 people or about 72% of the population. There are approximately 2,100 privately owned treatment plants (J. Clark, personal communication, March 24, 2009). Approximately 40 billion gallons of wastewater per day are treated at these facilities (Center for Sustainable Systems, 2010).

The technical staff at these facilities include plant operators, scientists, engineers, mechanics, and electricians. The engineers usually have educational backgrounds in sanitary, civil, or environmental engineering and obtain a professional engineer license

from the state government where they are employed. Operators may or may not hold academic degrees, but they take program coursework to prepare for a state certification exam to become an operator and progress through a series of tests and corresponding grade levels. As with most organizations, support functions include staff in information technology, public relations, finance, and human resources.

Publicly owned wastewater organizations can be a part of a city, a county, or a regional special district. Regardless of type of organization, public officials will operate in a governing structure and be bound by public sector laws and practices. Since publicly owned wastewater treatment plants are funded by taxpayers' dollars and governed by publicly elected officials, most records and information are accessible to the public because of federal and state freedom of information, environmental review, and public meeting laws. This may contribute to the general openness of technical information and sharing within the field.

The predominant organization for wastewater professionals is the Water Environment Federation (WEF) whose mission is to preserve and enhance the global water environment (Water Environment Federation, 2009). The research arm of this organization, the Water Environment Research Foundation (WERF, 2009) has a policy to release journal publications after 2 years, furthering the availability of wastewater information. WEF and its publications are discussed in more detail later in this chapter and in Chapter II.

There are several other organizations for wastewater agencies including California Association of Sanitation Agencies (CASA) at the state level and the National

Association of Clean Water Agencies (NACWA). These organizations allow for coordination on policy issues and legislation. The Association of Metropolitan Water Agencies (AMWA) and the American Water Works Association (AWWA) are geared more toward water supply, but members may also have responsibility for wastewater programs and facilities.

Even in areas where there are separate water and wastewater organizations, the dividing line between the two sectors is not well defined since many wastewater treatment plants produce water that is of high quality and in the direct supply chain for water delivery. The water and wastewater sectors performed a self-assessment and published the results in the form of a state of the industry report in 2003 (Westerhoff et al., 2003). The publication provides case studies and trends on the industry as well as methods for success; the intended audience was the overall water industry, which includes water supply and wastewater treatment. Key points are presented in the following paragraphs.

It is estimated that in the United States approximately 15% of the population is served by investor-owned utilities, whereas in France 75% of the population and in the United Kingdom 90% of the populations are served by private utilities. In an effort to save money, many U.S. jurisdictions in the 1990s considered privatization. Organizations took measures to improve efficiency due to the threat of private sector acquisitions. This led to a review of practices and a collaborative effort between AWWA and AMSA to prepare handbooks on competitiveness, all in an attempt to cut costs. Water pricing is often challenging and it is difficult for staff, councils, and politicians to

value and set prices. Because water pricing has traditionally been low,[1] a small increase may be perceived as being high when it actually has a relatively small impact on household expenses compared to other goods and services. The private sector has been savvier at pricing and financing, and privatization was viewed as one way to acquire a cash boost. In addition, small utilities often struggle most with compliance as it is difficult to pay for improved technology as regulations change requiring higher levels of treatment (Westerhoff et al., 2003).

An independent utility is defined as being under a board or other governing body, and these organizations can have greater efficiency. Independent utilities may be state- or locally established authorities or joint/shared-power authorities. A dependent utility is within another unit of government, as with a city, and the utility can receive services, such as human resources and accounting, through the parent organization. This arrangement may make it more difficult to implement water-industry best practices due to a lack of economies of scale or dedicated purpose. In addition, dependent utilities are more affected by immediate public concerns, and it would be harder to reduce costs. According to Westerhoff et al. (2003), "The more independent the utility is, the greater its ability to make recommendations and decisions that have not been compromised by political influences" (p. 57).

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[1]Average household cost per year in the U.S. for water and wastewater was $523 which would include drinking water, laundry, irrigation, bathing, etc. The cost for soft drinks and other noncarbonated beverages per household was $707 (U.S. Environmental Protection Agency, 2011a). In addition, of 18 developed countries, U.S. residents spend the lowest percentage of household income on water utilities (U.S. Environmental Protection Agency, 2011b).

Networks and Collaboration in the Wastewater Industry

In addition to influences particular to an organization, professional networks can also play a role in changing technical and management practices. Peers from within a profession interact. Professional networks form an avenue for sharing of information through conferences, publications, newsletters, and online groups. City employees may join more management-oriented organizations such as the International City/County Management Association (ICMA). Among wastewater professionals, Water Environment Federation membership is common.

There are many avenues for networking within the wastewater industry. Professional organizations exist that fulfill this need through publications, conferences, special interest committees, and research teams. The Water Environment Federation offers journals, magazines, newsletters, conference proceedings, and several operational manuals. An annual conference is held as well as 15 specialty conferences. One of the conferences is related to management and the remaining are technical. Members may also join 46 different committees to network with others who share similar interests. Some of the committees serve an internal organization function, such as awards or bylaw review. Most committees are technical in nature, and a few relate to management. Trainings are offered throughout the year including webcasts.

Eight discussion boards are available for the public to view and postings are available for review for a period of 4 years. Six discussion boards are technical in nature, relating to the treatment or analysis of wastewater. Discussion board activity was analyzed by this researcher in 2009 in preparation for this study; the discussion boards

included 2,267 topics and 10,279 responses (WEF, 2009). One management board had 78 topics and 207 responses. The eighth board was for a specific promotional public education broadcast and only included five topics and seven responses. The public nature of the discussion boards may partially explain why the management board had fewer responses; managers may not want to post questions on sensitive issues.

In May 2011, the discussion boards were reviewed again. They had slightly lower post rates and previous topics had been cleared in late 2009. The lower usage could be attributable to additional modes of communication through social media including LinkedIn, Facebook, and Twitter.

Membership in the international WEF organization includes membership in the regional and local organizations. For instance, membership in the California Water Environment Association and the local region, Santa Ana River Basin Section, are made available for further networking. The state or regional associations offer training as well as annual conferences. The local organizations offer training, socials, and field trips to nearby plants. The state, regional, and local organizations may also offer information through the website and group sharing.

It is this researcher's opinion that wastewater professionals generally want a one-stop organization for all of their needs and do not want to belong to many different organizations to be able to network and acquire technical and management knowledge and skills. In addition, professional memberships may be paid by the employer for one, but not necessarily two organizations. Therefore, the employee may not want to pay out of his/her pocket for another membership. Also, if conference attendance is also limited

by an employer, monthly magazines may be the only foreseeable benefit of joining a second professional organization.

In addition to these formalized networks, informal networks also exist. Due to a reliance on certain products, connections may be made with other nearby wastewater agencies to gage market pricing for certain products and materials. If an agency is considering a new technology, employees may also reach out to representatives from other agencies who have experience with the product or service to gain feedback prior to making a decision on procurement and implementation. Agencies in certain regions may form a group to benchmark performance as well as customer rates. Typical benchmarks in the wastewater industry include cost to treat a million gallons, customer cost per single family residence, and number of miles of pipe. Networking also occurs during capital improvement design projects by meeting and interacting with consultants.

Definitions of Terms

Many terms are used throughout this paper that may be specific to this research or related fields of study. Although these may not include all related terms, definitions follow for more technical and frequently used terms. Unless otherwise referenced, the definitions are this researcher's understanding.

Academician. An individual who is a member of an academic institution.

Academic research. Research conducted with an academician involved.

Administrative research. Research that relates to the administrative functions as opposed to the core technical business of the organization. It may include research related to such items as organizational structure, strategic planning, diversity, quality and

systems management, training techniques, leadership, policy development methods, among many others.

Applied research. Research that aims to produces practical solutions to concrete problems (Argyris, 1993).

ASPA—American Society for Public Administration. National association of 10,000 administrators, scholars, and public manager members from 52 countries worldwide; for more information, see http://www.aspanet.org.

Basic research. Research that has no immediate or foreseeable use.

Collaboration. Work effort with individuals from multiple organizations.

Community of practice. Professionals coming together to share ideas and information.

Epistemology. The study of knowledge.

Explicit knowledge. Often more tangible than tacit knowledge and can be put into words and easily documented, such as product specifications and the final product.

J-PAE—Journal of Public Affairs Education. Quarterly publication of scholarly articles.

Knowledge production. The generation of new information.

Knowledge management.

> The deliberate and systematic coordination of an organization's people, technology, processes, and organizational structure in order to add value through reuse and innovation. This coordination is achieved through creating, sharing, and applying knowledge as well as through feeding the valuable lessons learned and best practices into corporate memory in order to foster continued organizational learning. (Dalkir, 2005, p. 3)

Knowledge transfer. The movement of information from one person or organization to another.

Knowledge transfer mechanism. The method for information to move from one person or organization to another.

Knowledge utilization. The application or use of information.

Mode 1. Term defined by Gibbons et al. (1994) that refers to empirical and factual knowledge generated by conventional methods within a single discipline.

Mode 1.5. Term defined by Huff (2000) to describe manner of collaborative research with practitioners and academics and is transitory between Mode 1 and 2.

Mode 2. Term defined by Gibbons et al. (1994) that refers to knowledge production through multidisciplinary and broad contexts.

Model 1. A theory of action that is private and less likely to develop cumulative learning.

Model II. A theory of action that is allows greater learning.

NASPAA. The National Association of Schools of Public Affairs and Administration accredits master's degree programs in public policy, public affairs, and public administration; for more information, see http://www.naspaa.org.

Network. A structure of interdependent organizations, or part of organizations, outside of the normal formal linkage (Milward & Provan, 2006).

NSF—National Science Foundation. A U.S. federal agency whose purpose is to promote the progress of science, advance the national health, prosperity, and welfare, and secure the national defense. NSF provides research funding.

PAR—Public Administrative Review. Journal with publications related to public administration, sponsored by the American Society for Public Administration.

POTW. Publicly Owned Treatment Works (public sector wastewater treatment organizations).

Practitioner. An individual who is employed or volunteering in an organization, as opposed to someone who is solely studying the field.

Public administration. Defined by Marini as,

> The practice and study of the professional formulation and influence of public policy and the implementation of such policy on a regular and organized basis on behalf of the public interest of a society, its civic subparts, and its citizenry. (as cited in Ott & Russell, 2001, p. 8)

Tacit knowledge. Implicit knowledge that cannot be easily put into words (Argyris & Schön, 1974). Tacit knowledge can be described as the know how to get to the final product.

Theoretical research. Same as "basic research" that has no immediate or foreseeable use

Type I. Term used in this study to categorize organizations with characteristics that do not encourage utilization of research.

Type II. Term used in this study to categorize organizations with characteristics that encourage utilization of research.

WEF—Water Environment Federation. Organization of wastewater professionals "dedicated to the preservation and enhancement of the global water environment."

WERF—Water Environment Research Foundation. An organization whose mission is to conduct research in the field of water.

Summary

Chapter 1 provided the reader with the background of the development of public administration, research in the field, and context about the challenges and problems that have led to this study. The potential contributions to public administration were outlined, and the overview of the research questions provided information on the direction of the research. In addition, the summary of the methodology presented the approach that was used in this research study.

Preview

The following chapter identifies publications related to practitioner utilization of administrative-type research, knowledge transfer, the history of public administration research, and a review of administrative literature in the wastewater field. Collaboration as a means of knowledge production, transfer, and absorption is discussed in detail. Chapter III presents the theory and framework related to the utilization of research: epistemology, action, organization, networks and collaboration, and knowledge management. In a broader context, knowledge production, knowledge transfer, and knowledge utilization also are considered in this research study. Chapter IV, Methodology, discusses in depth the methods used for the study. Chapter V, Analysis of the Data, describes the characteristics of those interviewed and the results. Chapter VI presents the implications, recommendations, and the findings.

CHAPTER II

LITERATURE REVIEW

In order to evaluate the validity of the proposed framework from Chapter II and in the setting of public wastewater practitioners, literature was searched with several different intentions. The literature survey includes research conducted in public administration or in other fields, focused on one of the three phases of research utilization, including research practices, generation of knowledge, transfer of knowledge, and utilization of knowledge that may be applied to public administration. This provides information of processes that could be applicable regardless of field or discipline. In addition, knowledge was sought from other fields that have found challenges in connecting theory and practice. Studies in other fields may reveal that the problem has been previously studied and potential solutions developed. In addition, publications were reviewed specifically focusing on the administrative and management issues in the wastewater field. To frame the current situation, the history of research within public administration is first presented.

History of Public Administration Research

New disciplines developed in the latter part of the 19th century include economics, psychology, communications, organizational behavior, and administrative and management science. With time, research methods also emerged in support of these

new disciplines. Public administration developed out of political science and management in the late 1800s and the first official academic program emerged in 1926 (McNabb, 2008).

During the latter part of the 1800s, the social sciences split from the natural sciences. New disciplines developed, such as sociology, economics, psychology, and anthropology. Research methods came into view, including qualitative and quantitative approaches. The public administration field of study was acknowledged in the late 1880s and first university program in 1926. Since it was an offspring of management and political science, debate began around whether public administration should be a social science or an administrative science. This debate surrounding the field also affected the approach to research (McNabb, 2008).

Late in the 19th century and into the 20th, professionalism grew. Professions can be considered highly specialized occupations. A shift to technical rationality from advocacy and reform occurred during the Progressive Era. Many professional associations formed including those for dentists, civil engineers, accountants, and doctors. Within universities, graduate and professional schools developed. This positivist approach relied on technical rationality, promoting the scientific foundation and technical expertise. The downside to this change is that some new disciplines lacked the ability to address large-scale social and ethical concerns (Schön, 1983; White & Adams, 1994).

Initially, researchers urged the positivist approach and quantitative methods most similar to the scientific method and the natural sciences approach. As it became apparent

that the positivist approach would enable researchers to determine findings to key public administration issues, alternative approaches and qualitative methods were sought (McNabb, 2008). The scientific approach to research includes identifying that there is a problem or something that needs to be further studied or identified (McNabb, 2008). Currently, there is a focus on rationalism and scientism. A review of historical moral and political ideas in public administration would prevent reinventing the past (Waldo, 1948).

Several with the field have criticized research. Stivers stated,

> The field of public administration has been marked since the early twentieth century by a largely fruitless search for scientific truth. I say "fruitless" because the attempts to identify generalizations about administrative practice that hold across all or even most situations inevitably runs against what seems to me to be an undeniable aspect of our subject matter—that is, any particular situation is simultaneously similar to and different from any other situation. (as cited in McNabb, 2008, p. 55)

The questions about research continued as an ongoing debate about public administration's nature and if it should be categorized as a social science, such as sociology and psychology, or an administrative science, like business. This is an important debate because it strongly affects the nature and direction of research in public administration (McNabb, 2008). Positivism and quantitative research methods were urged by the researchers in the early years of public administration. It became apparent to some that many of the questions of the field could not be answered through quantitative methods. Therefore, qualitative approaches were encouraged. Richardson and Fowers (1998) suggested that quantitative methods were only indicating patterns of variables and not leading to an explanatory theory.

Stone (2002) proposed that people in general have a need to create categories and classify items. Counting and categorizing, which is typical of quantitative methods, subsequently creates more disagreement and problems than are necessary. Case research for public administration is a tool that is effective across disciplinary fields and political boundaries that allows for an in-depth study of a subject (McNabb, 2010). Qualitative methods would employ more descriptive analyses and would avoid the potential disagreement created by counting and categorizing.

Ricucci (2010) concludes that there are still,

> Lingering concerns over the "identity" of the field, particularly whether it is an "art" or a "science," and perennial questions such as "What are the appropriate methods for studying or theory building in public administration?" The public administration community continues to ask, for example, whether public administration should strive to be a science, and thus predisposed to the "tools" of science, including its analytical methods. (p. 2)

In addition, public administration has no single paradigm, which is often a sign of a mature science. It may be that public administration is pre-paradigmatic or too fragmented to have a dominant paradigm.

Public Administration General Literature Criticisms

The scope and focus of research in public administration has been evaluated and criticized for various reasons including lack of theory testing, noncumulative research, lack of funding by outside parties, and poor quality (McNabb, 2007). One recurring argument is that public administration has not adequately developed theory or advanced a system of theories with assessments and understanding of each part of the system (Daneke, 1994).

Not only does public administration not have a standardized procedure for research (Spicer, 2008), but there has also been debate regarding the research approach to public administration—whether it should follow normative scientific research or alternative approaches. Pragmatism has been frequently utilized in the research approach due to public administration being a field of practice and many of the researchers have at some point in their careers also been practitioners.

Incentives for academics are often based upon the number of publications. There are several differences between the needs of academics and practitioners. These include a theory versus practical, "data-supported versus pragmatic," "scientific method versus case" studies/examples, and differences in academic-focused journals versus practitioner focused, and tenure versus organizational effectiveness (Bolton & Stolcis, 2003, p. 627). In engineering and many sciences, practitioners are interested in furthering academic research and research may be funded by both government and the private sector. Practitioners and researchers are often part of the same community of practice based on core business or technical subject matter. While administration is present in all organizations (forestry, transportation social services, education), the interaction between practitioners and researchers is likely to occur for core business functions, but not necessarily for administration and management.

Ricucci (2010) describes the ongoing debate of how knowledge is generated within public administration. It may be generated by experience or from theory. These two views form the grounds for empiricism, knowledge acquisition through senses, versus rationalism, knowledge acquisition through reason. As an alternative perspective,

the variety of research methods utilized in public administration highlight the broad range of tools and lenses through which to view a problem. Modes of inquiry have included interpretivism, rationalism, empiricism, postpositivism, and postmodernism. This variety has helped to build both practice and theory.

McNabb (2010) also defends the use of multiple types of research methodologies by elaborating on the value of case research for public administration. It is often used to understand a phenomenon with its context. Case research can be explanatory, interpretive, or critical. Explanatory is the most applicable for public administration and the most common. It serves to "develop a causal explanation of some social phenomenon" (p. 28). In addition, case research may be used to develop or examine theory.

Linking Theory to Practice

In the early 1980s, there was concern that research was becoming irrelevant for practitioners and professional schools. Research should be teaching managers new strategies and how to implement them (Lynton, as cited in Schön, 1987?). Utilization of research knowledge is an outward sign that research has importance and validity. When an academic field and the practice are connected, the needs for research are driven by practitioners and the research informs the practice (Argyris & Schön, 1974).

> On the high ground, manageable problems lend themselves to solution through the application of research-based theory and technique. In the swampy lowland, messy, confusing problems defy technical solution. The irony of the situation is that the problems of the high ground tend to be relatively unimportant to individuals or society at large, however great their technical interest may be, while in the swamp lie the problems of greatest human concern. (Schön, 1987, p. 3)

Schön (1987) proposes a reflective practicum integrating practice and research, and professional schools look to be a link between university/research and practice.

Differences in research range from applied with immediate possibilities for use to basic or theoretical research, which has no immediate or foreseeable use for the findings. Basic research may only be understood by, or of interest to, fellow academics. The interaction of both types of research is necessary to further the theoretical knowledge of any field. Applied research may become stagnant without new concepts from basic research as well as losing "intellectual and methodological rigor" (Wright-Isak & Prensky, 1993, p. 23).

Additional proposals to improve the connection between theory and practice include the researchers' publishing their work in journals and texts, teaching their findings, consulting, and providing training related to their area of study. Academic researchers could provide training to students to use research by reviewing and determining items for action. Qualitative research should supplement quantitative research in a study, and researchers should be able to use a range of research techniques and be skilled in all of them for any given study. This will allow the best suited approach to be utilized (Beyer & Trice, 1982).

Lynn (1996), in *Public Management as Art, Science, and Profession*, asserts that helping managers do well at thinking straight and acting in a thoughtful manner (a) is bound to produce better performance, all others things equal, in a way that having a more admirable character or more enlightened values will not; (b) is an appropriate goal for university-based education and training in a way that character and personality

development are not; and (c) is essential to the creation of the viable concept of professionalism in public management in a way that a stress on personal beliefs and qualities is not.

The field of public administration is considered an action field, which further drives the move toward a strong link between research and the practice. Schön (1987) attributed "a crisis of confidence in the professions and their schools" to "the prevailing epistemology of practice" (p. 12). Agranoff and McGuire (2003) wrote that management and administration are fields of action, and although it may be challenging, research within the field should recommend paths of action and information to apply.

Public administration practice without a foundation in theory reduces the credibility of the profession. Englehart (2001) stated:

> Practice without theory is a hollow exercise and public management without theory is mere tinkering with systems. The absence of theory within practice greatly diminishes the perception of public administration as a profession; . . . theory gives practitioners that context and enables them to take a broader view of their functional work on Timney . . . [and] practice is theory-in-place. (Englehart, 2001, pp. 371-372)

Simon suggested that for public administration to be a science, it should be "concerned purely with factual statements" (as cited in Spicer, 2008, p. 56). Spicer reviewed ideas through public administration's history and believed that if public administration were to be purely emulating the natural sciences, the study of past ideas would be meaningless. It is nearly impossible to convey information about social elements in an impartial way.

Raadschelders and Lee (2011) reviewed publication trends in *Public Administration Review* (*PAR*) from 2000 to 2009. They reiterate the challenges over the

years of linking academics and practitioners. Their research efforts show fewer publications by practitioners in the review period of 2000 to 2009. The percentage of practitioners publishing articles has declined in both the United States and other countries. Several possible explanations are presented for the decline. First, practitioners may be alienated by the specialization and new research methods. Second, public employees work on a performance-based system and there is no incentive for writing journal articles. Third, public employees who would be writing articles are at the higher levels of the organization and these positions are more political. Fourth, contractors are often providing service for the public organization including writing articles, and *PAR* may not be the publication choice for visibility of contractors. Last, budget cuts may leave fewer people to do more work, and public employees may not have the time to prepare publications.

Public administration theory and practice should be complementary to each other. Two methods of doing this would be academics learning from practitioners and having better tools to disseminate information to practitioners. Specific suggestions include blogging, articles in local or national newspapers, or trade publications (Van Slyke, 2010).

Quality of Research

There are several authors who found public administration research to be of low quality for several reasons (McCurdy & Cleary, 1984; Stallings, 1986). Since academic research may have a very narrow focus, it may not provide much for the practitioner to apply. In addition, one study may contradict another, which also leaves the practitioner

skeptical of both studies (Wise & Tschirhart, 2000). Adams and White (1994) critiqued research, and the majority of studies were of poor quality, which would be unlikely to further the theoretical framework of the field or be useful to practitioners.

Quality may be characterized through validity, generalizability, and the research method (Wise & Tschirhart, 2000). For each of the characteristics to be of high quality, sound research methods suitable to the research questions should be applied, acceptable sample sizes used, and statistical evaluations should be applied appropriately. Conversely, quality may be poor or questionable if the method of research and statistical evaluations is inappropriate. If the quality is poor, it may limit the chances for utilization.

Yin (2003) provides four tests to ensure quality of research that can be specifically applied to case studies. Satisfying these tests will establish sound research practices and give the reader confidence with the research methodology. The tests include construct validity, internal validity, external validity, and reliability, which are defined as follows:

- *Construct validity*: establishing correct operation measures for the concepts being studied
- *Internal validity* (for explanatory or causal studies only, and not for descriptive or explanatory studies): establishing a causal relationship, whereby certain conditions are shown to lead to other conditions, as distinguished from spurious relationships
- *External validity*: establishing the domain to which a study's findings can be generalized
- *Reliability*: demonstrating that the operations of a study – such as the data collection procedures – can be repeated, with the same results. (Yin, 2003, p. 34)

Academic research may be seen as fragmented knowledge with a small piece of information presented in each study and later studies may contradict findings of previous

studies. This leaves the practitioner without much to put into practice because the practitioner would not know which study is correct (Wise & Tschirhart, 2000). Wise and Tschirhart (2000) conducted a literature review on diversity data and evaluated how useful the research is for practitioners. While this type of review and synthesis, coupled with publication in a premier journal, seems to have potential for linking the gap between academic research and practitioners, the authors could come to no clear conclusion for practitioners about the benefits or downsides of diversity in the workplace. In their attempt to summarize the findings across the literature, they found mixed results, units of measure that did not allow for comparison, or the study subjects that did not allow for generalization to larger populations (Wise & Tschirhart, 2000). This conclusion is consistent with the findings of Adams and White (1994) related to the quality of dissertation research from several social science fields.

Specialized terms and acronyms are frequently used in studies and reports. One publication found that use of jargon use does not significantly impact credibility (Brown, Braskamp, & Newman, 1978). This is then considered a factor that should not impact the quality or the ultimate utilization of knowledge.

Adams and White (1994) found that dissertation research from several fields, including public administration, was of poor quality. Dissertations were rated based upon the existence of a framework, flaws in the research, relevance of the findings, importance, and quality. Public administration received a D+ for overall quality rating. Of all the public administration dissertations reviewed, Adams and White found that only 6% had definitive practical relevance and 40% had possible relevance. Forty-six percent

of the public administration dissertations had no relevance to theory, and 37 % had obvious flaws. Adams and White's study described practice-based research, which is often characterized by asking how instead of why. Asking how will not seek to identify the cause of a phenomenon. These are dissertations that contribute to neither the theoretical nor the applied research because they are simply descriptive. Foreign-focused research is identified as a study that focuses on a single case in the author's home country (non U.S.) and typically describes the implementation of a policy or initiative. This type of research was criticized for lack of theoretical or practical relevance. The authors conclude that practice-type research as well as foreign-focused public administration research are both held to lower standards for the dissertation.

Cleary (1992; 2000) reexamined doctoral dissertations from years 1990 and 1998 and compared the findings to the earlier McCurdy and Cleary work (1984). The dissertations in public administration were generally found to be improving over time. Areas where the most improvements were seen included research purpose, showing causal relationship, and cutting-edge research. Choosing topics of importance showed a slight overall decrease and theory testing only showed a modest improvement. It was also noted that dissertations in 1998 on topics of importance did not correlate with higher quality work as had been seen in the past.

In Raadschelders and Lee's (2011) review of *PAR* content from 2000 to 2009, the authors recommended that future journal articles more clearly describe the epistemological and ontological assumptions of the research methodologies. Although

the review was not focused on the quality of the journal publications, they noted that this was often missing from the empirical studies.

Spicer (2008) provided a different perspective: that perhaps the field has focused too much on the scientific method for research and the questions of public administration are so complex that no single approach fits all. It was suggested that "a more philosophical, historical, and comparative approach" (Spicer, 2008, p. 66) be utilized. Another perspective, provided by Pollitt (2011), poses that theory and knowledge building is happening within subgroups of public administration, and this is the current mode across many different fields. Pollitt elaborates on methods and advances in comparative public administration. With disagreement among scholars about methods and approach, it is understandable how research has not met expectations.

O'Leary, Van Slyke, and Kim (2010) stated that improvements have been made in the field of public administration:

> Progress continues to be made in both the intellectual diversity of topics and the empirical sophistication with which studies are being designed, data gathered, and findings analyzed. The quality of public administration research is improving, and its use and dissemination are on the rise. (p. 293)

In addition, they find that more policymakers are using research in their decision making.

Knowledge Transfer

Knowledge has become known as a critical resource for organizations to handle the ever-changing environment. It is not possible for organizations to advance their knowledge solely through in-house research; therefore, a reliance on outside research organizations becomes necessary (Santoro & Saparito, 2006). There are many ways to

obtain information, including training, hiring a consultant, attending a conference, networks, and research. One possible way for knowledge to transfer from academic researchers to practitioners is through a collaborative research effort.

Lynn (1996) also suggests that tacit knowledge is best learned through on-the-job training, mentoring. On the surface this would seem to diminish the value of academic research for practitioners; however, it may simply be a more challenging mode of knowledge transfer.

Knowledge Transfer Through Training

Organizational training may also be an avenue for transferring research knowledge into public organizations. Attendance at formal training sessions allows knowledge to be imparted, which may have developed from academic research. Training may also provide information from sources other than academic research. This is an opportunity for practitioners to acquire knowledge, which they may decide to utilize and put into practice.

Knowledge Transfer Through Collaboration

Collaborative research is one mechanism for knowledge to transfer from academic researchers to practitioners. This also may allow for better alignment with practical intentions. Collaboration may not only offer more effective solutions to complex problems, but may also be a means to organizational learning. Similar cultural traits may enable both collaboration and organizational learning. Traits include

individuals in organizations that value "equality, adaptability, discretion and results" (Agranoff & McGuire, 2003, p. 180).

The term, community of practice, may also be used to describe professionals coming together to share ideas and information through conferences, teleconferences, projects, listservs, webcasts, or e-mails. These communities are most likely to be successful with a sponsoring board, a review of priorities by stakeholders, and leaders who take on roles (Snyder & Briggs, 2003). This is often the function assumed by a professional organization.

Academic researchers may collaborate in many different ways. The literature documents academic-academic collaboration (Sargent & Waters, 2004), academic-industry collaboration (Lee, 2000; Rynes & McNatt, 2001; Santoro & Saparito, 2006; Siegel, Waldman, Atwater, & Link, 2004) typically in the sciences, practitioner-academic-stakeholder collaboration (Andersson, 2009), and academic-practitioner collaboration (Amabile et al., 2001; Rynes & McNatt, 2001) through management-type research within an organization. Although this study is focused on academic-governmental agency collaboration and research, insight can be gained through other fields of study.

In academic research, a collaboration continuum ranges between complementary to integrative at each extreme. On the complementary end, the research can be broken into discrete tasks and each collaborator works on his or her task. At the integrative end, all aspects of the project are shared. A collaborative project can operate anywhere in between the two extremes (Hara, Solomon, Kim, & Sonnenwald, 2003).

One approach to academic collaboration can be the utilization of organizations for social science research. This form of collaboration does not appear to be common or well documented in the literature. One example of this type of research within an organization is presented in *The Forest Ranger* (Kaufman, 1967) where Kaufman spent extensive time in the U.S. Forest Service observing organizational behavior. Kaufman made general and agency-specific findings on organizational behavior. He wrote, "They broaden what Simon has called the 'zone of acceptance,' inculcating in field officers the predisposition to respond primarily to cues and signals from the leaders of the agency, and to resist conflicting influences from other sources" (Kaufman, 1967, p. 229). Kaufman drew on Simon's work to link practice to theory. He was able to draw general organizational conclusions, make recommendations for further studies, and assess how this in-depth analysis could be used in a complementary manner with other methods of analysis. Kaufman nearly proved Herbert Simon's theory on administrative behavior through evaluation of this ideal agency. He detailed how the Forest Service's method of specialization, unity of command, span of control, organization by purpose, process, clientele, and place all contribute to the efficiency and cohesiveness of the organization. Kaufman concluded that this method of examination should be used in conjunction with other methods. Since Kaufman actually cited Simon's concepts in *The Forest Ranger*, he was employing multiple methods, relying on theory to tie into his field findings.

In the conclusion, Kaufman (1967) stated that "it would be gratifying just to be able to portray an organization accurately, to capture the drama, the excitement, the spirit

of administration" (p. 241). His method of research allowed for portrayal of an organization and demonstration of a new research method.

In a study conducted by Rynes and McNatt (2001), case studies of academic research inside organizations were reviewed. The findings revealed that "organizations appeared to participate primarily out of good will or curiosity, rather than the expectation of immediate applicable results" (p. 16). Their findings would suggest that academic researchers should not be concerned about conducting research in organizations for fear of pressure to provide results of immediate value. Another finding included that the college's rank or reputation did not appear to impact the organization's willingness to work with the researcher, nor did the quantity of the researcher's prior publications (Rynes & McNatt, 2001). An increase in the research conducted in organizations would benefit industry and organizations as higher performance is linked with the use of management practices that were developed from research (Becker & Gerhart, 1996).

An assessment by Andersson (2009) found that stakeholder participation in a collaborative effort served multiple purposes including building trust and having people with relevant information present to share with and educate others. These factors enable dynamic problem solving for the very complex issues facing the public. Vogel (2010) described three possibilities for transferring knowledge between practitioner and academics. These included (a) development of knowledge simultaneously yet independently from each other; (b) practitioners developing knowledge then sharing with academics, such as through academic publications and vise versa (the transfer strategy); and (c) academics and practitioners jointly working on research. A study was conducted

in Germany to identify which of the three modes was in place by evaluating publications of various fields and the number of authors. While the dominant method for transfer of knowledge from academics and practitioners was through the transfer strategy, collaboration strategy is a viable option, and may be the strategy of the future.

Organizational and individual skills for successful collaboration. One of the ways that knowledge may transfer from research to practitioner is through collaborative research efforts. Collaboration for knowledge transfer may happen in several different ways and is affected by many factors. Collaboration may occur as a result of funding for academic research. Although the economic incentive of grant money may be present, there is evidence that this alone will not create a successful collaborative effort. Interpersonal skills and relationship building play a large role in collaboration. Specific factors that will influence the success or failure include work style, writing styles of the collaborators, work priority, personal connection/compatibility, work connections, incentives, such as prestige, funding, or publications, and socio-technical infrastructure (Hara et al., 2003).

In addition to interpersonal and relationship skills, Santoro and Saparito (2006) found that relational trust was linked positively with the transfer of knowledge between academic and industrial collaborators. Relational trust is defined as follows:

> The willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party. (Santoro & Saparito, 2006, p. 337)

Santoro and Saparito also found in this study that information was more likely to be shared in a beneficial way when the academic industry collaborators trusted each other.

In a case study, the majority of those responding from the university, industry, and academic researchers agreed that interpersonal relationships were very important for collaborative efforts. They also cited common problems as one of the other parties not understanding their point of view or having an appreciation for others' motives or culture (Siegel et al., 2004). Conflict over ideas seemed to be a problem that could be worked through; however, conflict over roles and responsibilities or differences in problem-solving approaches appeared more difficult to resolve (Amabile et al., 2001).

In reviewing academic collaborations where researchers enter an organization to conduct a study, Rynes and McNatt (2001) found that interacting, listening, and asking were key skills for successful collaborations of this type. Spending more time within an organization allowed for increased benefits through surprising results, increased personal learning, and observed change of the organization. In light of Santoro and Saparito's (2006) finding that trust is linked positively to successful collaboration, it is possible that the additional time spent within an organization builds trust with people allowing them to share more honestly during a case study.

For collaborators that are not physically near each other, collaboration has better chances for success by best utilizing each participant's skills, establishing conflict resolution processes, and having frequent meetings. Conflicts arising from a poor understanding of cultural differences as well as project roles among collaborators can lead to negative outcomes (Amabile et al., 2001). It appears that similar characteristics are needed for inter-organizational collaboration as well as for intra-organizational (Tjosvold & Tsao, 1989).

In addition to this set of characteristics, a desire for outside and new information is necessary for an organization to be considered innovative. In a study of the medical device industry in New York, it was found that more innovative companies had more interaction with academia than their low innovation counterparts (MacPherson, 2002). In a European study (Fontana, Geuna, & Matt, 2006), the openness of the company to the outside environment was a critical factor to describe the level of collaboration with academia. This supports the need for relational trust that Santoro and Saparito (2006) stated to be essential. The Fontana et al. (2006) study also showed that the alliances were very diverse and generalizations were not able to be made.

Vyhmeister (2000) studied organizations and found that additional layers of middle management negatively impacted organizational learning. This study utilized a model to understand the relationship between management and organizational learning.

Based upon a literature review and interviews with career researchers and academic researchers, Sargent and Waters (2004) presented a framework for academic research collaboration (Figure 1). If an organization were to collaborate with academics, interpersonal processes are of extreme importance and shown at the center as they are continually utilized throughout the project and important to its success (Sargent & Waters, 2004).

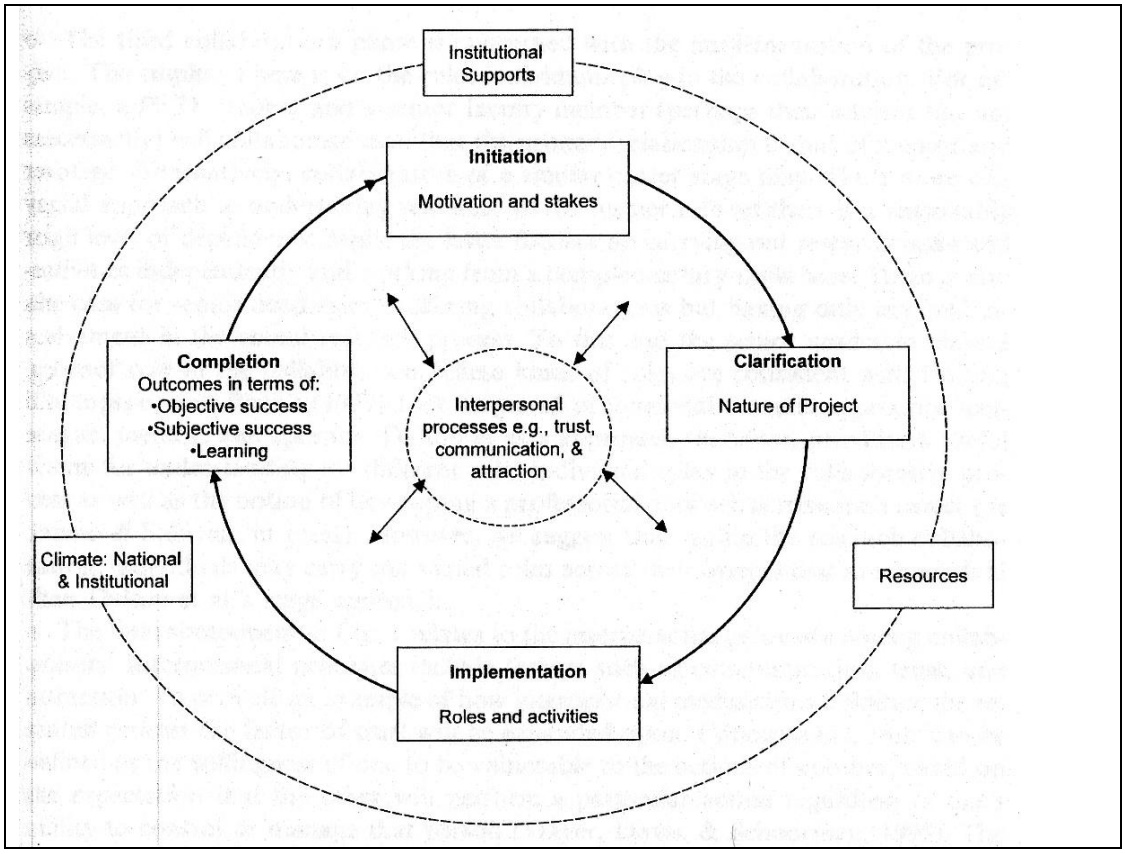

Figure 1. Model of academic research collaboration. From "Careers and Academic Research Collaborations: An Inductive Process Framework for Understanding Successful Collaborations," by L. D. Sargent and L. E. Waters, 2004. *Journal of Vocational Behavior, 64*(2), p. 311.

The core processes include project initiation, clarification of the details of the research project, implementation, including roles and activities during the project, and completion where the project will be evaluated. The interpersonal processes are shown at the center as they are continually utilized throughout the project and are important to its success. Amabile et al. (2001), Hara et al. (2003), and Santoro and Saparito (2006) all have research findings that expound on the value of interpersonal skills in academic research collaborations.

Motivational reasons to collaborate. To understand the drivers for academic researchers or industrial partners to enter a collaborative effort, Lee (2000) describes a hierarchy of motivation. His study mostly focused on manufacturing, scientific, and engineering research. Academics desire the following when entering into research collaborations with an industrial company:

1) Securing funds for graduate assistants and lab equipment,
2) Gain insight into one's own research
3) Field-test application of one's own theory
4) Supplement funds for one's own research
5) Assist university's outreach mission
6) Create student jobs and internships
7) Gain knowledge useful for teaching and
8) Look for business opportunity. (Lee, 2000, p. 120)

Lee (2000) also presented the ranking of motivations for collaboration by industry. These included:

1) Research on product development,
2) Conduct 'blue sky' research in search of new technology,
3) Solve technical problems,
4) Design prototypes,
5) Provide seminars and workshops,
6) Conduct fundamental research,
7) Support universities, and
8) Develop software. (Lee, 2000, p. 130)

Knowledge has become known as a critical resource as organizations attempt to handle an ever-changing environment (Santoro & Saparito, 2006). Although Santoro and Saparito's article was written with a focus on private sector manufacturing firms, the concepts may be transferred to the public sector since knowledge can be a resource in any field. Santoro and Saparito argue that it is not possible for organizations to advance their

knowledge solely through in-house research; therefore, a reliance on outside research organizations becomes necessary.

The institutional context of collaboration plays a large role in the success of the effort. Amabile et al. (2001) argue that the organizational support for the collaborative research effort is important. The external environment complicates collaborative research in many ways (Buisseret & Cameron, 1994). This can be seen in a university example where the university had an independent research vision from the individual collaborators.

Based upon the literature, Figure 2 graphically presents the different factors that impact an organization's suitability as a collaborative partner for academic researchers. An organization's success will fall anywhere on the continuum for each of the factors.

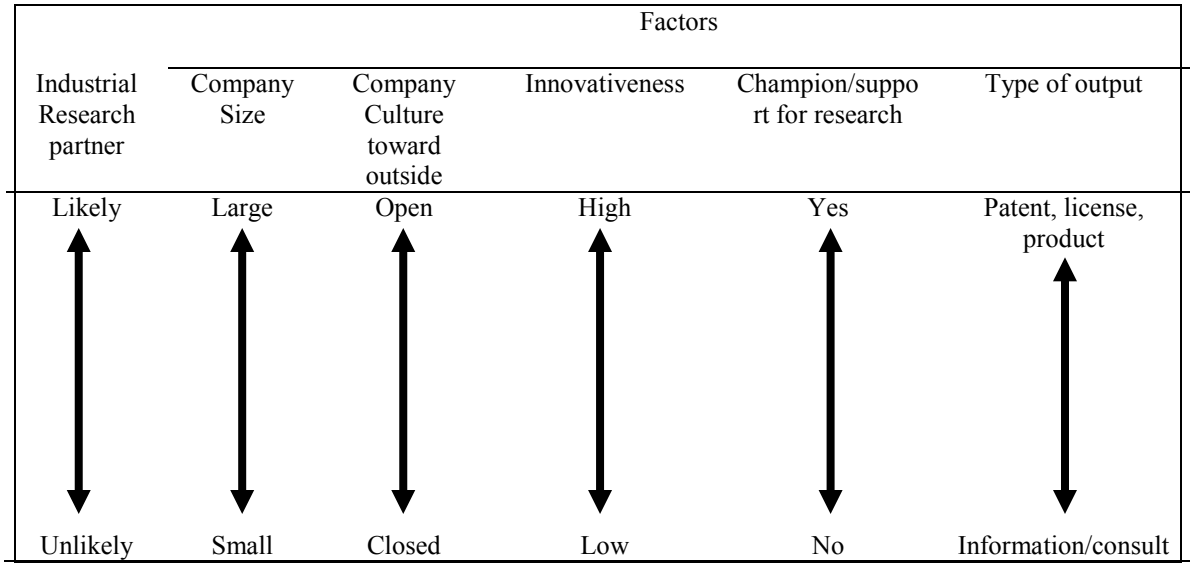

Figure 2. Factors affecting collaboration. Figure developed by this researcher.

Encompassing all aspects of the research project are resources, such as funding and staffing. The climate is influenced by the institution, politics, culture, and institutional support. Sargent and Waters (2004) found that funding was a key factor impacting collaboration. Schramm (2006) confirms that universities that successfully partner with industry treat their partners as "allies" and students are encouraged to think about the "business potential" of their research efforts while in school (p. 23). This study focused on research involving intellectual property. Multiple benefits are realized by partnering with business including usable research, practical experience for students, and potential employers (Schramm, 2006).

Issues concerning the commercialization of academic research. Several studies have evaluated collaborative efforts and have categorized their research by the type of industry (Carayol, 2003; Fontana et al. 2006; Gulbrandson & Smeby, 2005; Jankowski, 1999; Lowe, 1993). Gulbrandson and Smeby (2005) focused their study around funding of research by industry and the impacts on research including an evaluation if funding varied by field of study. Technology and natural sciences had the highest percentage of funding by industry and humanities the lowest. Jankowski (1999) states that sources of funding for university research, broken down by field of research, have been changing over time. This change has caused an increase in collaborative efforts.

Funded research is more prevalent in medicine, sciences, and engineering; however, administrative research may also be funded. Although grants and funding enable research to be completed, there are downsides as well. Funders are typically

private sector organizations that can gain from new discoveries that lead to products and sales revenue. Corruption may be seen where a profit is to be made.

The government may also fund research through organizations, such as the National Science Foundation, and wastewater agencies may fund research efforts. Administrative-type research may be conducted by an academic, researcher, by a company for its internal information and subsequent optimization, or in preparation for a mainstream book. For example, the nonprofit IBM Center for the Business of Government provides funding for administrative research and makes the written reports available to the public.

In 1980 in the United States, a congressional act allowed universities and businesses to own patents from research that was conducted using federal monies. In 1999, the University of California was issued 468 patents; whereas prior to the change in law, there were 400 patents issued in the entire United States to universities, research hospitals, and other research institutes. While Demain (2001) refers to these as successful collaborations, the government may later buy, in bulk, a product that was the result of federally funded research and have to pay full price with taxpayers' dollars. This commercialization may lead to conflicts of interest or corruption.

Lee (2000) raised the question about motive and stated concern that academic alliances with industry would steer research in the direction of only those with commercial application. Unfortunately, he was not able to evaluate this with the data findings.

Carayol (2003) asserted that less available government funding has pushed academic researchers into alliances with industry that may lead to initiating a "dysfunctional collaborative research project" (p. 906). By dysfunctional, Carayol refers to accepting or postponing research that the academic would like to pursue, but delays, in order to maintain funding. If a researcher has funding from an industrial partner, he or she may be incentivized to conduct research for a product that could ultimately be a cash-cow product for a company, such as pharmaceuticals or cigarettes.

New policies that could restrict collaboration with industry in the medical field are causing much debate. The medical field has acknowledged it "followed the money" through industry alliances and reaped the benefits, which include large clinical programs, more than a threefold increase in annual funding, bigger and nicer facilities, among many others (Finkel, 2006, p. 1181). While there is recognition of the potential to sway research, the public health of society has benefited from academic research collaborations through availability of products that may not otherwise be available.

Although the prevalent examples of industry and academic research alliances are in the pharmaceutical and technology sectors, research in the social sciences could be impacted if funded through commercial sources. If the practitioner organization is funding the research and wants to see a certain outcome, the results could be questioned. The impacts could include a loss of credibility for the researcher due to a perceived bias or pressure from the funding organization to achieve certain results.

In the private sector, technology transfer and patent development is a common mechanism for academic research to find its way into practice. There are five

universities in the United States that produce approximately 100 patents each per year (Schramm, 2006). If there were an equal economic incentive for public administration research, there might be additional research and greater visibility, as well as more utilization of the research.

Recommendations From the Literature Review

Through the literature, the following proposals have been given for improved research and connection between theory and practice, which may lead to greater utilization.

Rynes and McNatt (2001) encouraged collaboration of academic researchers through more inside-organization research. Their study showed no evidence of resulting problems and encouraged research initiated by an organization. The more time that the researcher spent at the site of the organization, the researcher found "greater personal learning, more surprising findings, and greater likelihood of change implementation" (p. 17).

Collaboration may cost more than the economic benefits, but will require further study (Katz & Martin, 1997). Agranoff and McGuire (2003) also urge the public administration field to evaluate if the benefits outweigh the cost of collaboration and to study this area further. Not much research has been pursued on the culture and climate in public agencies (McNabb, 2008).

O'Leary et al. (2010) recommended that public administration research knowledge be cumulative, methods and means of knowing remain diverse; it maintains the broad set of values, and it cross academic boundaries

Connection of Theory to Practice

Several authors propose methods for improved research and connection between theory and application, and academics and practice. Huff (2000) suggests that issues to study will come from practitioners, data will also come from practice, yet academics will develop definitions, establish frameworks, and compare data across organizations. Huff refers to this approach as Mode 1.5. Gann (2001) proposed more collaborative research efforts with government sponsorship.

Van de Ven and Johnson (2006) suggested that the researchers

1. Ground the research question or problem in concrete and observable phenomena in order to appreciate and situate its multiple dimensions and manifestations.
2. Develop plausible concepts and models that represent the main aspects of the observed phenomena and that thereby provide a base for new theories to address the central research question.
3. Use appropriate methods to design the research and obtain empirical evidence of the concepts and plausible models for examining the question about the phenomenon being examined.
4. Apply and disseminate the research findings to address research questions from the perspectives of different academic and practitioner users. (p. 810)

Since public administration does not have a dominant unifying theory then research within the field may be validation of other field's theories or revolutionary research.

Beyer and Trice (1982) suggest that researchers should publish their work in journals and texts, teach their findings, consult and provide training related to their area of study. Academic researchers should train students to use research by reviewing and determining items for action. Senior researchers should mentor junior researchers. Qualitative research should supplement quantitative research in a study, and if the subject of study involves two groups of distinct interests, research should be conducted on both.

Researchers should be able to use a range of research techniques and be skilled in all so for any given study, the best-suited approach will be utilized. The researcher should be actively involved in observation and data collection.

Although prepared for research on disability and rehabilitation, findings on utilization may be applicable to public administration (Research Utilization Support and Help [RUSH], 2011). The National Institute on Disability and Rehabilitation Research proposes that research should "change current practice or confirm it." Their findings include the following:

1. Utilization is improved by having the end users involved in the research.
2. Final utilization may look different from the original research findings as the end users may have adapted the results to fit their specific situation or needs. Prior to implementation, people filter and process the findings so transfer on information may not be successful.
3. The source of the research is more important that the quality. If this is true, then public administration research could have a difficult time gaining acceptance by those who affiliate more closely with another field as the end user would not necessarily be familiar with the researcher. This would support the idea that end users are more likely to utilize information from a national bestselling book if there is name recognition. The researcher needs to know the end user and understand his or her concerns, needs, "worries, beliefs, constraints, and priorities" (RUSH, 2011, Difficulties in Research Utilization Link).

This is similar to business where the consumer is seen as a priority. For public administration, it is difficult to understand those outside of the field as cultures exist within other fields or organizations. Often, practitioners may more closely identify with another field, for instance accounting or science, or an engineering discipline.

Several researchers evaluated published papers (Box, 1992; Houston & Delevan, 1990; Lan & Anders, 2000) and found little had been studied on organizational culture and climate. Schein (1996) asserts that public administration has not paid enough attention to culture and its influences on agency operation and ultimately, policy. Culture includes "shared norms, values, and assumptions" (p. 229). These characteristics would need to be observed, not necessarily measured.

Administrative Literature in the Wastewater Industry

The characteristics of the wastewater industry were presented in Chapter I, and this section presents the infrastructure within the industry for sharing administrative information as well as the findings of administrative literature related specifically to the wastewater industry.

Most of the organizations within the United States are publically owned and can be a part of a city, a county, or a special district treating wastewater from a region of several cities. Since water treatment and wastewater treatment plants may operate under the same umbrella organization, often the two are grouped together. Many wastewater treatment plants produce water that is of high quality and in the direct supply chain for water delivery. For the purposes of the literature review, both water and wastewater treatment publications were evaluated.

The prominent organization for wastewater professionals is the Water Environment Federation (WEF) whose mission is to preserve and enhance the global water environment. The organization was founded in 1928 and holds an annual conference and specialty conferences throughout the year. The majority of the topics are technical in nature, related to wastewater treatment, wastewater conveyance, and handling of byproducts. WEF also publishes texts and manuals related to wastewater. WEF has 75 member associations, which are geographically arranged by state, region, or country, and there are approximately 35,000 members. Key activities of WEF include:

- (R)esearch and publish the latest information on wastewater treatment and water quality protection;
- (P)rovide technical expertise and training on issues including wastewater collection, treatment, reuse, and operations; residuals and utility management; sustainability; and emerging water quality issues such as microconstituents;
- (S)ponsor conferences and other special events;
- (R)eview, testify, and comment on environmental regulations and legislation. (WEF, 2011, About WEF page)

Technical research is conducted in the wastewater industry by practitioners, consultants, private sector organizations, and universities. Wastewater practitioners typically conduct research for the purpose of improving operational performance or to reduce costs. The research can be conducted independently and is self-funded, in collaboration with others, as well as funded through organizations such as the Environmental Protection Agency (EPA), Water Environment Research Foundation (WERF), or the National Science Foundation (NSF). WERF, founded in 1989, is the research arm of WEF that supports water-related research through an interdisciplinary approach to address issues of water quality. Major sources of funding include government grants and subscriber dues (Guidestar, 2009). This organization makes

research publications available to WERF subscribers; however, after 2 years, the publications are available to the general public. The organization cites the value of having accurate information available, especially if elected officials are researching information related to potential public funding of water projects (WERF, 2009).

For technical issues, wastewater agencies may pay a membership fee to join a research organization. This would allow a direct influence over the research subjects and firsthand review of new findings. Two technical research organizations for wastewater organizations are WERF and the Water Resource Research Center (WRRC). As previously stated, WERF is affiliated with WEF. WRRC is associated with the University of Arizona.

Publications in the Wastewater Industry

Westerhoff et al. (2003) found that little had been published on utility leadership based on the lack of available publications on the subject, which is consistent with the results of this current literature search. Forty-six publications were identified through library database searches on administrative issues in water or wastewater agencies; however, few focused on leadership. The search was extended to the technical publications of the professional association to determine if management and administrative topics were covered. The findings are detailed in the following paragraphs.

Publications of WEF include five journals/magazines and six electronic newsletters. Of the hard copy publications, *Water Environment Research* is strictly a technical research journal. *Water Environment & Technology* (*WE&T*) is a magazine,

World Water is a technology magazine (one in English and one in Chinese), *World Water Reuse & Desalination*, and *Journal of the SJWP* is a publication that highlights industry award winners.

The monthly *WE&T* magazine was reviewed for a period of 3 years, January 2006 through December 2008, for the types of articles published. This limited time period was selected in order to compile a list of topics for use in the development of the interview instrument described in Chapter IV. The articles were categorized into technical and administrative topics. Technical topics were considered those related to technical issues, such as optimizing chemical addition, preventing sewage overflows, or reducing odors. Administrative issues included topics, such as contracting, the economy, staff roles during emergencies, collaboration, succession planning, remote management of people, training, funding, women and the glass ceiling, worker productivity, revenue sources, public perception, knowledge management, mentoring, education, organizational visibility, budgeting, and public outreach. Over the 3-year period, 33 of 321 or 10.3% of the articles addressed administrative issues. All were practitioner case studies. Over time there was no obvious trend toward increasing or decreasing the ratio of administrative articles. Two consecutive months had no administrative publications (November 2008 and December 2008), and the highest percentage of administrative topics reached 62.5% (August 2006).

The newsletter, *Utility Executive,* published by WEF, was also reviewed for content and had a higher percentage of articles geared toward administrative issues. This publication is produced six times per year, and 10 issues were reviewed from

January/February 2008 through June/July 2010. Of 75 articles, 38 were devoted toward administrative items (51%). The articles were based on case studies by practitioners. Topics included strategic planning, education, communicating and involving the public, staffing, future employees, organizational culture and diversity, collaboration, rates and revenue sources, business procedures, contracts, and leadership. Many of the technical articles focused on how a project or system will result in reduced costs. The financial bottom line was more prevalent in articles in the last six issues, corresponding to the economic recession. This same period also showed a decline in administrative articles.

With both the *Utility Executive* and *WE&T*, succession management was a prevalent topic. In *Utility Executive*, 13% of the administrative articles were devoted to this subject. In *WE&T*, issues related to the public, as well as succession planning, were the most recurring topics.

Administrative Literature Within the Water and Wastewater Sector

Literature was searched for journal articles, dissertations, and published master's theses in the water utility sector. With no bounds on the initial publication date through September 2, 2009, literature was searched for the terms wastewater, water utilities, organization, management, research, public utilities, sanitation, water, and sewer through ProQuest database. Countless publications were identified relating to technical aspects of wastewater operation and treatment design; however, only 46 publications or studies were identified that related to administrative and management issues of water/wastewater organizations. Those related to the administration and management of water

organizations are presented below and grouped by research matter inside or outside of the United States.

The following studies focused outside the United States:

- Strategic planning and competition in the wastewater sector (Mattisson & Thomasson, 2007)
- Accountability in water companies (Larrinaga-Gonzalez & Perez-Chamoro, 2008)
- Knowledge gaps in water management (Bandyopadhyay, 2007)
- Review of public-private partnerships and governance structure for water delivery (Bertels & Vredenberg, 2004)
- Research and guidance for customer orientation for water utilities (Seppala, Rajala, & Katko, 2004)
- Mathematical model to show relationship between management systems and efficiency in water utilities (Garcia-Valinas & Muniz, 2007)
- Developing, planning, and administering a wastewater project in the context of a community network (Ratner & Gutierrez, 2004)
- Review of a specific organization's public works administration covering recommendations for improvement, such as training, use of task forces, performance management, and clarification of mission (Corbett, 1995)
- Financial: Rates, economics, and crises: Carmeli & Cohen, 2001; Daane, 1998; Lahlou, 1998)
- Water supply management (Robinson, 1986)

- Evaluation of funding on collaborative research using a water utility for its case study (Chung, Cook, & Kress,1998)
- Regulatory and agency origins (Jordan, Richardson, & Kimber, 2007; Rydz, 1971a, 1971b)
- Privatization and utility governance (Memon, Imura & Shrakawa, 2006; Pietila, Hukka, & Katko, 2007; Sauri, Olcina, & Ricu, 2007; Suleiman, Van Well, & Gustafsson, 2008; Ogden & Anderson, 1995)
- Decision-making tools (Loetscher & Keller, 2002)

The following research literature focused within the United States:

- Mathematical modeling to predict operational efficiency of wastewater treatment plants in Texas (Sanders, 1999)
- Theoretical research and practical guidance for communications in water utilities (Bishop, 2006)
- Findings of research on customer information systems for water utilities (Rettie, 2005)
- Institutional knowledge in water utilities in Pennsylvania (Adam, 2009)
- Decision making in light of available information technology in Texas water utilities (Baldwin, 2001)
- Comparison of regulatory compliance to water utility ownership and benchmarking (Wallsten & Kosec, 2008)
- Perception of power by wastewater employees (Chansler, 1997)
- Hollowing of wastewater treatment/contracting (O'Toole, 1996)
- Efficiency of public and private water utilities (Hawley, 2000)

- Evaluation of institutional norms in water agencies (Lach et al., 2005)
- Use of a model to evaluate the best source (public vs. private) for water services (Day, 2007)
- Increased accident rate in U.S. water utilities (Azimi-Bolourian, 1981)
- Professional development for water quality employees (Shepard, 1980)
- Pricing for water (Dah, 1988)
- Benchmarking in water supply (Love, Bunney, Smith, & Dale, 1998)
- Privatization (Duman, 2003; Foster & Taylor, 1994; Heilman & Johnson, 1989)
- Management systems for efficiency (Burgess & Reavill, 1996; Lemons, Yarborough, & Roberts, 2009)
- Performance indicators comparisons for public and private water and wastewater organizations (multicountry; Hassanein & Khalifa, 2007)
- Organizational culture and diversity (Mitchell, 1996)
- Case study of financing a sewer project (Howell-Moroney & Hall, 2011)
- Decision making (Flannery, 1997)

Several themes can be identified through the literature search. Privatization was being considered by many municipalities in the mid to late 1990s, and this is also apparent through the literature search. Management, performance, and benchmarking recur and may have been an outcome linked to privatization. From the study on customer information systems, it was apparent that it was a joint effort between a professional research foundation, two public water agencies in different geographic locations, and a private organization (Rettie, 2005). This is a positive sign of knowledge transfer as well

as collaboration. As discussed earlier in this chapter, this mode of operation is a shift in methodology as suggested by many, for instance, Huff's Mode 1.5.

Another study was related to the transfer of knowledge in water supply plants in Pennsylvania. Research recommendations include facilitation of face-to-face interactions to share knowledge, a culture allowing open sharing, and funding to allow this to occur. Without funding, collaboration was recommended as a means to enable knowledge transfer (Adam, 2009).

Lach et al. (2005) investigated culture within water utilities to find a conservative and unyielding culture. This research began with the pre-existing assumption that there was a cultural problem and looked for evidence to support the assumptions. Employers attest to it requiring 3 to 10 years for a new employee to fully get up to speed in knowledge of the physical systems. The teams consisted of engineers, lawyers, and economists. New employees are inculcated into the institutional norms, which lack in innovation, allow for only incremental change, and remain imbedded in conservatism leading to multiredundant systems that cost taxpayers money. This culture was deemed not to be sufficient to meet the needs of the ever-changing water demands. A case study of the financial collapse of a county due to financial methods utilized to fund a sewer project (Howell-Moroney & Hall, 2011) illustrated the multiple decisions and conditions that led to the crisis. The authors describe how the situation of such complexity warrants new methods for greater transparency. The level of technical detail involved in financing and civil engineering cannot be readily understood by the public or elected officials.

A water utility study by Westerhoff et al (2003) reviewed literature and identified gaps, practices, benchmarking, and performance measures. Change is accepted as a constant and a positive improvement in a learning organization. Characteristics of learning organizations within wastewater utilities include (a) understanding the customer and seeking feedback, (b) planning the business approach, (c) developing managers as leaders, (d) improving staff skills and aptitude, and (e) smoothly facilitating change. Some of the threats to organizational learning include inadequate financial resources, labor organizations, employees who do not desire to learn and grow, and attempting to fix the surface issue but not the root cause. This is in line with one of the goal of this research to identify characteristics of organizations that support learning.

Summary

The cross-disciplinary literature review revealed several organizational factors that enabled utilization of research; these include having a larger organizational size, an open culture, highly innovative employees, a champion for research, and the final output be a product, license, or patent as opposed to information.

This literature survey summarized the literature on utilization of academic research through discussion of each of the key phases involved: production of knowledge, transfer of knowledge, and absorption or application of knowledge. In addition, literature on administrative functions of wastewater utilities was reviewed. The utilization of public administration academic research is contingent on the purpose/quality of the research meeting certain criterion, a knowledge transfer mechanism, and prerequisite characteristics of the receiving organization. Although

knowledge can be produced, it is subject to scrutiny of quality and research method, and the intent must meet the need of the end user.

One way that knowledge is transferred is through collaborative research where the practitioner is involved with the academic research effort. Collaborative research is on the rise, and may be in the form of academic-academic, academic-practitioner, and academic-industrial relationships. Benefits of academic collaboration are many to industry, practitioners, and the academic researcher, but often difficult to articulate or quantify. Benefits tend to be "perceived" as opposed to quantifiable, such as access to resources not normally available and improved reputation of the researcher.

Key findings include the following: Academic research collaborations are usually initiated for funding purposes (Carayol, 2003; Finkel, 2006; Jankowski, 1999; Katz & Martin, 1997; Lee, 2000). Interpersonal skills are important to collaborations and can lead to failure if not proactively managed (Hara et al., 2003). Trust between collaborators is also critical (Santoro & Saparito, 2006). Factors related to the organization can be used as an indicator in their propensity to collaborate including its innovativeness, type of industry, and culture. Models are presented that describe academic-industry collaboratives and range from physical structures to conceptual frameworks. Since research has the ability to become a marketable product, economic incentives may drive transactions and call into question the research validity.

Administrative literature related to the wastewater industry was reviewed and key themes included privatization, management, performance measures, and benchmarking.

Chapter IV, Methodology, describes the approach that was used to test the hypotheses and build upon the existing theories.

CHAPTER III

THEORY

The theoretical framework for this research includes theories of epistemology, organization, research, knowledge management, networks, and collaboration. The theoretical basis for the transfer of knowledge is epistemology, and it involves large-scale learning that requires changes in an agency's planning and way of thinking (Santoro & Saporito, 2006). Theories of action may also be applicable through acquisition of information related to research and then utilizing the new knowledge. Organizational theories will apply to the characteristics and actions of the organization in accepting and utilizing the research. The following section describes the theories as related to this study.

Epistemology

Epistemology is the study of the production, acquisition, and application of knowledge. One prerequisite for the utilization of research is to have one or more knowledge-transfer mechanisms in place such that research has an avenue to reach practitioners. Transfer of knowledge is rooted in epistemology, defined as the study of the foundations of knowledge (Frankfort-Nachmias & Nachmias, 2000). According to Moldoveanu (2002) in "Epistemology in Action," classical epistemology is built upon to

develop a guide for understanding the processes of organizational learning. These would include specifying and gathering information, analyzing data, and processing to produce decisions (Modoveanu, 2002). Knowledge management and organizational theory may be considered branches of epistemology.

Two epistemological considerations are positivism and interpretivism. Bryman (2004) and McNabb (2008) describe positivism as an approach to deriving knowledge through methodical steps traditionally used in the natural sciences and considered objective as opposed to subjective. Positivist epistemology holds that the practice is based on technical rationality (Schön, 1983). Schön (1983) advocates an epistemology of practice consisting of a reflective practice as opposed to solely technical rationality.

Bryman (2004) describes ontological orientations of objectivism and constructionism. Objectivism supports the belief that people's actions are independent and do not influence social phenomenon. Constructionism is the ontological approach that supports nearly the opposite; human action influences and continually shapes social phenomena. Qualitative research is geared toward the ontological lens of constructionism. An assumption informing this research's methodological approach is that policies and attitudes of individuals form the culture of the organization, which, in turn, leads to certain learning approaches. This research, through case studies, will attempt to understand the human influences forming the social phenomena of research including knowledge production, transfer, and utilization.

Research theory builds upon previous research and is, in effect, cumulative (Argyris & Schön, 1974). According to Shils, "Technical rationality is an epistemology

of practice derived from positivist philosophy, built into the very foundations of the modern research university" (as cited in Schön, 1987, p. 3). Technical rationality holds that practitioners are instrumental problem solvers who select technical means best suited to particular purposes (Schön, 1987). The order of knowledge is basic research, applied research, and skills for everyday use (Verblen, as cited in Schön, 1987).

Theory of Action

The organization may be viewed as an open system, interacting with other systems to bring knowledge into the organization. Argyris and Schön (1974), in *Theory in Practice,* describe a theoretical framework for action and practice. An action theory is specific to human behavior, unique to individuals, and attempts to predict and explain behavior. Theories of practice may be composed of several related theories of action, integrating both thought and action. Individuals' stated theory may be different than their actual theory. These differences are discussed by Argyris and Schön in terms of espoused theory and theory-in-use. Espoused theories are one that they profess they live and operate by. The theory-in-use is the theory that they actually use, which may be different from their espoused theory or stated theory that they claim to hold. Theories that are written and known by others in the field are considered explicit.

Theories that are specific to individuals and are not written are considered to be implicit. An individual may not even be capable of verbally articulating his or her implicit theories. Implicit knowledge was coined by Michael Polanyi in *The Tacit Dimension* as tacit knowledge and is that which cannot put into words easily (Argyris & Schön, 1974; Schön, 1987). Explicit theories may also become implicit or tacit

knowledge. Learning to put a theory of action into practice is similar to learning a new skill; it requires practice and doing rather than just memorization (Argyris & Schön, 1974).

The cross-disciplinary literature review reveals several organizational factors that enable utilization of research including larger organizational size, an open culture that is highly innovative, having a champion for research, and the final output being a product, license, or patent as opposed to information. If the individual or organizational culture influences the utilization of research, then Maslow's theory on the hierarchy of needs or Simon's administrative theory may be considered in the theoretical framework. Simon's administrative man would take on the goals of the organization, be rational, efficient, and obedient to authority (Denhardt, 1993; Harmon & Mayer, 1986). If the organization's goal is to continuously improve, then individuals will seek new opportunities to reduce costs or improve services and potentially seek out research to apply it. The self-actualized individuals may seek to improve themselves and their organization.

This research study investigated theories of action and attempted to link organization and individual traits to action by asking about behaviors. Since the actual behavior of practitioners may not be same as their espoused theory, a limitation of this study is that one cannot determine someone's theory in use by asking; it must be observed.

Theory of Leadership

The topic of leadership has extensive research. At times in the past, prominent leadership researchers, Ralph Stogdill and Warren Bennis, questioned the conclusiveness

of the efforts and the overall understanding of leadership. This shows similarities to public administration in its efforts toward a unifying theory. The concepts in leadership are very complex and depend on context. From the 1990s into 2000, theory leaned toward leadership of a "multifaceted" integrated transactional and transformational nature. Mainstream leadership literature is dominated by business administration and psychology. Broader administrative leadership is seen throughout reform, ethics, and management (Van Wart, 2003).

Deficiencies were cited with past leadership models as they did not take into account the context of organization and complexities (Lawler, 2008). Research on the individual leader model has been mainstream but limiting. Alternative to the individual leader is collective or distributive leadership (Lawler, 2008). Situations can both constrain and enable action. In addition, many things, such as tools, can exert leadership or influence. For instance software or hardware can lead the individual and affects distributed leadership. Tension can also be created from deviation from a previously accepted organizational norm (Ross, Rix, & Gold, 2005a). This distributed leadership must exist in an organization. The past can also exert influence. An example is cited of a merger where the individuals brought different and conflicting approaches. Leadership within an organization is affected by far more than an individual (Ross et al., 2005b). Outcomes can also depend on the area of a manager's responsibility and allowed discretion over the way work is organized, all affected by the organizational structure, culture, professionalism, and external factors. Informal organizations are important plus other factors within and outside the organization are also important (McGurk, 2010). In

research conducted by Anderson (2010), it was found that leaders relied highly on intuition for decision making.

Transfer of knowledge is limited for softer leadership skills, possibly due to complexities not fully explored or understood. Some of these complexities include opportunities for change, making a strategic contribution, and incentives. The main difficulty with leadership research is that the impact of learning is hard to show causality (McGurk, 2009).

Bonsall (2010) stated that "many learners were seemingly unaware that they needed to take responsibility for their own learning" (p. 12). To overcome this, it is recommended that learners (managers) should take responsibility for their learning and become informed of varied opportunities, such as "keeping learning logs, shadowing, deputizing, doing a project, taking on new responsibilities" (Bonsall, 2010, p. 13).

Innovation and entrepreneurialism are not blindly supported when it comes to public service and spending the public's money; therefore, entrepreneurial leadership in the public sector is likely to be met with resistance if seen at all (Van Wart, 2003). In looking at innovation in the United States public sector, half of the innovation originates from middle managers or frontline staff, a quarter from agency heads, with the remaining stemming from politicians, interest groups, and those outside government (Borins, 2002). Some researchers pose that innovation is contradictory to public service work in that it has strict process for accountability. Organizations should create support for innovation (Borins, 2002).

Practitioners viewed theoretical explanations as not related during a training (McGurk, 2009). This plays an important role in the theory-practice relationship as it would indicate that practitioners lack interest in knowing the theoretical basis for their action or perhaps need to see how it relates to action and why it is worth knowing.

Knowledge Management

McNabb found that more than 300 books existed on the subject of knowledge management (KM); however, none focused on the public sector until McNabb's own *Knowledge Management in the Public Sector* (McNabb, 2007). Governmental organizations and the private sector perform differently so a focus on the public sector was necessary. Government acts in response to legislation and mandates whereas the private sector will be driven by the bottom line and profit. Knowledge management relates to "managing information to make the most of knowledge in an organization in order to benefit from finding and applying innovative answers to old and new questions" (McNabb, 2007, p. 7).

History and Development of Knowledge Management

Computerized applications were developed beginning in the 1950s and 1960s with the use of the mainframe computer, but were highly specific to each agency and access to data restricted to business units on a need-to-know basis. This led to limited availability of information and restricted sharing and transfer. Commercial systems became available in the 1980s, and then great strides in knowledge management systems developed in the late 1990s, such as e-mail, scheduling software, and databases. Early in

the 2000s, online systems became available, then in 2003, the Federal Enterprise Architecture Management System was developed, creating a framework for uniformity in the federal government; however, state and local levels of government had to create their own system and many were strapped for resources (McNabb, 2007).

A Learning Organization

Organizational learning is dependent on individual learning, including an individual's interests, behaviors, and assumptions, as well as theories of action. A major phase in organizational learning requires a change in core values and knowledge structure, as well as an organizational challenge that needs to be resolved or addressed (Schön, 1983).

Argyris and Schön (1974) describe theories of action and behavior in terms of Model I and Model II. Model I behavior can be characterized by private, single-loop learning, theory-making/theory-testing, competitive, not collaborative, and less likely to be developed into cumulative learning. It is competitive, win/lose, rational, diplomatic behavior that is self-sealing (Argyris & Schön, 1974). Model I is a theory of action that determines actual behavior of practitioners. Theory of action may not be same as espoused theory. One cannot ask another person for his or her theory in use; it must be observed (Argyris & Schön, 1974).

Model II gradually allows more effective testing of assumptions and greater learning through double-loop learning. Double-loop learning and Model II permit progressively more effective testing of assumptions and greater learning about a person's

effectiveness. In addition, Model II enables people to support others and have positive experiences. Model II is desirable for professionalism (Argyris & Schön, 1974).

Within an agency or level of government, there are many different business units with different knowledge backgrounds, skill sets, and roles. Knowledge can and should be considered one of an organization's most valuable assets. The information can be inefficiently organized or misplaced, especially with organizations that are physically spread out or in multiple geographic locations. Access to and utilization of information are desirable to optimize and improve processes, which ultimately lead to improved efficiency and cost savings. This has been encouraged in the public sector through the Reinventing Government initiative as well as other performance initiatives. Optimizing and improving organizational performance are often outward signs of a learning organization. Private sector companies were driven to become learning organizations to gain a competitive edge, and knowledge was identified as "the only sustainable source of competitive advantage" (McNabb, 2007, p. 7). A learning organization is defined as "one that has learned how to modify the way it operates as a result of new information, knowledge, and insight" (McNabb, 2007, p. 16). Any organization needs to manipulate knowledge before identifying, retaining, reviewing, comprehending, adapting, and transmitting it. Optimizing through effective use of knowledge aids in reducing costs for government organizations, but other benefits may also be gained.

Knowledge management undeniably relates to information technology (IT), and that is often the most visible component because of the costs and resources for staff support, software development, and procurement. Social systems are also necessary for

agency-wide knowledge management for effective organizational learning. These include facilitation of knowledge acquisition through sharing and distribution, a knowledge audit, existence of communities of practice to connect and solve problems, setting of standards, relationships with peers and stakeholders, voluntary exchange of information, integrating disciplines, and double-loop learning. In order to succeed, knowledge management must be prioritized by senior management and the benefits acknowledged. Implementation will be outwardly visible through sharing of knowledge within the organization and employees' dedicating time. The knowledge management organizational culture is more difficult to alter than the physical infrastructure of an IT-based system. Cultural characteristics that indicate knowledge management principles have been accepted include sharing of information, trust related to the appropriate use of information, giving credit to others when due, and an agency policy that promotes learning. Types of innovation in government that may be a result of KM and learning include a new service or product, a new management process, organizational innovation, distribution, marketing, a raw material use, or components (McNabb, 2007).

Network and Collaboration Theory

Knowledge management is closely tied to collaboration and networks as information can be transferred through a network, which can be either formal or informal. Networks may exist for many different purposes, including implementation of a service, solving a problem, building community capacity, or sharing information between interdependent agencies. Information diffusion networks apply to professional networks as new information and best practices are shared to become diffused through

organizations of members. Problem-solving networks may also be present through agencies' banding together or joining forces with academics to study and address an issue or specific concern (Milward & Provan, 2006).

Several definitions of networks can aid in understanding how they are utilized in the context of this research project. According to O'Toole,

> Networks are structures of interdependence involving multiple organizations or parts thereof, where one unit is not merely the formal subordinate of the others in some larger hierarchical arrangement. Networks exhibit some structural stability but extend beyond formally established linkages and policy-legitimated ties. . . . The institutional glue congealing networked ties may include authority bonds, exchange relations, and coalitions based on common interest, all within a single multi-unit structure. (as cited in Milward & Provan, 2006, p. 9)

Theories about collaborative networks further provide insight into knowledge production, knowledge transfer, and acquisition for practitioner-academic research collaboration efforts. There is a fast-growing body of literature on collaboration. Agranoff and McGuire's (2003) research on cities resulted in a model of collaborative management. An organization's propensity to collaborate is defined by its

(a) collaborative strategy, ranging between passive and opportunistic; and

(b) collaborative activity, ranging from inactive to active.

Networks within public organizations can be informal or formal structures. The members may be from a variety of organizations, both governmental and nongovernmental working in an interdependent manner to share, coordinate, and execute activities and policies with the home organization (Milward & Provan, 2006).

Cigler (2001) in *Getting Results Through Collaboration* describes collaboration as "an intensity of linkages" (p. 71). These connections are developed to take action on a

multisector, multiorganizational basis. Four levels of collaborations are defined as (a) networking partnerships, (b) coordinating partnerships, (c) cooperative partnerships, and (d) collaboratives. Cigler's research, although focused on local government, identified preconditions for the development of collaboratives. Of the nine conditions, several could be relevant to public sector research efforts including (a) perceived or real fiscal stress, (b) outside capacity building, (c) collaborative skill-building, (d) promotion of a visible advantage for involved parties.

Many governmental organizations work together or with private sector organizations collaboratively to achieve common goals or out of necessity where zones of influence may impact others. Collaboration can also facilitate knowledge transfer or be a tool to jointly pursue research. Regardless of the purpose, collaboration needs management. Collaboration is the working together of individuals from two or more organizations for a common cause. For a network to succeed, support is necessary from member organizations, trust between members, participation of technical experts, staying within mission of network (Agranoff, 2003).

Agranoff and McGuire (2003) propose elements of a collaborative management framework. Related propositions include:

> (1) The choices of whether, why, or how to collaborate are based on structural and administrative considerations, along with economic and political imperatives.
> (2) Given a distinct number of mechanisms, levels, and purposes of linking activities, numerous types of patterns of collaborative activity exist in practice. (p. 7)

While economics and politics are only responsible for some of the differences in collaboration, the type of government organization impacts collaboration as well as how the effort is organized and managed (Agranoff & McGuire, 2003).

An organization's capacity and ultimately its capabilities are tied to the connections and associations of the organization and individuals. The capabilities are formed through abilities, knowledge, past practice, and relationships. If one person or team learns of something through research or practice, then others in the network will gain by association, provided that a learning environment exists. This linkage and learning may take a considerable amount of time. An organization can also be negatively influenced by its environment or affiliation (Bångens & Araujo, 2002).

The use of social media is a new form of networking and sharing knowledge. This is a nontraditional tool and an area for research exploration (Ines, 2010). Networks and collaboration are important for practitioners yet they may not be aware that research exists. Some collaboration research focuses on the social aspects, and some on the technical aspects, yet very few look at both. The complexity of the problems faced in governmental organizations cross many boundaries (Lynn, 2006). The intersection of political and academic boundaries requires networking and collaboration to effectively understand the problems and implement solutions.

Kim (2010) presents competencies for collaborative leadership. These include a shared clear vision, a dedication to a management merit system, innovation, the ability to share data and information across boundaries, and being transparent with information, which leads to the development of a learning organization. These are proposed as

necessary for a public organization's collaborative leadership. Kim suggests that more empirical research be conducted on collaborative leadership in the public sector.

Proposed Theoretical Framework

In order to gain an understanding of the factors affecting the utilization of academic research by practitioners, literature from several different fields was reviewed to propose a framework for such utilization. There are a series of phases involved in the overarching process; these include production, transfer, and utilization of knowledge.

Fields of study that have dealt with the question of utilization include library science, management, construction management, engineering, marketing, and social science. Studies may have been conducted in other fields, focused on one of the three phases of research utilization, and this study will seek insight from the other studies to apply to public administration. In order to gain an understanding of the factors affecting the utilization of academic research by practitioners, the literature review portion of this paper used a cross-disciplinary approach to develop a framework for utilization.

Based on this theoretical review, and a cross-disciplinary evaluation, Figure 3 presents a visual display of the author's understanding of the process flowchart for the application of academic research. The process flow diagram depicts the steps required for academic research to become available for practitioners and utilized. The path for utilization of research includes production of high-quality and applied research, presence of a knowledge transfer mechanism, and individuals or organizations with characteristics that enable successful absorption of knowledge. Satisfying all of these criteria will still not ensure utilization of the research.

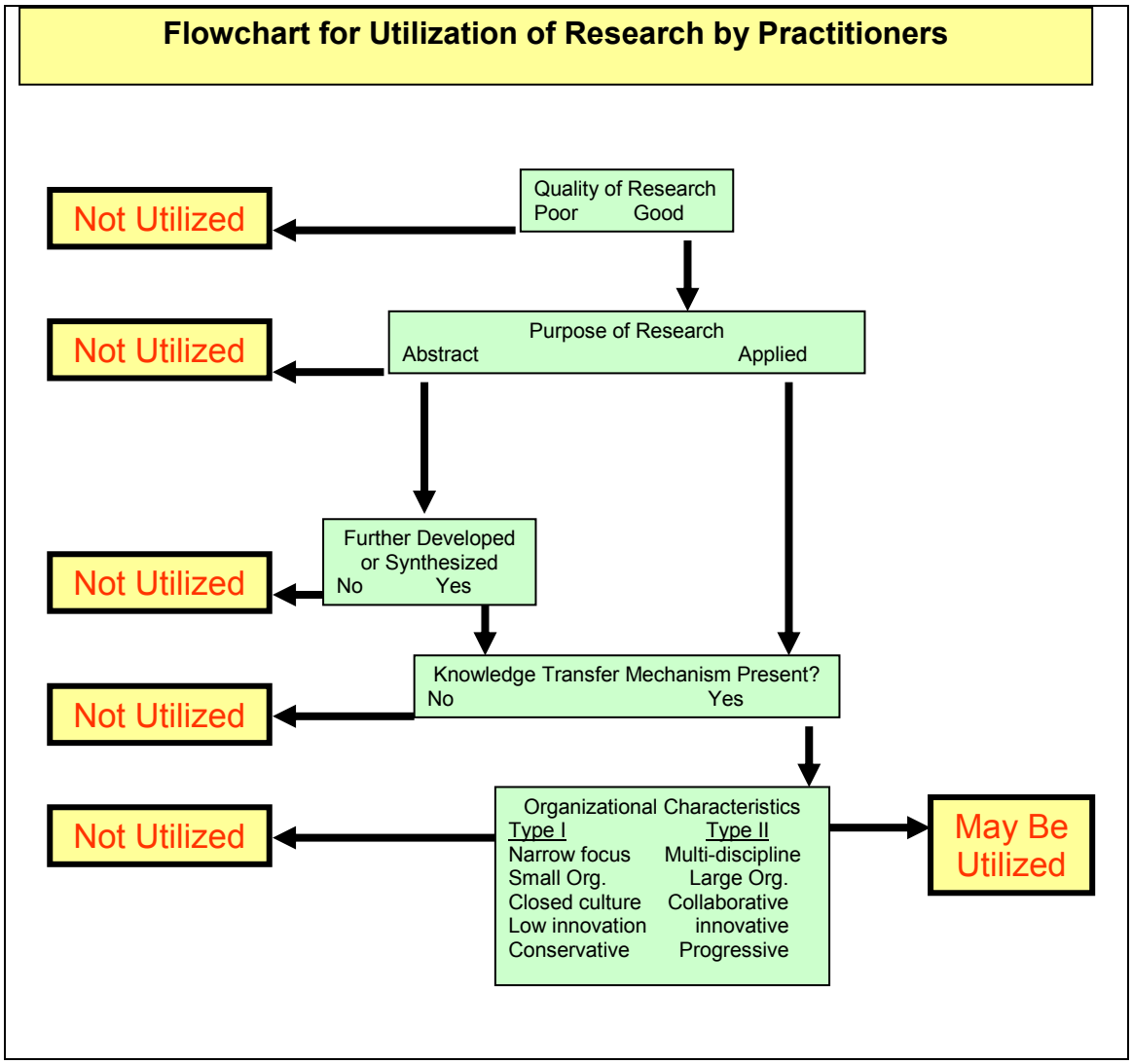

Figure 3. Flowchart for utilization of research by practitioners. Figure developed by this researcher.

The application of academic research is contingent upon three successful phases. The first phase focuses on the research, including the intention and quality. If the quality of the research is poor, it may limit the chances for utilization. Poor quality may be characterized through internal and external validity, bias, and, in general, the manner in which the research was conducted. If the results are suspect, the quality may be

considered poor. If the author is intending for the research to have a practical application, it is more likely to be utilized by practitioners. However, if the purpose of the research is purely theoretical and conceptual, then it may never be used in practice. Abstract research may be further developed and the research findings ultimately lead to a practical application. The type of research may be visualized on a continuum related to the purpose, ranging from fully abstract and theoretical to fully-applied with an immediate practical application. In addition to purpose, quality of research may also be a factor in utilization.

The next phase for utilization involves the transfer of knowledge of the research from the study phase to the practitioner. This may be accomplished through publications, training, personal interaction, or a presentation at a professional conference to name a few. Even if the methodology of the research was excellent, the quality of the publication or the presentation may affect the perceived quality or the effective transfer of the knowledge. Closely linked to knowledge transfer is the character of the receiving unit, the individual or organization. There are previously published studies on both units of analysis, the individual and the organization (Santoro & Saparito, 2006). Type I and Type II are further developed through this research; however, Type I for the proposed framework is similar to Gibbons et al. (1994) Mode 1 and Argyris and Schön's (1974) Model 1. Type I is single discipline, narrowly focused, closed culture, low innovation, small organization, no champion for the cause. These types of organizations are often referred to as conservative or traditional. Type II reflects Argyris and Schön's Model II or Gibbon's Mode II or even Huff's Mode 1.5. Characteristics include a supportive

collaborative environment, joint effort between practitioners and academics, and large organizations that are innovative.

Based upon the flowchart, the proposed framework was developed (see Figure 4).

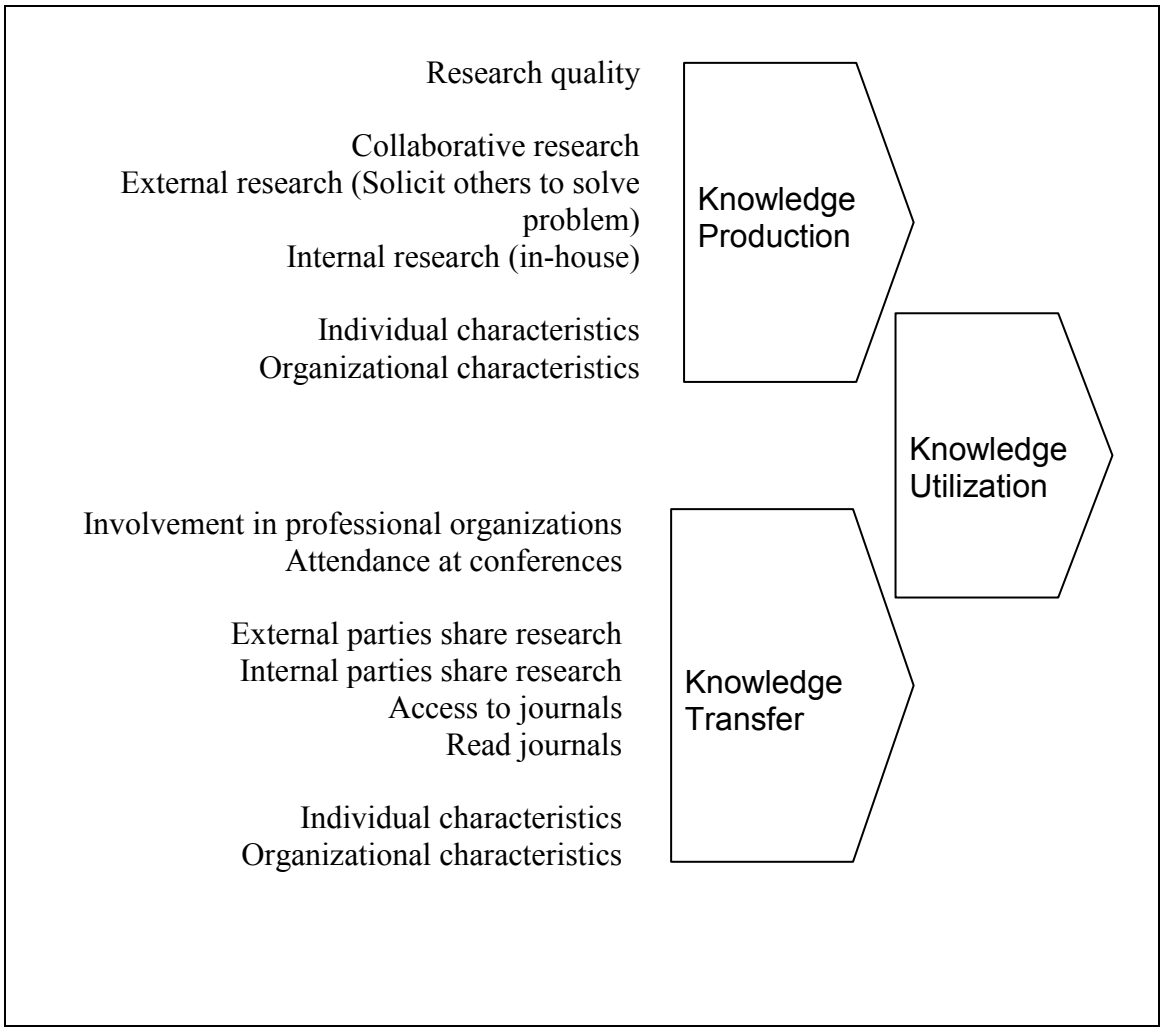

Figure 4. Framework for utilization of research by practitioner. Figure developed by this researcher.

Knowledge utilization requires both production and transfer of knowledge. Knowledge production is influenced by research quality, collaborative research, in-house research,

soliciting others to conduct research to solve problems, individual characteristics, and organizational characteristics. Knowledge transfer is influenced by professional organizations, conferences, presenting research findings, outside experts presenting, teaching, journal access, individual characteristics, and organizational characteristics.

Summary

Epistemology and theories of action are at the core of this research influencing how the practitioner learns and works with new knowledge. Knowledge management is also critical in acquiring or manipulating information. The theoretical basis for the transfer of knowledge is epistemology, and it involves large-scale learning that requires changes in an agency's planning and way of thinking (Santoro & Saparito, 2006). Theories of collaboration and networking also influence this work.

This research tested the framework by interviewing practitioners in wastewater utilities to determine their perception of research quality, means of knowledge transfer, and various characteristics or both the individual and the organization.

CHAPTER IV

METHODOLOGY

Introduction

This chapter describes the research methods and details of the approach used. The subject of this study is utilization of research by wastewater practitioners. The wastewater field is generally open to sharing due to several factors. As public agencies, most information is public. In addition, practitioners in the field share information when they have it, and hope that others will openly share with them when needed. Much is also available on technical websites. This research used a comparative case study approach through detailed interviews with representatives from 12 wastewater organizations to answer the research questions. The factors that influence differences in knowledge production, transfer, and utilization were evaluated to determine reasons for the differences between administrative-type research and core business research. Each of the questions was identified in this chapter and linked to the purpose for the question.

The wastewater sector was used to answer the research questions. The practical utilization and linkage of technical research is evident within this field. The framework developed in Chapter III is expanded to illustrate how each of the major questions are linked to the methodology as detailed in Figure 5. Each of the research questions was supported by survey questions. The survey questions provided a method to obtain unique information about how the independent variables influenced utilization of research.

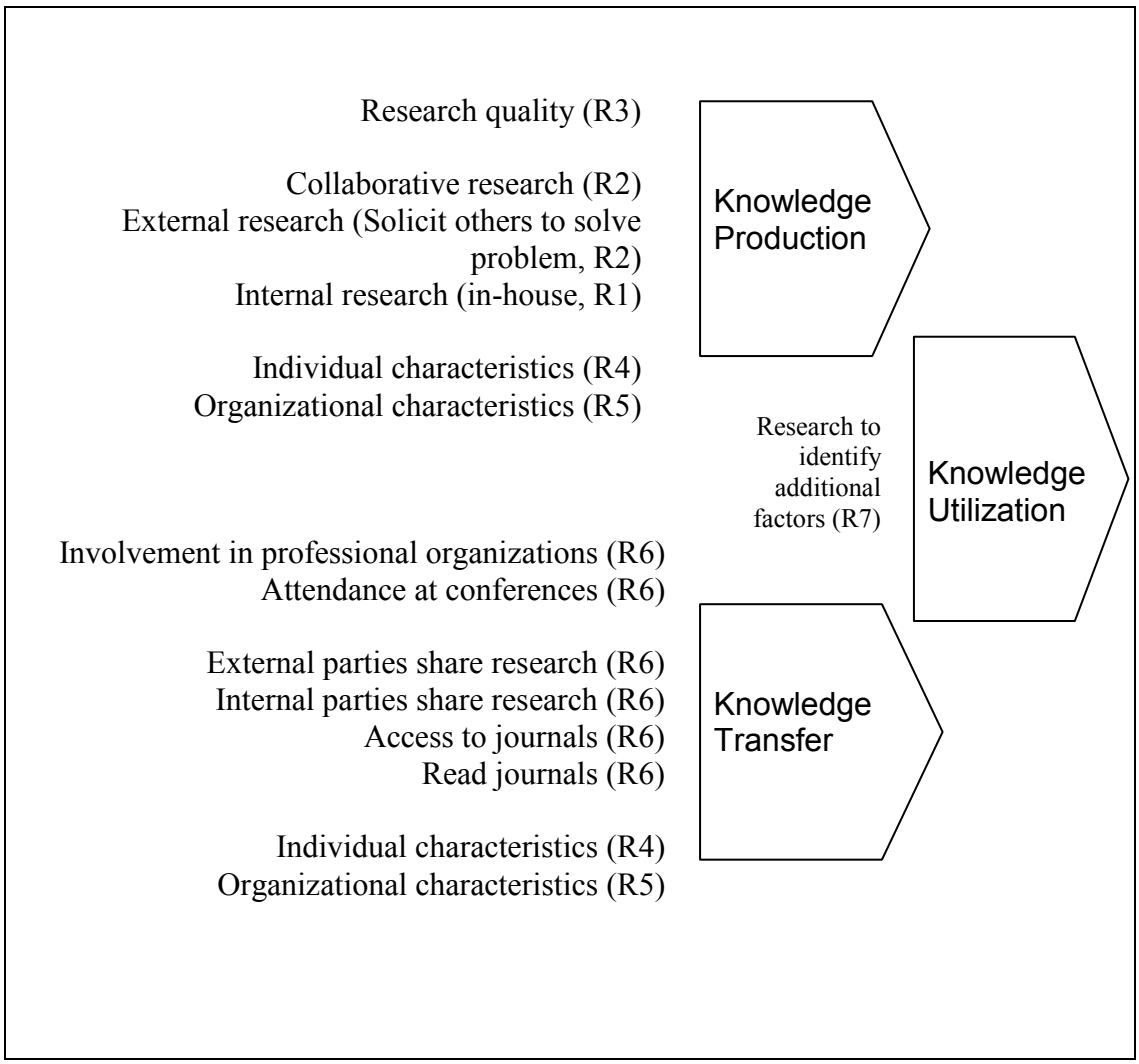

Figure 5. Framework for utilization of research by practitioners linked to questions. Figure developed by this researcher.

Research Design

Comparative Case Study Approach

Strategies considered for this research included experiments, surveys, archival analysis, history, and case studies. Case studies are often used in psychology, sociology, political science, social work, business, and community planning. The case study approach is best for current events that do not require a controlled environment. Yin

(2003) identified key reasons for utilizing case studies as they "illuminate a decision or set of decisions; why they were taken, how they were implemented, and with what results" (p. 12). Case studies also serve to explore an event or process in its natural setting, and are even more useful when the delineation between the event or process and the natural setting is not obvious (Yin, 2003). In addition, multicase findings tend to be more impactful and convincing that single case studies (McNabb, 2010). For this research, influential factors were expected to be complex and many, and were likely to include characteristics of the individual and the organization, attitudes, and culture. The phenomenon cannot be truly understood outside of its context. Since the focus was on contemporary versus historical events and did not require control of behavioral events, the case study approach was determined to be most appropriate.

The research method for this study was the comparative case study using interviews as the tool. Case studies are often challenging, but preferred for answering "how" and "why" questions in social science. Case studies may be exploratory, explanatory, or descriptive, which allows for flexibility and depth in the research findings. A case study is defined as "empirical inquiry that investigates a contemporary phenomenon within its real-life context especially when the boundaries between phenomenon and context are not clearly evident" (Yin, 2003, p. 13). McNabb (2010) described three categories of multicase research, including longitudinal, comparative, and interpretive. Longitudinal research evaluates cases over time. Comparative research compares individual items of each case. Interpretive research focuses on a concern or

event to test a theory or generate new theory. This study is a combination of comparative and interpretive research.

Van Evera (as cited in McNabb, 2008) identified five reasons for using case studies: to generate theories, to test existing theory, to determine predecessor conditions, to verify the value of the predecessor conditions, and to give details of cases of special value. This study served to generate theory.

Case types may be categorized by several different criteria including typical, diverse, extreme, deviant, influential, similar, or different (Seawright & Gerring, 2008). Since this research was exploratory in nature, it was initially unknown what factors within the agency or of the individual would influence the utilization of research. Therefore, upon initiating the research it was unknown how representative or diverse the selected group of agencies was relative to the critical factors. A variety of agencies were chosen; these included large and small with different governing structures and those that were geographically diverse. The intent of this research was to uncover more information. Bryman (2004) described the benefits of comparative case studies asserting that "we can understand social phenomena better when they are compared in relation to two or more meaningfully contrasting cases or situations" (p. 53), and that they "allow the distinguishing characteristics of two or more cases to act as a springboard for theoretical reflections about contrasting findings" (p. 55).

Case studies have drawn general criticism for the possible lack of structure and rigor in research methodology. Structure, rigor, and defined methodology are more prevalent with quantitative techniques and the scientific method. This criticism stems

back to the philosophical divide about the best way to conduct research. Other research approaches have many textbooks to describe methodologies; however, this is not so in case study. This limitation was overcome by devising structured interviews and quantitative as well as qualitative analyses. To overcome these limitations, five key areas for research design of case studies include the questions, propositions, units of analysis, connecting the propositions with the data, and tools for evaluating the results (Yin, 2003).

Use of Interviews

Several options were available for performing research including direct observation, face-to-face interviews, telephone interviews, and surveys. There are benefits and disadvantages to both face-to-face and telephone interviews. Telephone interviews can be completed more quickly and at a relatively lower cost since travel is not necessary. In addition, some interviewees may be more apt to respond to sensitive questions when they are not interviewed face to face. However, in telephone interviews, the researcher does not see the eyes and the body language of the responder either. These nonverbal indicators may indicate something different than the words of the person. When present in person, the researcher can ask a follow-up question when body language seems incongruous with responses. The drawbacks of face-to-face interviews include the amount of time required and the cost (McNabb, 2008). Personal interviews also have advantages over mailed surveys. Mailed surveys often have low response rates, or long response times (Frankfort-Nachmias & Nachmias, 2000).

Surveys and questionnaires often ask subjective questions that elicit opinions that are representative of attitudes. Questions may be categorized as closed, open, or

contingency. Closed-ended questions are typically less complex and easier to ask and answer; for instance, a question may ask if someone agrees or disagrees with a specific view. Depending on how the questions are phrased, bias may be brought in by suggesting responses. Open-ended questions allow the researcher to obtain all the information that the interviewee is willing to provide, and can therefore be more thorough. Contingency questions are those that only require a response if the previous question was yes or another specific response. It is possible to ask all types of questions in one survey or interview (Frankfort-Nachmias & Nachmias, 2000). The sequencing of questions can be funnel format, progressing from broad to narrow focus. An inverted funnel format can create some unintended consequences. For instance, if specific questions are asked first that elicit strong feelings or opinions from the respondent, the interviewee may be more inclined to answer the general questions based on just the referenced specific situations. In addition, if asked to rank or choose from a list, responders tend to choose those at the top of the list or rank those at the top higher. The wording of each question should be carefully considered to ensure that phrasing or definitions are understood in the same manner to both the questioner and respondent. In addition, the questions should be simple, clear, impartially stated, nonthreatening, not double-barreled, not leading, brief, and appropriate (Frankfort-Nachmias & Nachmias, 2000; McNabb, 2008).

The Likert scale can be used for measuring attitude. This is considered the most widely used scale system for measuring attitude. The 5-point scale, developed by Rensis Likert in the 1930s, measures the level of agreement by a respondent with a statement.

The responses provide ordinal data; however, data from all respondents may be summed and then used as interval data (McNabb, 2008).

Sample and Population

The in-depth interviews were conducted with individuals in a supervisory or management position within wastewater agencies. The sample included a selection of representatives from wastewater agencies throughout the United States. The interviews took place with candidates from various regions including the Midwest, Mountain Plains, Northeast, Southeast, and West Coast in the United States. The regional division was defined consistent with the International City/County Management Association (2010). Large, medium, and small agencies, defined by the daily volume of wastewater treated, were contacted. It was anticipated that various governing boards would also be represented through the study, and this was confirmed through the interviews. The population was all of management in public wastewater agencies throughout the United States. The number of wastewater agencies is approximated by USEPA at 16,000 (U.S. Environmental Protection Agency, 2009).

Twelve wastewater agencies were initially chosen for interviews. The group was originally determined based upon geographic locations across the country and was a mix of independent wastewater treatment agencies and wastewater treatment services as a branch of city government. In addition, plants of varying sizes were chosen as they were likely to have proportionate workforces. Fourteen agencies were initially identified; the researcher anticipated that some would not be willing to participate or she would not be successful in contacting an individual who met the research criteria at the agency. Of the

14 original agencies, 11 were interviewed; however, one of the interviews was later discarded since the individual did not meet the research criteria of being in a managerial position. Two of the agencies on the initial interview list were nonresponsive to multiple phone calls and messages. Upon reassessing the composition of the agencies interviewed, small treatment plants, and those located outside of the West Coast would balance the sample population. Therefore, one of the initially planned interviewees in the West Coast region was not contacted. One small treatment plant was contacted in the Southeast, but its manager declined to participate due to lack of time. Another small plant was contacted in the Northeast, and although its representative indicated a willingness to participate, he was not available to talk during two different scheduled interview times. Since this individual held many responsibilities for the organization and was often the only person on duty, it was understandable that his time was limited. Two other small treatment plants were contacted and successfully interviewed. The names of the agencies and individuals will remain confidential. Overall, 15 interviews were conducted, and 12 were utilized for the research evaluation. Of the three that were not utilized, two were part of the pilot interviews, and one did not meet the criteria of being in management.

Unit of Analysis

The units of analysis were both the individual and the organization, and the individual interview revealed information about both units. Research and interview questions probed both organizational and individual traits and practices; therefore, both the individual and organization were analyzed. Although having two units of analysis is

unconventional, the case study may reveal characteristics of both that influence the findings. To link data to the propositions, each of the major research questions and propositions was linked to survey questions. General observations of data were used in combination with the context of the response.

Instrument Design

The instrument used in the research was the in-depth interviews, which were composed of structured questions. The structured questions are analyzed with descriptive statistics in Chapter V. Initial questions focused on the individual and organization, then on technical research utilization, and finally on administrative research utilization. A few contingency questions were included in the study, and they allowed the surveyor to limit the number of questions that need to be answered and were relevant to the respondent. The order of the questions was determined based upon personal information first, then grouping segments of the interview by core-business questions and then management questions.

Each question was carefully reviewed to ensure that the wording was clear, brief, simple, precise, appropriate, and free from bias. Questions 21 and 22 used the Likert scales. Question 23 used a modified Likert scale, with a 10-point scale.

To the greatest extent possible, responses were categorized and quantitatively evaluated. However, one benefit of case studies includes the detail and breadth of response that cannot be adequately conveyed through statistics, as the responses are subjective and variable. In addition, since much of this study was exploratory, the

qualitative evaluation provided the framework for understanding the knowledge transfer and utilization mechanisms.

Methodological Approach

In order to test the questions prior to the research, the interview questions and process were pilot-tested within the researcher's agency, the Orange County Sanitation District. The questions were presented to two individuals and the interviews timed. Feedback from the interviewees allowed the researcher to adjust the questions to provide more clarity.

Some minor modifications were made in the phrasing of several questions to make them more understandable to the interviewee. In addition, Question 21 was moved to come after Question 11. For Question 1, more detail was added to specify that its description include the interviewee's title and levels of management. For Questions 4, 8, 10a, and 10b, each question was revised to include reference to the interviewee's actions or his or her employees' actions. Since many managers do not get involved in the technical work, it was appropriate to ask about their subordinates. For Questions 4a and 13, the word, "information," was added; therefore, the participants were asked about the sources for obtaining technical research or information. When someone reviews an article, hears a presentation by a consultant, attends an in-house class with a hired trainer, or reads a bestselling management book he or she may not be able to identify whether it was research, so the broader term was used. For questions 10 and 13, instead of stating "What is required . . . " the questions were phrased, "Does your organization have any requirements. . . ." Finally, Question 13 was rephrased to include the individual in the

event that the participant could not think of organizational requirements. This option was made available as personal management style or techniques may be implemented without affecting the entire organization. The final instrument is presented as Table 1.

Each of the survey questions support one or more of the overarching research questions. The linkages are presented in Table 2.

Data Collection Procedures

Interviews were conducted with 12 public sector wastewater agency employees to ask about their obtaining, valuing, and utilizing research. These served as an inquiry about public administration research and their core business-related research within the agency. Interviews were conducted between April 2 and June 22, 2010. The durations varied between 16 and 41 minutes, with an average time of 27 minutes.

Information about the organization and methods used to obtain knowledge were investigated, including organizational and individual factors that could potentially influence culture and ultimately knowledge utilization. The questions were administered in a case study format through interviews. The research consisted of interviewing those in a management role in 12 wastewater plants asking the individuals about how they gather and put to use new information from the wastewater field as well as management information. A modified snowball sampling technique was employed in that if the person that the researcher first contacted did not meet the research criteria, he or she was asked to recommend another person from within his or her organization. On six occasions, the person originally contacted either did not meet the criteria or did not want to participate.

Table 1

Interview Questions

#	Question
1	Describe your
1a	position within organization
1b	years in the field
1c	years with organization
1d	education, degrees, certifications
2	What is your organization's size (number of employees, service area)?
3	What is the governing structure?
4	How (where, source, method of obtaining) do you obtain technical information to use on job? (This could be for new designs, operational methods, troubleshooting problems)
4a	What are the top 2-3 sources or paths for obtaining technical research?
5	Do you read technical journals? (Which ones?)
6	Does your organization conduct technical research related to wastewater?
7	Does your organization pay for, promote, or support involvement in technical organizations?
7a	Attendance at conferences? And what types of staff?
7b	Support giving presentations of research or studies?
8	In your current organization, have you worked with a university partner to solve a technical problem?
9	Does your organization bring in outsiders (i.e., consultants, trainers, industry leaders) to present on technical topics? (If yes, describe.)
10	What is required of technical research prior to deciding to implement it?
10a	What steps do you take to validate the quality?
10b	Approximately what percentage of the technical research that you review do you implement?
11	Have you or others in your organization collaborated on a technical research project, journal submittal, or conference presentation? What type of partners?
12	How do you obtain management information to apply on the job?
12a	What are the top 2-3 sources or paths for obtaining management or administrative information?
13	What is required of management/administrative research prior to deciding to implement it?
13a	What steps do you take to validate the quality?
13b	Approximately what percentage of the administrative or management research that you review do you implement?
14	Do you read administrative/management journals? (Which ones?)
15	Does your organization conduct research or studies related to management, business practices, or leadership?

Table 1 (*continued*)

#	Question
16	Does your organization have a library or access to online journals?
17	In your current organization, have you worked with a university partner to solve a management or administrative problem?
18	Have you or others in your organization collaborated on a management or administrative research project, journal submittal, or conference presentation?
19	Does your organization pay for, promote, or support involvement in management organizations?
19a	Attendance at conferences?
19b	Support giving presentations of research?
20	Does your organization bring in outsiders (i.e. consultants, trainers, industry leaders) to present on management/administrative topics? (If yes, describe.)
21	With respect to technical/core business issues, would you describe your organization as? (5 point Likert scale rating, from 1-5 where 5 is highest rating)
21a	Quick to change
21b	Innovative
21c	Continuously improving
21d	Collaborative with other organizations
21e	Strives to be one of the best in industry (examples may include being in the top 25%) of industry benchmarking measures, is often the 1st to do xyz, only hires candidates with Masters or higher, etc.)
21f	Supporting technical or core business research
22	With respect to management/administrative issues, would you describe your organization as? (5-point Likert scale rating, from 1-5 where 5 is highest rating)
22a	Quick to change
22b	Innovative
22c	Continuously improving
22d	Collaborative with other organizations
22e	Strives to be one of the best in industry (examples may include being in the top 25%) of industry benchmarking measures, is often the 1st to do xyz, only hires candidates with Masters or higher, etc.)
22f	Supporting administrative/management research
23	On a scale of 1-10, with 10 as the highest rating, how would you rank the importance of:
23a	Staffing and succession planning
23b	Revenue, rates, financial stability
23c	Community support
23d	Employee training and education
23e	Other issues of high importance?

Table 2

Research Questions Linked to Survey Questions

Research Question	Survey Question
R1: Are there differences in the perceived utilization of technical-focused research versus administrative-type research within wastewater treatment organizations?	4, 5, 6, 7, 8, 9, 10, 10a, 11, 12, 13, 13a, 14, 15, 16, 17, 18, 19a-b, 20, 21a-f, 21f, 22a-f
R2: Are there differences in collaboration on technical versus administrative issues within wastewater treatment organizations?	7, 8, 9, 11, 12, 15, 17, 18, 19, 20, 21, 21d, 22, 22d
R3: Does the quality of research influence utilization?	10, 10a, 13, 13a
R4: Do the characteristics of managerial leaders in wastewater treatment organizations affect the production, transfer, and utilization of academic_administrative-or core-business research?	1a-d, 5, 8, 10, 10a, 11, 12, 13, 13a, 14, 17, 18
R5: Do characteristics of wastewater treatment organizations affect the production, transfer, and utilization of academic administrative-type research?	2, 3, 6, 7a-b, 8, 9, 11, 12, 15, 16, 17, 18, 19, 19a-b, 20, 21a-f, 22a-f
R6: What are the prevalent knowledge transfer mechanisms within wastewater treatment organizations for administrative-type research?	4, 5, 6, 7, 8, 9, 10, 10a, 11, 12, 13, 13a, 14, 15, 16, 17, 18, 19a-b, 20, 23a-e
R7: What criteria enable utilization of research?	4, 4a, 10a-b, 12, 12a, 13a-b

The researcher made telephone contact and set up a time for a telephone interview. The consent form, with brief information about the purpose of the study, was e-mailed to the participant, and verbal consent was obtained prior to beginning the interview. These documents are included in Appendix A. Care was given to ensure that the questions were administered in an ethical manner. The researcher truthfully and thoroughly described the purpose of the research and provided information on the study in advance. This research design was reviewed and approved by the Institutional Review Board (see Appendix B). The interview process was discussed in advance, and a post-

research publication was offered to the participant if he or she desired to receive it. Of those 12 participants, 11 requested a copy of the post-research publication

Strengths and Limitations

This research was limited to individuals within publicly owned treatment works in the United States, so the findings are not be generalizable to other public sector organizations. The findings provide insight into reasons why research is or is not utilized that could be further explored in other research. In addition, this study also focused on those solely in management. Therefore, the results may not be able to be extrapolated to individuals outside of management.

In addition, the chosen interviewee may have a different view from another person within the organization, and his or her responses may not be representative of the larger population.

Since the research instrument was an interview, the findings are based upon individuals' perceptions, not observation of behavior. This is important to note since perception and reality may not always be precisely the same.

Additional information linking each question to its related proposition, unit of analysis, and method of analysis is available in Appendix C, Codebook for Data Analysis.

Summary

This chapter described the background for choosing the research methods and details of the approach, which utilized comparative case studies to answer the research

questions. The intent of the research was to determine factors that influence differences in knowledge production, transfer, and utilization and the differences between administrative-type research and core business research. This research aims to provide a lens into the field of wastewater treatment. This may ultimately aid in linking academic research to practitioner application of research.

CHAPTER V

ANALYSIS OF THE DATA

Introduction

The intent of Chapter V is to describe the data collected, first by describing those interviewed by both individual and organizational characteristics, then by presenting the findings for each of the major research questions, and finally, patterns that were observed. Referring to more than one characteristic of the interviewee does not present a risk of revealing the participants' identities due to the large number of wastewater agencies across the United States as well as the number of possible people within each agency. Where possible, answers were categorized or ranked, and then reviewed for patterns. In other cases, narrative responses were reviewed. In addition to Likert-scale questions, open-ended responses were solicited. The terms interviewees, participants, and respondents are used interchangeably throughout Chapters V and VI.

Interviewee Characteristics

Several questions were used to characterize the individuals who were interviewed. The individual characteristics included: years in the field, years with the organization, education and degrees, certifications, levels of management above the individual, gender, and position title. Table 3 presents the number of individual interviews within specific ranges of years in the field and descriptive statistics on their years in the field. It is

apparent that most of those interviewed in management have been in the field for many years. The average time was nearly 25 years.

Table 3

Interviewees by Number of Years in Wastewater Field

Years in the field	Number interviewed
Less than 5	0
5 to less than 10	1
10 to less than 15	0
15 to less than 20	0
20 to less than 25	5
25 to less than 30	2
30 and greater	4

Descriptive statistics

Years in field	Value
Average	24.8 years
Min	9 years
Maximum	34 years
Standard dev.	6.7 yrs

Table 4 presents the number of individuals interviewed by their years with their organization and the related descriptive statistics. There was a greater distribution indicating that although many of the participants had been in the field for 25 years, they had not necessarily been with their organization for as long.

Table 4

Interviewees by Number of Years With Their Organization

Years with organization	Number interviewed
Less than 5	2
5 to less than 10	4
10 to less than 15	2
15 to less than 20	1
20 to less than 25	2
25 to less than 30	1
30 and greater	0

Descriptive statistics

Years in field	Value
Average	12.5 years
Min	3 years
Maximum	27 years
Standard dev.	7.6 yrs

Table 5 presents information about college degrees including the number of participants who held various levels of degrees, the number of college degrees that each interviewee held, and the type of degree that each participant held. Engineering and biology were the most common degree type and the predominant highest degree was a master's degree.

Table 6 shows the type of certificate that each participant held. Participants may hold multiple certificates. Professional engineer and wastewater treatment plant operator certificates were the most commonly held, and five individuals held no certificates.

Table 5

Degree Held by Each Person Interviewed

Highest degree held	Number interviewed
No college degree	1
Bachelor's	3
Master's	6
Doctoral	2

Number of college degrees held	Number interviewed
No college degree	1
1 degree	4
2 degrees	4
3 degrees	3

Type of degrees held	Number interviewed
No college degree	1
Biology	4
Business	1
Engineering	7
History	1
Public administration	1
Speech	1
Urban studies	1

Table 6

Interviews by Type of Certificate Held

Certificates held	Number individuals interviewed who held certifications
Confined space entry	1
Value engineering	1
Professional engineer	4
Wastewater treatment plant operator	3
Collection system certification	1
Pretreatment certificate	1
No certification	5

Participants were asked how many levels of management, or positions, were above them. Results are presented in Table 7.

Table 7

Interviews by Levels of Management Above Interviewee

Levels of management above interviewee	Number interviewed
Top	1
1 above	3
2 above	6
3 above	2

When reviewing gender, all participants were men. Three of those initially planned for interviewing were women. The researcher's initial list had agency names and potential candidates for interviewing. Upon initial contact, the candidates were asked if they met the criteria, and if they did not, they were asked to recommend another individual in their organization. Of the three women on the list, two did not meet the criteria of being in a management role. The third woman chose not to participate and asked the researcher to interview another manager at the agency. The researcher later learned that this female manager retired a few weeks after she was contacted, which may have been a factor in her nonparticipation.

Organizational Characteristics

Organizational characteristics that were reviewed include the region, the number of employees, the volume of wastewater treated, the types of services provided, the governing structure, and lastly, whether board members were elected or appointed.

The categorization for U.S. regions was used as those used by International City/County Management Association (ICMA) and presented in Figure 6. ICMA divides the United States into five regions. Those outside of the United States are included in one region.

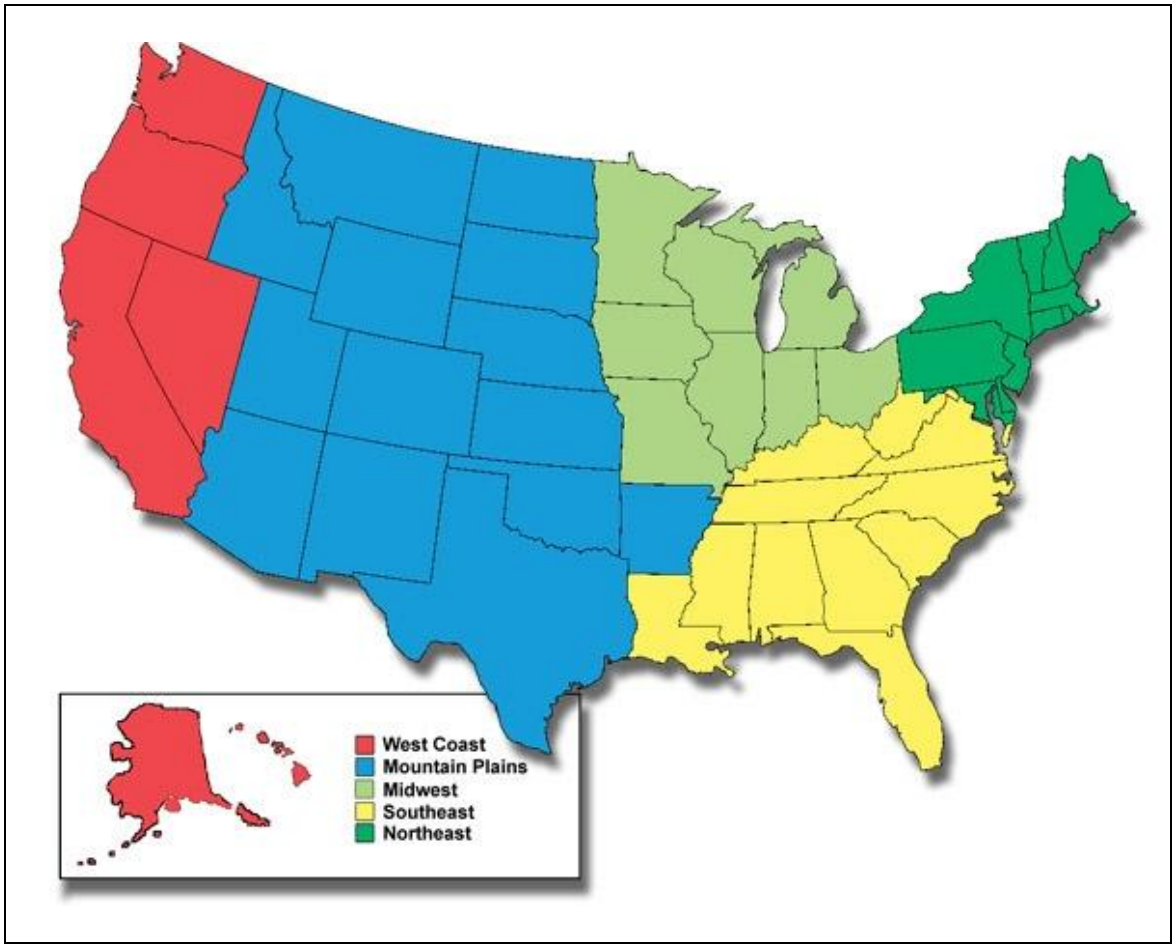

Figure 6. ICMA geographic regions. From International City/County Management Association, 2010. Retrieved July 7, 2010, from http://icma.org/en/Page/724/ICMA_Regions

The West Coast region includes Alaska, California, Hawaii, Nevada, Oregon, and Washington. Mountain Plains include the states of Arizona, Arkansas, Colorado, Idaho,

Kansas, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, Utah, and Wyoming. The Midwest region is composed of Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin. The Southeast region includes Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia. The Northeast is composed of the states of Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. The number of agencies interviewed by geographic region is presented in Table 8.

Table 8

Individuals Interviewed by Geographic Region

Region	Number of agencies represented in region
Midwest	2
Mountain Plains	3
Northeast	1
Southeast	2
West Coast	4

Three attempts were made to interview another agency in the Northeast; however, the individual was not able to participate.

The categorization of plant size by million gallons treated is used by the California Water Environment Association (CWEA). Small plant size is less than 5 MGD, medium is 5 to 20 MGD, and a large plant is greater than 20 MGD. For the purposes of this research, the dry weather average flow was used for categories. The numbers of participants interviewed from agencies categorized by size are presented in

Tables 9 and 10. Table 9 represents the average daily volume of wastewater treated, a common measure in the wastewater industry, and Table 10 shows the size of the organization based upon the number of employees.

Table 9

Individuals Interviewed by Volume of Wastewater Treated

Size of plant (wastewater treated, dry weather average, million gallons per day (MGD)	Number
< 5	3
5 < 20	1
≥ 20	8

Table 10

Individuals Interviewed by Number of Employees at Organization

Size of organization (number of employees)	Number
0 < 100	3
100 < 500	1
500 < 1,000	4
1,000 < 5,000	4

The type of organizational structure is presented in Table 12. The method by which board members are seated is presented in Table 12, and Table 13 presents the type of services offered.

Table 11

Government Structure

Type of organization	Number
City	2
Special district/authority	10

Table 12

Governing Board Composition

Board members	Number
Appointed	5
Directly elected	5
Indirectly elected	2

Board members are subdivided into three categories: appointed, directly elected, and indirectly elected. Members may be appointed by a mayor, a commission, a city council, governor, or another appointing body. Directly-elected board members acquire their post by running in an election for the position on the board of a city, sanitary district, or water district. Indirectly-elected board members become board members by being elected to another position. For instance, someone may run for city council, and then one member of that city council holds a seat on a water district board that has jurisdiction over many cities.

Table 13

Service Provided by the Organization

Services	Number
Wastewater	4
Wastewater plus water	4
Wastewater plus two or more services	4

Major Findings

The major findings are presented in categories organized by major research question. Specific responses and details are presented in the following sections, organized by major research question.

Interview Responses

In Chapter IV, the major research questions were presented with the corresponding interview questions. The following section presents general findings followed by an analysis by major research question with responses from the relevant interview questions.

In reviewing responses to the question of how much research is utilized, two groups of participants gave very similar responses, so their characteristics and response to other questions were compared for commonalities. Two of the interviewees stated they utilized 20% of technical information and 50-60% of administrative information. Selected responses to questions are presented for these two interviews in Table 14. Only the responses for the two comparative interviews are presented in this table. Other interview responses are presented in the discussion through Chapter V.

Table 14

Research Cluster I

Question	Interview D	Interview F
Describe your years in the field	29 years	30 years
Describe your years with organization	9.5 yrs	3 years
Describe your education, degrees, certifications	Bachelor in biology; wastewater operator license	Masters - urban studies; bachelor history and speech
What is your organizations size (number of employees)?	600 in group; 2,200 total	60
What is your organizations size (service area)?	300 MGD	dry 1 MGD, wet 8 MGD
Approximately what percentage of the technical research that you review do you implement?	20%	20%
Approximately what percentage of the administrative/ management research that you review do you implement?	close to 50%	60%

They had several commonalities, and of the individual traits or practices, they had similarities in their years in field, both held the title of director, read technical journals, and looked to training to obtain administrative information. Of the organizational similarities, their agencies offered multiservices, outsiders gave technical presentations to their organizations, had third parties review technical work to validate the quality, collaborated on technical projects, and stated no administrative collaboration. In comparing their responses for assessment of organizational characteristics, both ranked their agency as 2 of 5 for *quick to change* on a technical basis, 4 of 5 for *continuously*

improving (technical), 4 of 5 for collaborative (technical), 4 of 5 for *quick to change* (administrative), and 3 of 5 for *innovative* (administrative).

Another group of three participants had similar responses, utilizing between 50% and 60% of technical information and 25% to 30% of administrative information. Commonalities among this group included the title of manager, engineering degrees, 500 or more employees, 75-150 MGD of wastewater treated, involved in technical research with universities, had requirements for implementing technical research including cost, their agency supported involved in technical organizations, they collaborated with consultants on technical projects, their agency brought in outsiders to present on administrative topics, and they cited upper management as a source of administrative information. This group may be closer to the technical work and not as involved in the administrative decision making. Selected responses to questions are presented for these two interviews in Table 15.

Only the responses for the three similar interviews are presented in this table. Other interview responses are presented in the discussion through Chapter V.

Research Questions

The major research questions are presented with responses to specific questions that related to each of the major questions. Findings related to the questions are also discussed.

Research question 1. *Are there differences in the perceived utilization of technical-focused research versus administrative-type research within wastewater treatment organizations?*

Table 15

Research Cluster II

Question	Interview H	Interview J	Interview L
Describe your years in the field	23	25+	30
Describe your education, degrees, certifications	Bachelor's in Mechanical Engineering	Bachelor's in Mechanical Engineering; PE in Civil	Bachelor's in Civil Engineering; Master's in Public Administration (with concentration in management), PE in Civil; certified value engineer
What is your organizations size (number of employees)?	500 people	372 employees in Dept; 651 total	2,000 includes water supply
What is your organizations size (service area)?	100 MGD	Ave 150 MGD; design 181 MGD	75 MGD and 200 MGD for water supply
Approximately what percentage of the technical research that you review do you implement?	Greater than 50%	In the past 60-70%; New evaluation is cost, so less than 60%	50-60%
How do you obtain management information to apply on the job?	Majority comes from upper management	Discussions with senior management; consultants, decision making left up to individuals	Management and leadership training. In house, can tap outside organizations.
Approximately what percentage of the administrative/management research that you review do you implement?	30% overall; 90-100% for management	30%	25%

Research Question 1 served to assess whether there were differences between utilization of technical and administrative research. The notable distinction between utilization of technical versus administrative-type research was the reliance on management and human resources for administrative information.

Five respondents estimated that greater than 50% of technical research was implemented. Of those that assigned numeric values or ranges, it was estimated that between 38% and 50% of technical research was implemented. In some instances, participants gave ranges, for instance between 10% and 20% of research is utilized. For the majority of further analysis, the midpoint of ranges was used in calculations. Tables 16 and 17 present the responses for Administrative and Technical research utilization.

Table 16

Interview Responses for Technical Research Utilization

Interview name	Percentage of the technical research implemented	Percentage used for comparison
Interview A	25%	25
Interview B	Was 0 could be 100%. Just hired someone to oversee research.	0
Interview C	1 of 1; 100%	100
Interview D	20%	20
Interview E	Very little. Just hire a consultant to obtain the info.	5
Interview F	20%	20
Interview G	Most are implemented in some degree; 80%	80
Interview H	Greater than 50%	55
Interview I	10-20% budgets	15
Interview J	Past more 60-70%; New evaluation is cost, so <60%	55
Interview K	5%	5
Interview L	50-60%	55

Table 17

Interview Responses for Administrative Research Utilization

Interview name	Percentage of administrative research implemented	Percentage Used for Comparison
Interview A	100%; decision already made by the time it reaches this person. "Did not have a lot of input on what techniques we should use"	--
Interview B	70%	70
Interview C	Not familiar (HR)	--
Interview D	Close to 50%	50
Interview E	High percentage, 100%, mandated	--
Interview F	60%	60
Interview G	75%	75
Interview H	30% overall; 90-100% for management directed	30
Interview I	25%	25
Interview J	30%	30
Interview K	5% overall	5
Interview L	25%	25

Several individuals indicated that the management and administrative information they utilize is mandated and arrives in the form of management or human resources directives or policy. When the ratings from those that rely solely on mandated procedures for administrative/management information are removed, the average implemented administrative research is only 36.9%. With it included, 58.2% of administrative research is implemented.

Interviewees were asked to rank their organization from a technical perspective, as well as an administrative/managerial perspective for being *quick to change*, *innovative*, *continually improving*, *collaborative*, striving to be the *best in the industry*, and

supportive of research. In all cases, the mean ranking for technical issues was higher than the same question for administrative/managerial perspective. In all technical categories, the highest ranking (5 of 5) was given by at least one participant; however, for the administrative ranking, no respondent gave the top score for supporting research, innovation, or *quick to change*. Innovation was ranked much higher on the technical response (3.75 of 5) versus the administrative response of 2.7 out of 5. Support for technical research was also ranked higher (3.6 average) for technical substance versus 2.8 average for administrative/management issues. For the category of *best in industry* on a technical scale, the minimum ranking given was 3.0; this was the highest minimum ranking given for any of this series of questions. The mean was 4.4. It may indicate that everyone believes they are the best. Alternatively, the researcher selected top-performing agencies. Table 18 presents descriptions of the responses to agency characterizations.

Table 18

Descriptive Statistics of Self Rating

	Administrative issues		
	Mean	Std. deviation	Range
Quick to change	2.80	0.99	1 - 4
Innovative	2.78	0.81	1 - 4
Continuously improving	3.58	1.00	2 - 5
Collaborative	3.08	1.00	2 - 5
Best in industry	3.60	0.79	2 - 5
Supportive of research	2.80	0.97	1 - 4
	Technical issues		
	Mean	Std. deviation	Range
Quick to change	2.80	1.10	1 - 5
Innovative	3.80	0.75	2 - 5
Continuously improving	3.70	0.98	1 - 5
Collaborative	3.50	1.20	1 - 5
Best in industry	4.40	0.77	3 - 5
Supportive of research	3.60	0.99	2 - 5

Research question 2. *Are there differences in collaboration on technical versus administrative issues within wastewater treatment organizations?*

The purpose of this question was to determine differences in levels of collaboration for core business issues versus administrative issues. The researcher anticipated that employees working in a technical organization may be more comfortable working on concrete problems related to core business than those related to administrative problems. Interviewees were asked to rank how collaborative their agency was with other organizations with respect to both core-business and technical issues as well as managerial or administrative issues. The average ranking for technical or core business collaboration was 3.5 (on a scale of 1 to 5), and for administrative/management issues it was 3. Every agency had worked collaboratively on a technical project. The partners included academics/university partners, consultants, equipment manufacturers, trade organizations, industry associations, other agencies, editors, a conservation group, and certified laboratories. One respondent stated that his organization worked with both universities and consulting firms, but university researchers lend a greater sense of credibility over consultants. The rationale was that consultants may have the appearance of a financial conflict of interest in showing success to gain further work.

Related to management projects, only five participants stated that their organizations collaborated on a management or administrative research project, journal submittal, or conference presentation. The only example provided was a project related to a management system (such as total quality management or an environmental management system) that is used in a specific technical area within the wastewater field.

Two of the 12 respondents worked with university partners on management projects whereas 10 agencies had worked with university partners on technical issues. Of the two that did not, one had provided field samples for analysis to a university.

One method of collaborating or gaining access to collaborative networks is through associations and conferences. For technical associations, all of the agencies supported membership in technical organizations to varying extents. Some had an agency-level membership or only paid for membership if an employee attended a conference and the membership was included.

For management associations, only seven agencies offered support. Two qualified their responses to state that participation in management associations was limited to a specific realm of their work, and the other stated that it was only supported indirectly and for a specific purpose. Three respondents believed that at upper levels of the organization or in human resources, employees may be supported by their organization for membership in management associations, but they were not aware of this. Two cited that a very few, in their respective agencies, have support to be in a management association.

For attendance at technical conferences, all agencies supported attendance. One agency only offered support if the conference was held locally. Two others indicated recent restrictions due to budgetary cuts. Five participants indicated that attendance is typically for management. One organization opened attendance at technical conferences to all employees; two stated that although it was not formally limited to certain staff, it was primarily management who attended. One stated that operators do not attend;

whereas another stated that operators can attend conferences that are specifically geared toward operators. Another organization had a policy that only professionals could attend and technicians were excluded. One required that attendees present at the conference and another described a detailed organizational policy where conference organizers, committee chairs, and presenters could attend. Part of the policy included that position dictated geographic travel allowance for conferences whereby line staff could attend local conferences, supervisors could attend conferences within the state, and upper management could participate in national events.

For attendance at management conferences, nine agencies offered support. One qualified its response to state that management conferences are only supported within a specific realm of its work. Three respondents believed that at higher levels of the organization or in human resources, some may attend management conferences, but they were not aware of it. One cited that the conference needed to be local.

All agencies brought in outsiders to present on technical topics, and all but one brought in outsiders for management topic presentations or training sessions. One respondent stated that although he brought in outsiders for management topics it was not nearly as much compared to technical topics. The technical presentations were given by vendors, consultants, academics, and a state technical advisory group. The outsiders for the management presentations included a law firm that commonly provides training, a local consultant, and a manufacturing firm that was known for expertise in a particular management system.

Only four of those interviewed stated that their agency supported giving presentations related to management research, whereas 11 supported giving presentations on technical topics. One of the 11 stipulated that he could only do so if the conference was local. The respondent whose agency did not support technical presentations at conferences stated that this was a recent change. In general, there was a greater level of collaboration on technical issues than for administrative issues. This was observed through self-rating, responses to questions about collaboration, joint projects, presentations, and participation in conferences and associations.

Research question 3. *Does the quality of research influence utilization?* The purpose of Research Question 3 was to assess if reviewers filter research based upon the quality. If it is filtered for the quality, then it will not likely make it to the utilization phase. For technical research, the credibility of the researchers was noted as a necessity. For instance, a professional engineering license or another applicable certification was seen as giving credence to the research. Other factors and steps taken for establishing credibility of the research included that the technology needed to be proven prior to testing and implementation, and there needed to be a firsthand evaluation of successful applications by viewing a functional installation, talking to those who use the process or technology, and reviewing maintenance records. Four respondents cited financial benefits as a requirement.

Ten of the respondents said they would have a secondary review of the research or proposal. Of those, three stated that they sought consultants for an independent assessment. Other possible reviewers included vendors, operators, and plant managers

where the technology was in use, an in-house expert, calling references, utilizing a state technical advisory service, and, in particular, looking to those who would not have a financial interest in the success or implementation as potential independent evaluators. One agency required a rigid quality assurance and quality control (QA/QC) plan prior to initiating the research. Two have a technical review that closely scrutinizes the technical merits of the research. Three respondents cited that implementation just needs to make sense. There were no distinguishing responses related to quality of technical research that led to greater utilization.

For administrative and management research, it was noticeable in the oral responses that it was more difficult for interviewees come up with a response, and perhaps they had not consciously thought before about the quality of this type of research or information they received. Eight of the respondents cited that validation was on a case-by-case basis through discussion. One interviewee indicated that an internal audit office would review the material; another would ask for a review by the state technical advisory group. Followup through monitoring and measurement was indicated by three individuals. This would imply that they do not conduct a validation until after they implement it full scale. Six said that validation is not an option because management or administrative research would be implemented at a higher level or came from human resources. One of the six qualified his statement that major changes would go through management or even the governing board; however, implementation on a lesser scale may be handled on his level.

Four of the respondents said that everything is implemented since it is mandated through human resources and that was their only or main path of information on administrative or management information. One response was, "I did not have a lot of input on what techniques we should use." For those that measure performance criteria after implementation, the quality may become evident in full-scale implementation.

The quality of administrative and technical research appears to be viewed differently and, therefore, impacts implementation differently. For technical information, the quality is of such importance that users want to test it, see it in operation, and talk to those who have tried it. If individuals conduct testing, they plan for quality in advance. The credentials and affiliation of those presenting the information impact the perceived quality. For administrative research, there does not appear to be so much reliance on quality per se, but that the proposal needs to make sense. This could be due to participants having little familiarity with factors that affect the quality of administrative research.

Research question 4. *Do the characteristics of managerial leaders in wastewater treatment organizations affect the production, transfer, and utilization of academic administrative or core-business research?*

The purpose of this question was to identify personal traits that ultimately influence utilization of research. To evaluate the influence of individual characteristics, several categories were reviewed based upon interview responses. These include the number of organizational levels above the position in which the interviewee resided, their years in the field, their years in the organization, their degree type, their highest degree

achieved, the number of degrees, types of degree, and certificates held. Although types of workgroups were provided by the interviewee, there was such great diversity and likely variation from organization to organization in workgroup definition, that no further evaluation was done related to this. Types of workgroups included public works, research, operations and maintenance, planning, design and construction, plant engineering, water reclamation, plant services, collections, technical services, and biosolids.

Evaluation by years in the field. Those with less than 25 years experience in the field stated that they spoke to human resources on implementation of administrative research or information. One individual did not verify the quality of the information at his level while another commented that administrative information comes from upper management. Those who had more years of experience (over 25) did not state that they relied on human resources for directives and validation of information related to management or administrative issues.

Those with more than 25 years in the field tended to rate the importance of revenue, rates, and financial stability higher than those with fewer years in the field. The importance of staffing and succession planning was also rated higher by those with more years in the field. In addition, those with more years in the field (greater than 25 years) also rated their organization higher in *innovation*, striving to be the *best in the industry*, and *continuously improving* from an administrative perspective. The scope of this research did not assess if the characteristics were in fact the cause of these responses. The greater number of years of the participant yielded decreasing utilization of

administrative research, yet a slightly positive correlation with technical research utilization. Related to technical business issues, those with fewer years in the field saw their organization as less *innovative*. The relationship was inversely related for collaboration; those with more years in the field saw their organization as less *collaborative* than those with fewer years in the field. Figure 7 presents the data related to innovation and collaboration, among other technical organizational characteristics.

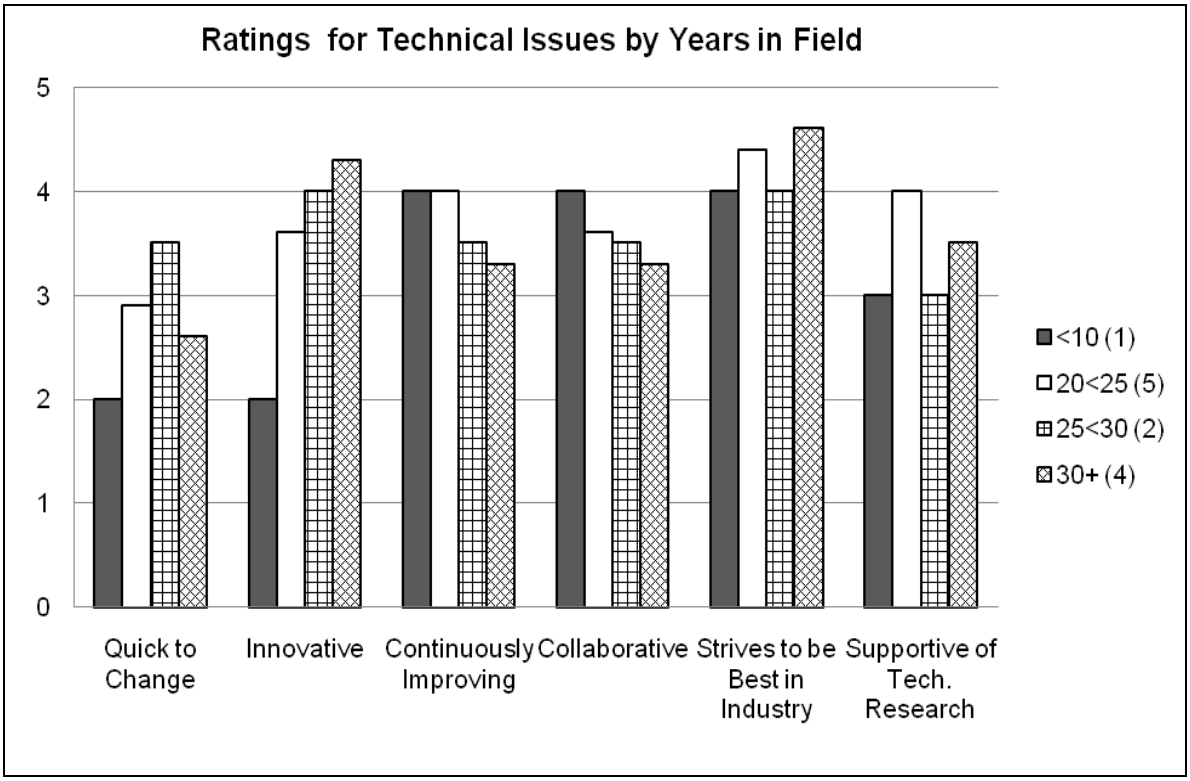

Figure 7. Average self-assessment scores by years in field for technical issues.

Figure 8 presents the average responses related to administrative issues. Those with more years in the field saw therir organization more positively in terms of *continously improving*.

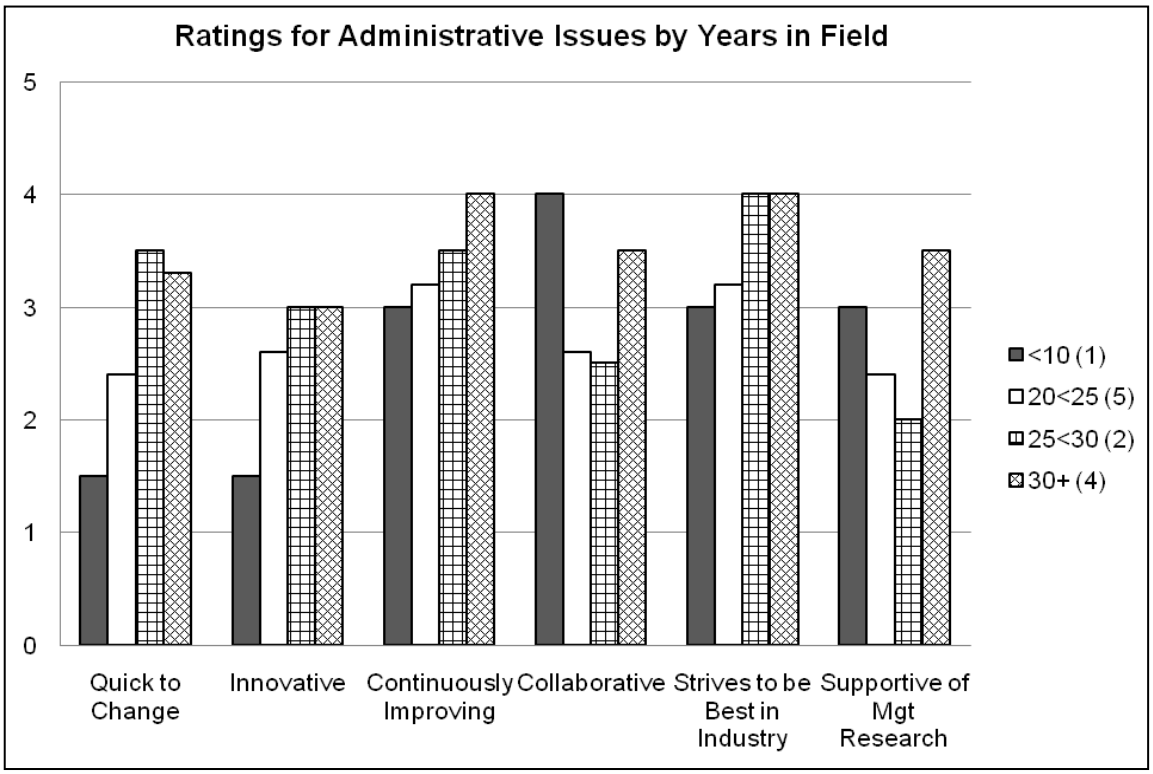

Figure 8. Average self-assessment scores by years in field for administrative issues.

For Figures 7 and 8, and those that follow, the number in parenthesis on the legend represents the number in each group. Due to the small numbers, some variances may be due to random fluctuation.

Years with organization. The number of participants for each range of years with their organization was presented in Table 3. Based on individuals' years with their respective organizations, those with fewer years had a stronger view of their organization as striving to be the *best in the industry* related to administrative issues. Those with more years with their organization held a stronger view of their organization's *innovation* related to management or administrative issues. Categories were collapsed into larger

ranges for the charts. No significant patterns were observed when categorizing responses by years with the organization (see Figures 9 and 10).

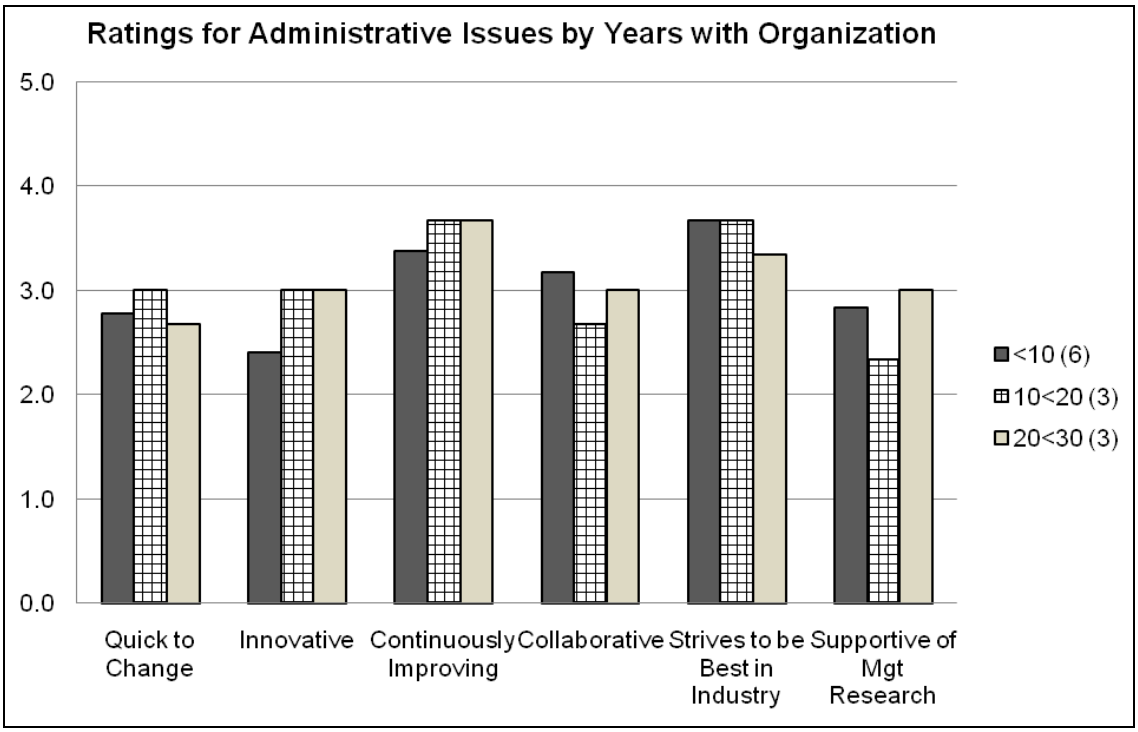

Figure 9. Average self-assessment scores by years in organization for administrative issues.

Evaluation by type of degree. The responses were considered by type of degree. Seven interviewees held engineering degrees, four held biology degrees, and one person each held a degree in business, history, public administration, speech, and urban studies. One individual did not hold a college degree. Many of the responders with engineering degrees (six out of seven) stated that their sources of technical information were their own research or standards and plans. Four of the seven with engineering degrees cited that they relied on their own research for obtaining technical information and three of the

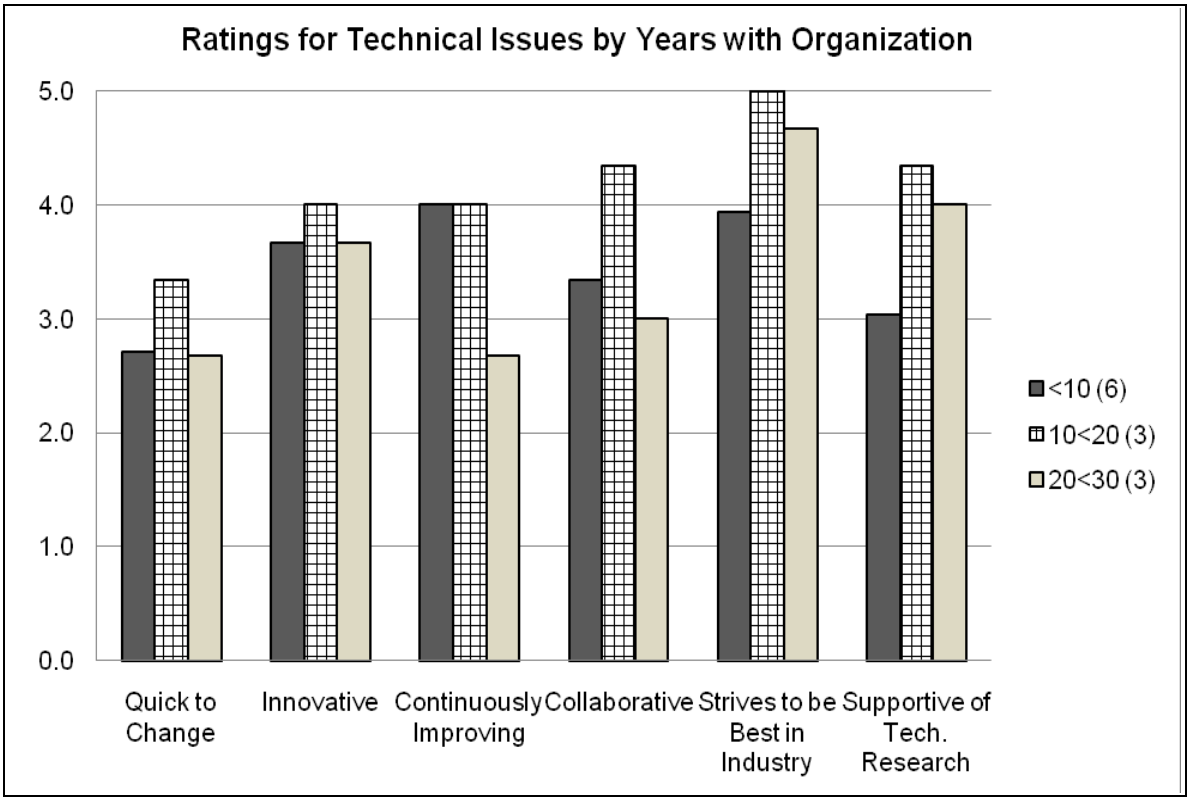

Figure 10. Average self-assessment scores by years in organization for technical issues.

seven relied on standards and plans. Those with engineering degrees may be more apt to have a hands-on approach of validating technical information and proving it for themselves, or they may be more likely to rely on other commonly used tools, such as plans, specification, and standards. The participant without a degree cited professional organizations and technical assistance program as his primary source for technical information. The one individual with a nonscience or engineering degree cited reliance on staff for information. This may be explained by the reliance on technical staff for technical information or the nature of a person in a higher level utilizing technical experts within the organization.

Engineers placed higher emphasis on community support, rates, and financial support than those with science (biology) degrees. Community support also appeared to be more important to those with engineering degrees as opposed to those in the sciences. This could be due to engineers working more with the public in implementing capital projects. Six of the seven with engineering degrees relied on human resources' training and directives from management for administrative information. Two of the responses related to management/administrative information included "not an option to validate" "decision already made by the time it reaches me," and "did not have a lot of input on what techniques we should use." Six of the seven respondents with engineering degrees did not read administrative journals. The engineer who read administrative journals also had a degree in public administration. Self-ratings for administrative and technical organizational characteristics are presented in Figures 11 and 12. The category of business and social science includes one respondant each from business, history, public administration, speech, and urban studies.

Evaluation by level of formal education. The level of education, as defined by the highest degree held by individual, was reviewed. Of the participants, three had their highest degree as a bachelor's, six as a master's, and two as doctorate. One person held no college degree. The higher the degree held by individuals, the more rigorous requirements for validating quality of technical research they described. The responder who did not hold a college degree cited no validation process other than spot checking of information. For technical information, those with bachelor degrees described first field-testing to validate, calling references, talking to vendors and consultants, data driven,

financial limits, and having a third party review and validate. Those who held master's degrees described hiring a consultant to review, having another public agency review, in-depth interview and data gathering from those using the process or equipment, and checking by a third party. Those who held doctoral degrees cited quality assurance and quality control, an internal chain of command for decisions, and hiring of a third party to review the material.

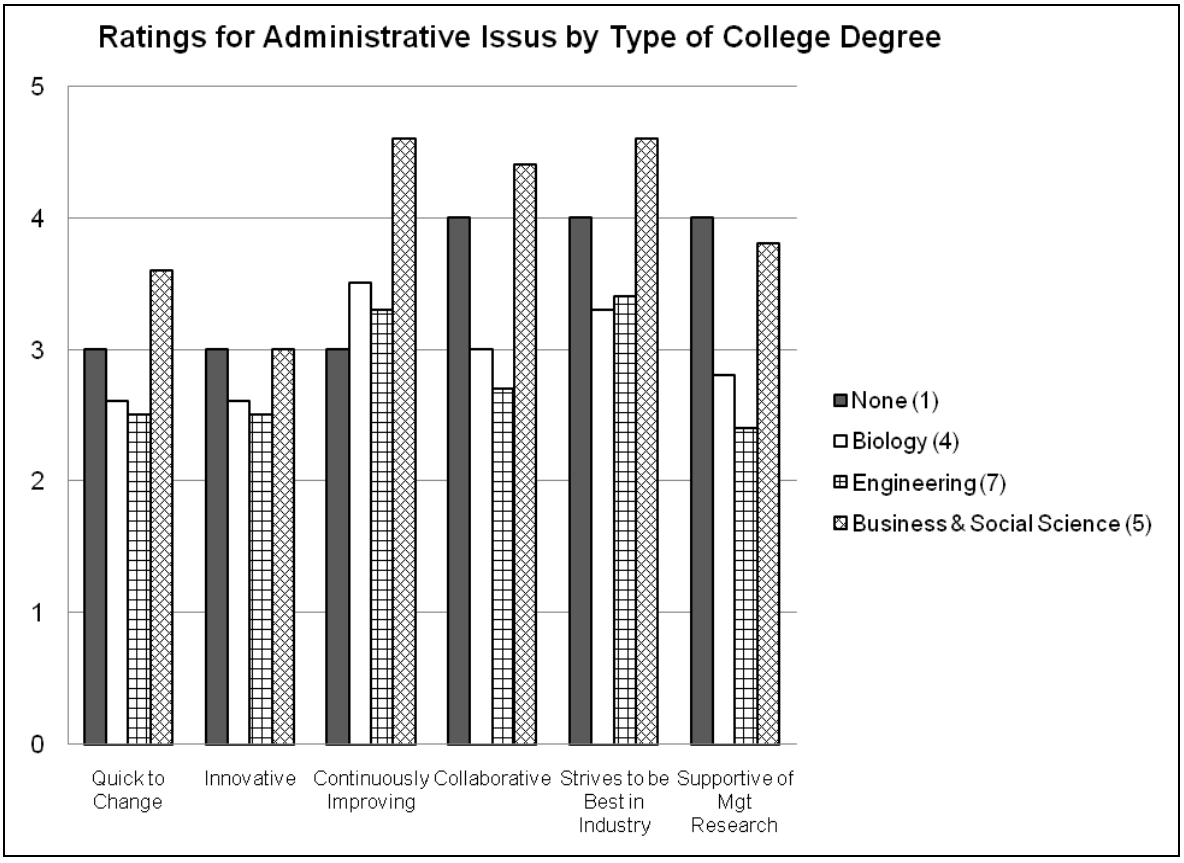

Figure 11. Average self-assessment scores by type of college degree for administrative issues.

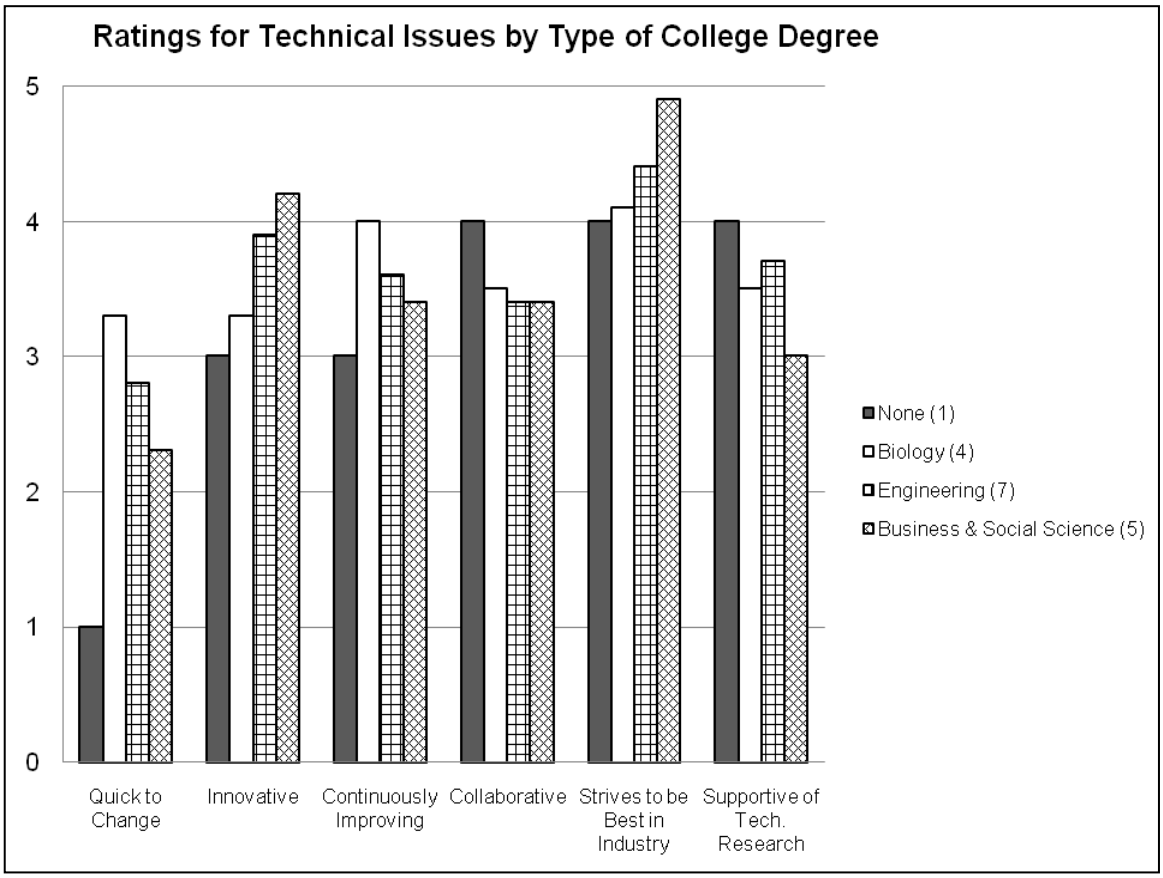

Figure 12. Average self-assessment scores by type of college degree for technical issues.

Those with doctoral degrees read more specialized technical journals, such those from the Society of Environmental Toxicology and Chemistry (SETAC), Water Science & Technology, and Environmental Science & Technology.

Of those with degrees, there was an increasing trend in rating the importance of employee training and education as a pressing issue. On the 10-point scale, those with bachelor's degrees valued employee training and education at 6.5, master's degree holders valued it at 7.4, and doctorates at 8. Those with higher degree attained also saw their organization stronger in terms of *continuously improving*. On a scale of 1 to 5,

those with doctoral degrees ranked their organization at 4.5, master's degrees at 3.6, and bachelor's degree at 3 for continuous improvement. Educational degrees and valuation of education may be a factor in individuals' relying more heavily on the credentials of others performing the research. Self-ratings for administrative and technical organizational characteristics are presented in Figures 13 and 14.

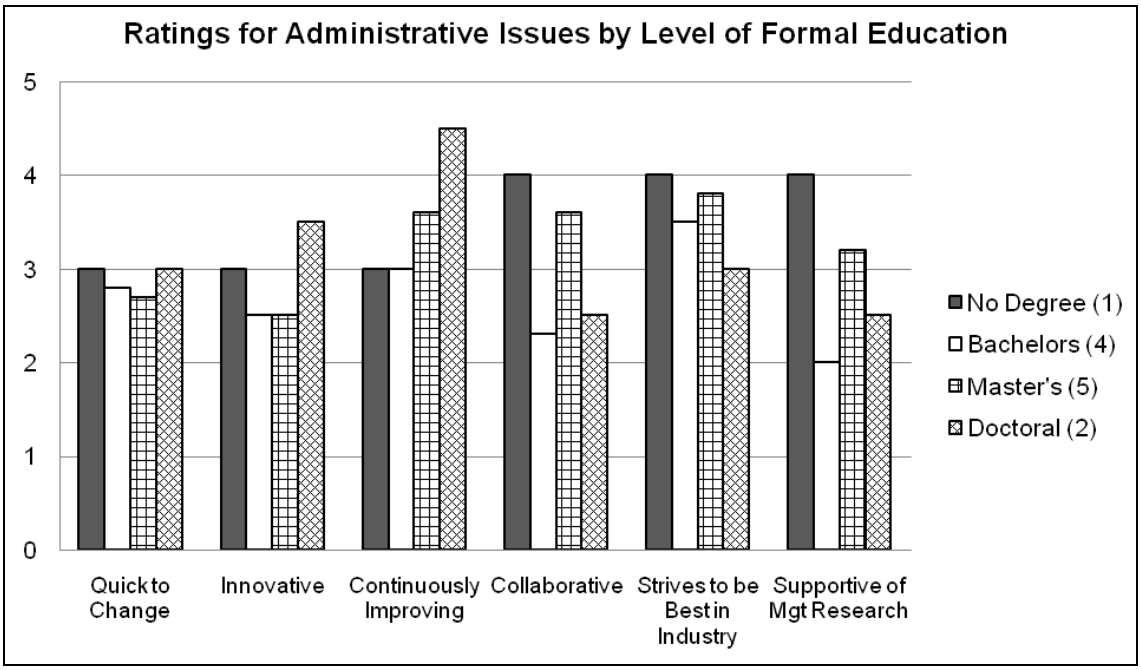

Figure 13. Average self-assessment scores by level of formal education for administrative issues.

With respect to technical issues, there is an increasing trend, by level of degree, in average responses for both *collaboration* and *striving to be best in the industry* ranking by the 11 with degrees (excluding no degree). For the self-assessment criteria of organizational innovation, the trend was an inverse relationship. The higher the degree, the less *innovative* they viewed their organization. Data are presented in Figure 14.

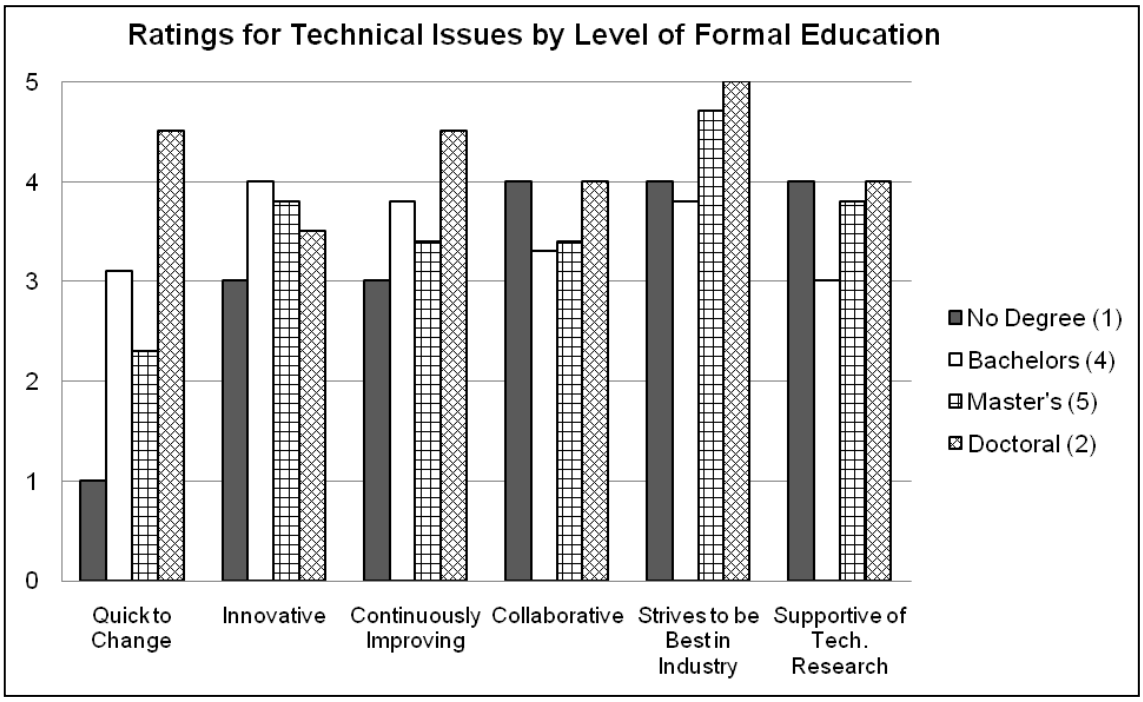

Figure 14. Average self-assessment scores by level of formal education for technical issues.

There appears an increasing trend in utilization of administrative information for those with higher degrees. Figure 15 presents the average utilization of administrative information by highest degree. This graph includes all responses, including those who stated that all research was utilized since it was mandated by management.

Evaluation by number of degrees held. When assessing the responses from those with degrees and considering the number of degrees held, those with more degrees viewed their organization as more *supportive of research*, for both technical and managerial research, than those with fewer degrees. In addition, those with more degrees viewed their organization stronger in terms of continually improving related to administration or management. The data are presented in Figures 16 and 17.

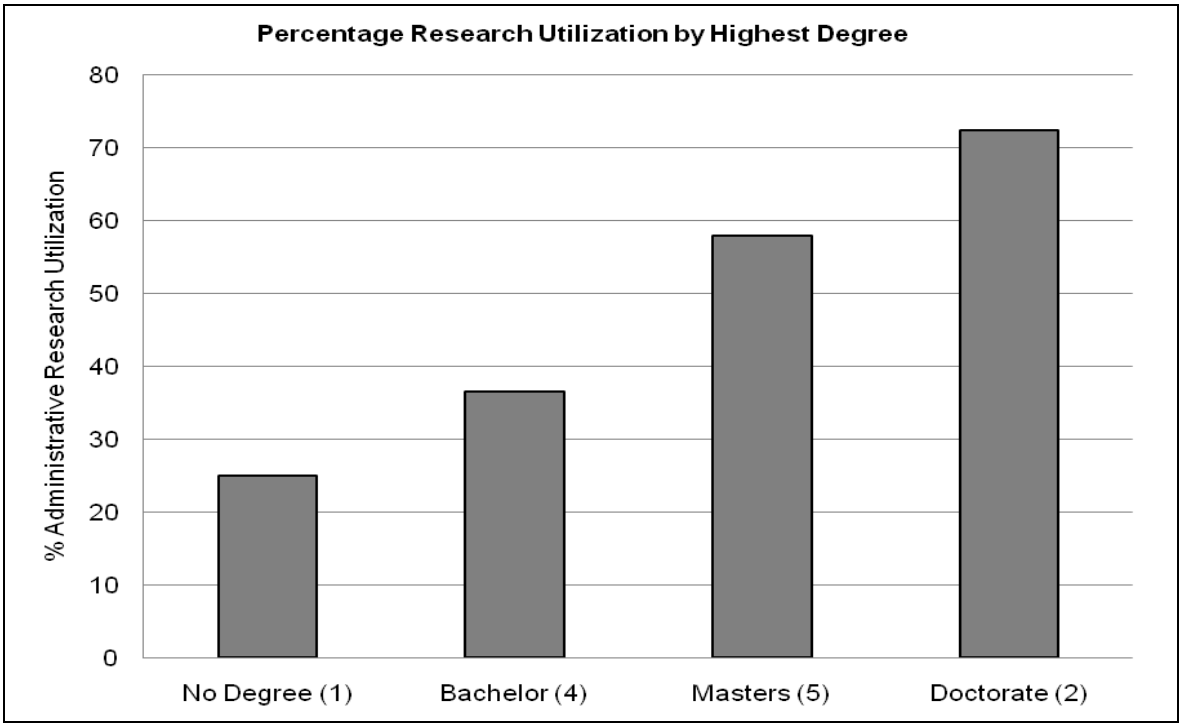

Figure 15. Percentage of administrative research utilization by highest degree.

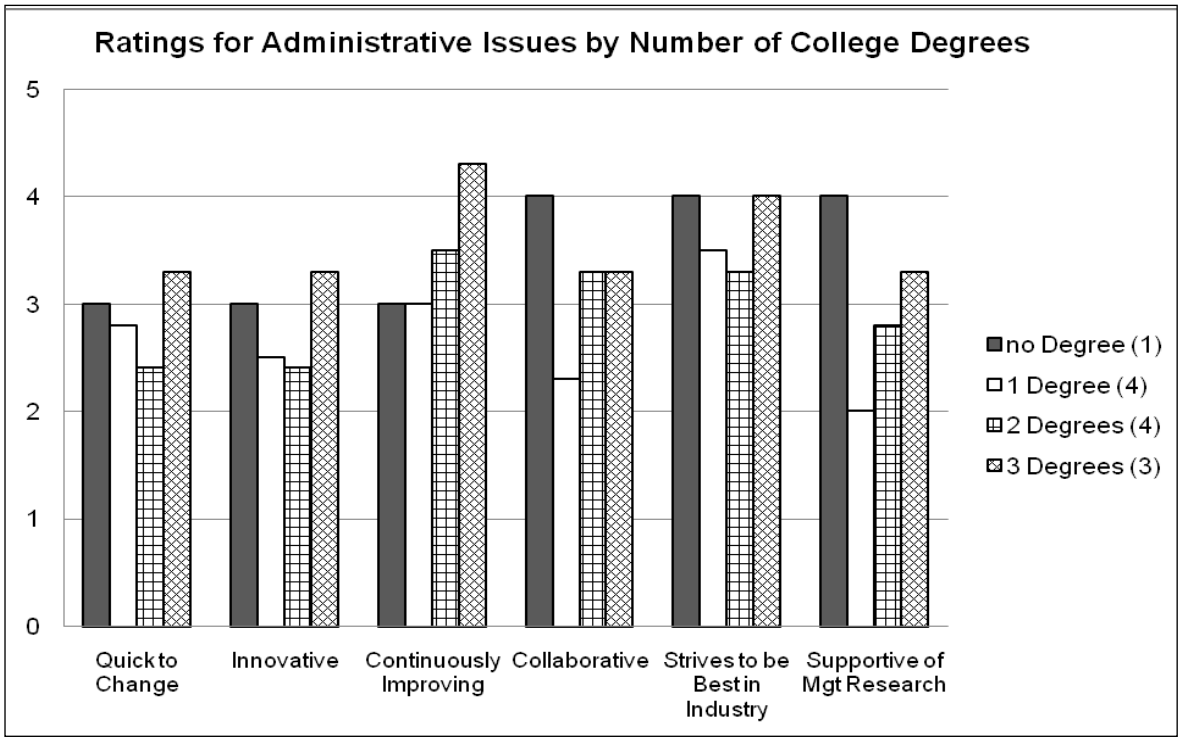

Figure 16. Average self-assessment scores by number of degrees held.

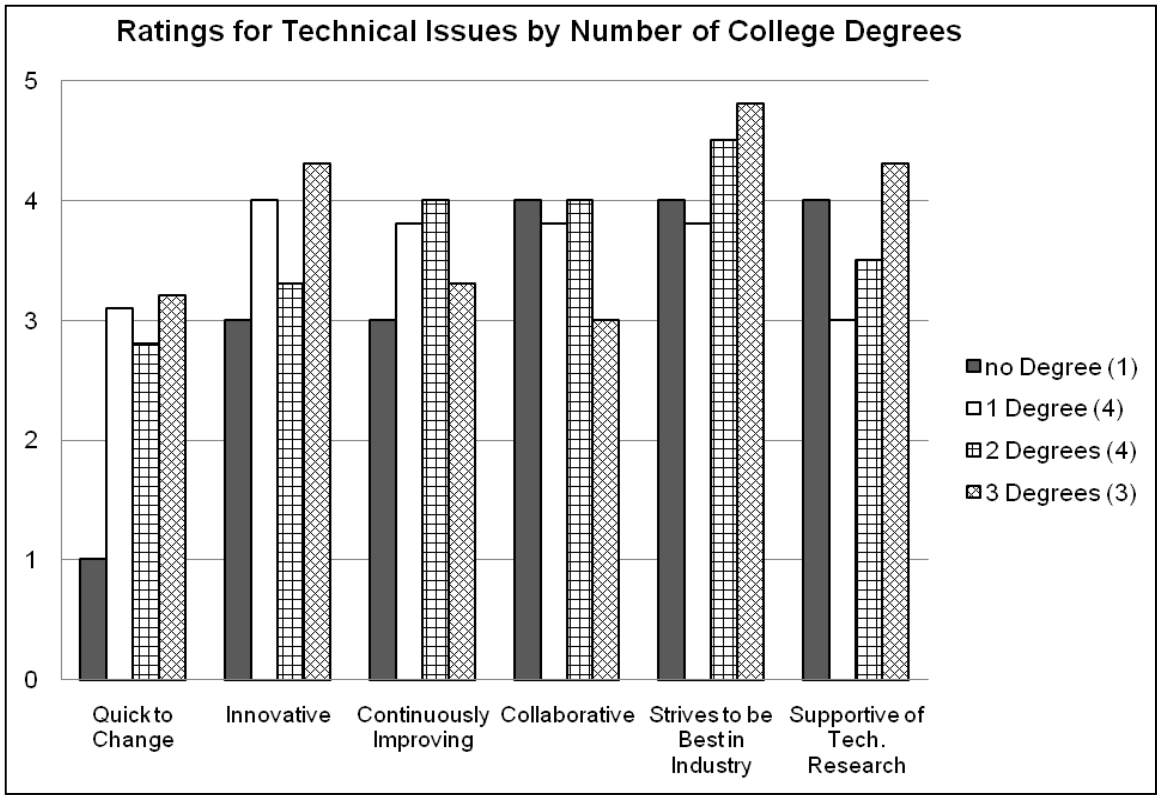

Figure 17. Average self-assessment scores by number of degrees held.

Evaluation by certification. The interviewees were asked about their certificates. Five participants held no certificates and some held multiple certificates. Four participants held professional engineer certification, three held wastewater treatment plant operator certification, and there was one certificate holder each of pretreatment, collection system, value engineering, and confined space. Figures 18 and 19 present data from self-assessments and are organized by certifications.

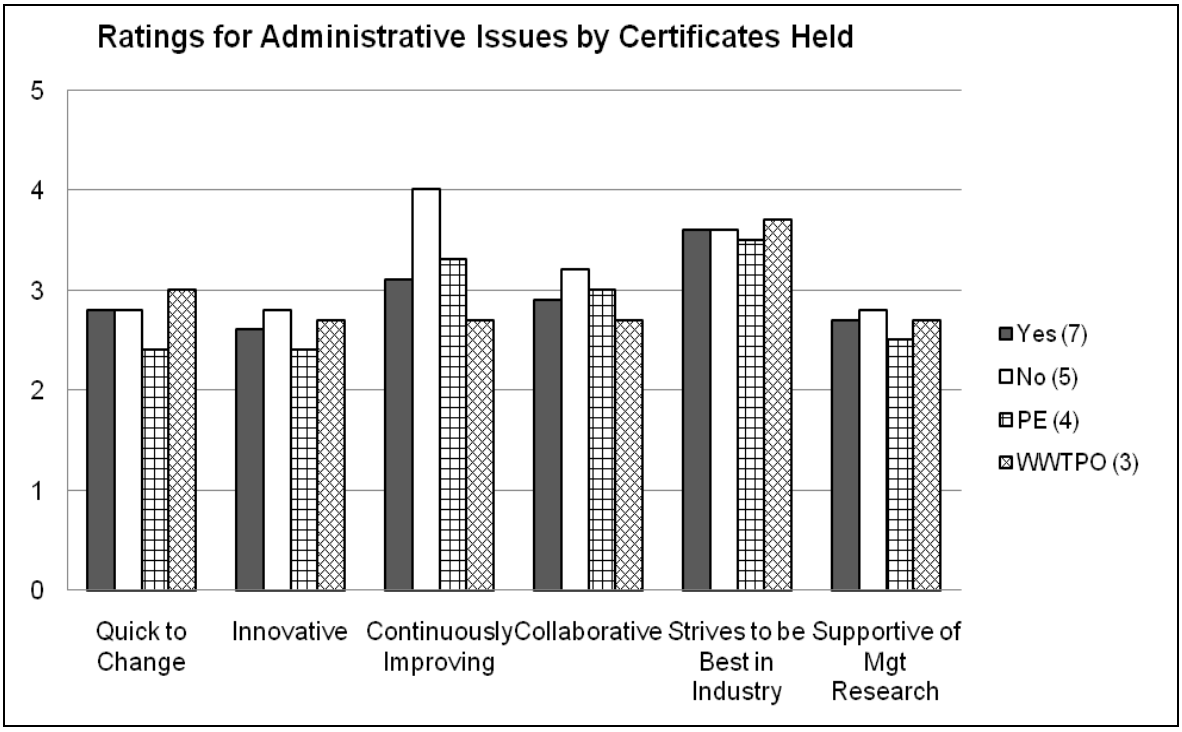

Figure 18. Average self-assessment scores by certificates held for administrative issues.

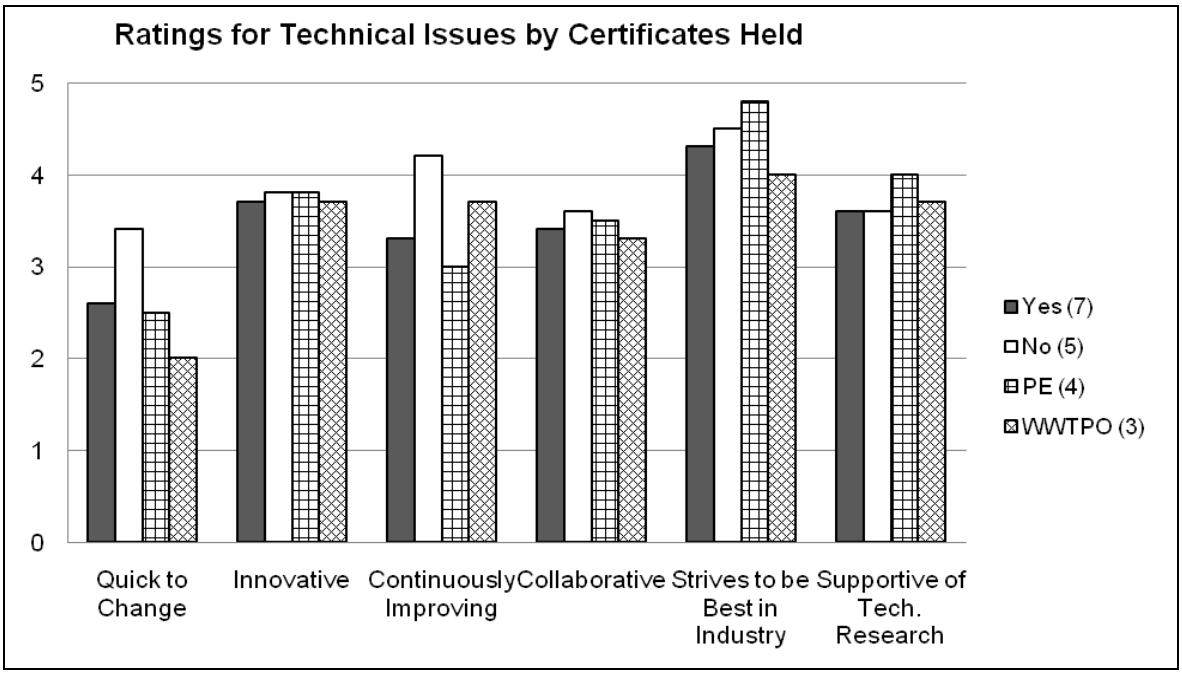

Figure 19. Average self-assessment scores by certificates held for technical issues.

Those who held wastewater treatment plant operator (WWTPO) certifications saw staffing and succession planning as much less important than those with no certification or professional engineering licenses. They may not experience this issue in their organization or recruitment may not be a concern. Those who held WWTPO certificates were at various levels of management (one, two, and three levels of management above) and education (no degree, bachelor's, and master's). This research did not ask about their prior work position, which could present an alternate explanation.

Evaluation by number of levels of management above. There appears to be an increasing trend in utilization of administrative and technical research with the more levels of management above the interviewee. This is slightly so for technical information utilization, but not as pronounced. Although the reported percentage utilization increased with more levels of management above, the self-rating of the agencies' support for research does show consistency. Those higher in the agency saw their organization as more supportive of management research. Those lower in the organization may directly use technical and administrative research. Alternatively, those at lower levels in the organization may not be informed about other business groups that implement less. The selection of interviewees may also introduce a bias in these responses (see Figures 20 and 21).

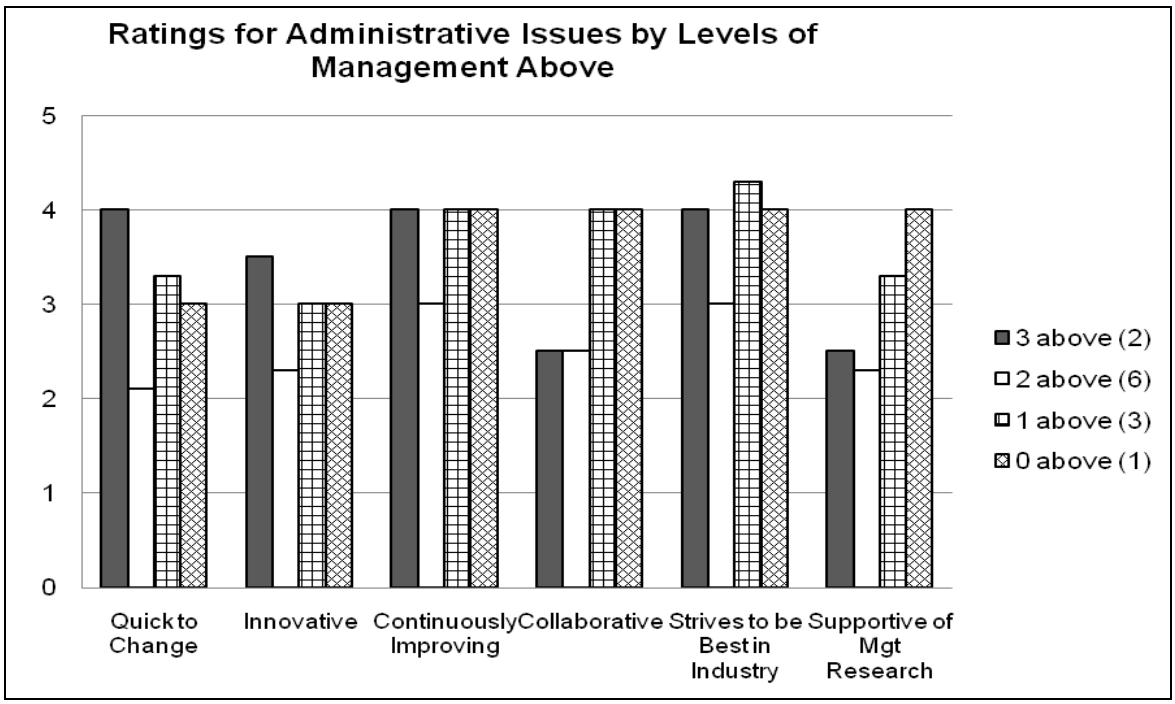

Figure 20. Average self-assessment scores by levels of management above for administrative issues.

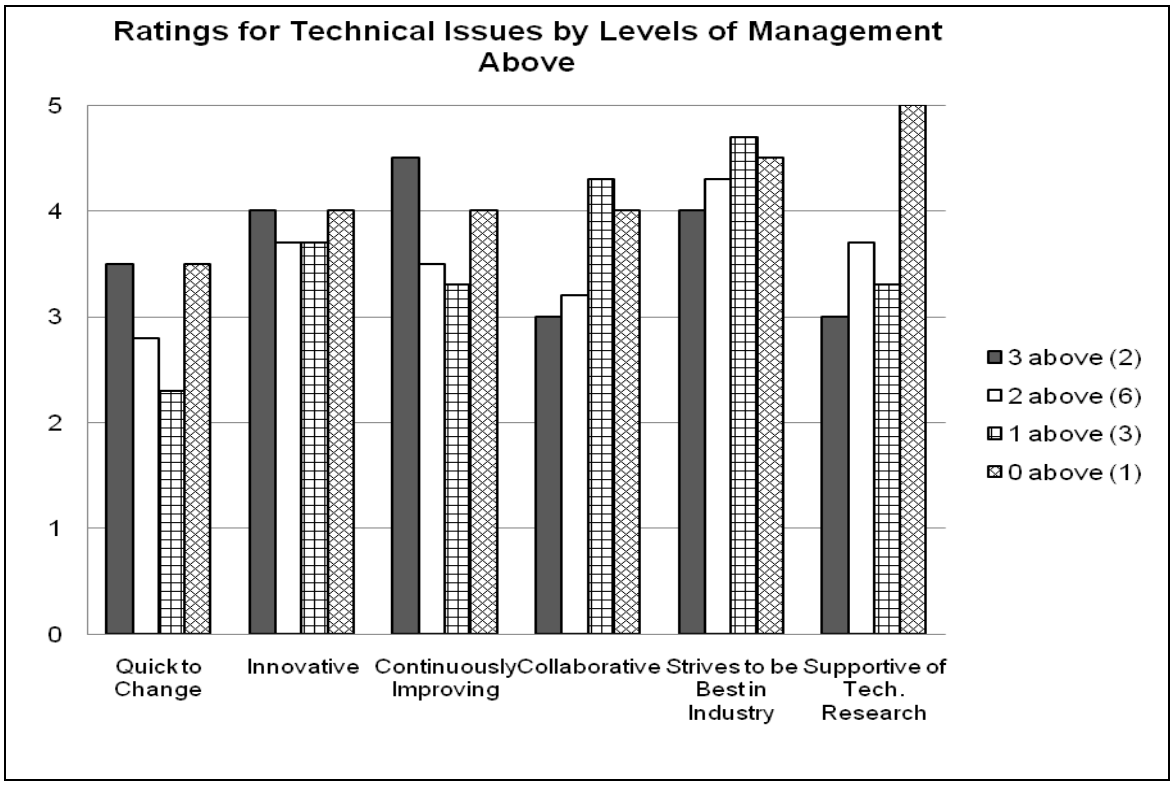

Figure 21. Average self-assessment scores by levels of management above for technical issues.

Research question 5. *Do characteristics of wastewater treatment organizations affect the production, transfer, and utilization of academic administrative-type research?*

This question served to determine if some traits of the organization significantly impact the production, transfer, or utilization of administrative- or management-type information.

To evaluate the organizational characteristics, several categories were reviewed based upon interview responses. These included the number of employees, the daily volume of wastewater treated, geographic location, type of governing structure, whether the board members were appointed or elected, and what services are provided. Finally, the production, transfer, and utilization of administrative information is contrasted to technical information for each organizational characteristic.

Evaluation by number of employees. The responses were categorized by the number of employees. These ranged from 0 to less than 100, 100 to less than 500, 500 to less than 1,000, and 1,000 to less than 5,000 employees. For organizations with less than 100 employees, the sources cited for administrative information were trade and professional organizations. Those who worked for organizations with greater than 500 employees cited internal training, human resources, other managers, and the attending external training sources of administrative information. A greater percentage (75%) of interviewees at organizations with 500 or more employees conducted administrative research whereas 25% of those at organizations with less than 500 employees conducted research on administrative issues.

The smaller organizations (fewer than 100 employees) were more likely to support involvement in management organizations (3 of 3). For those with more than 100 employees, 2 of 9 indicated full support for involvement in management associations, 4 of 9 indicated that this may be an option for others in the organization (human resources or the highest levels of management in the organization), one was supported if events were local, and another only if it related to the management system in use at his organization, and one indicated no support. Presenting management research at conferences was supported by 3 of 3 organizations that had less than 100 employees; whereas only 2 of 9 organizations supported this for the larger organizations. Related to management and administrative issues, interviewees were asked to assess their organization from an administrative perspective for a variety of characteristics. The smaller organizations, with less than 100 employees, ranked their agency higher in terms of *collaboration* with other organizations, *continuously improving*, striving to be one of the *best in the industry*, and *supportive of management research*. Figure 22 presents this information in graphical form.

The smaller organizations also ranked themselves as more *collaborative* in the technical arena. This may be due to limited internal resources and the need to rely on outsiders for more information. There was a slightly increasing trend of use of technical and administrative research with the size of the organization, by number of employees. The average rankings of collaboration are presented in Figures 22 and 23.

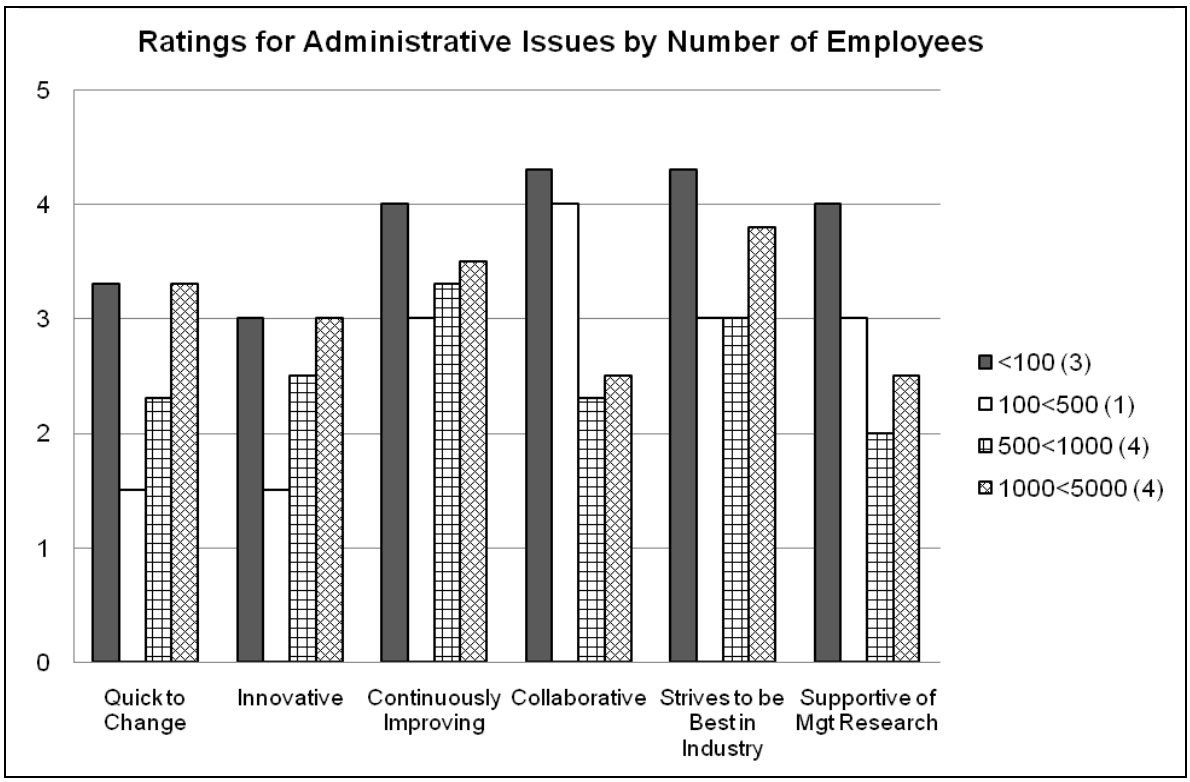

Figure 22. Average self-assessment scores by number of employees for administrative issues.

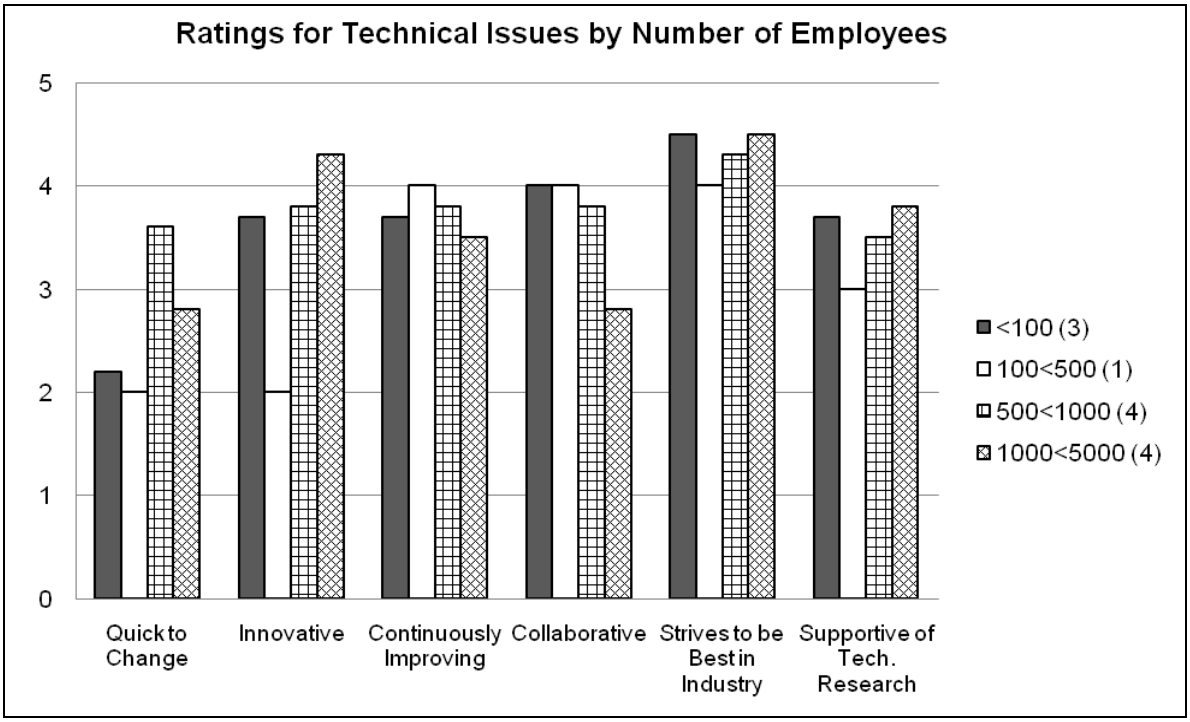

Figure 23. Average self-assessment scores by number of employees for technical issues.

Evaluation by volume of wastewater treated. When comparing organizational responses based upon the daily flow of wastewater treated, results were very similar for number of employees. The category of medium included only one respondent, and the volume was closer to the small category, so they were consolidated into one group for this evaluation by volume of wastewater treated. The organizations with less than 20 MGD of average dry weather wastewater treated, which included the categories of zero to 5 MGD and 5 to 20 MGD, rated their organization lower on technical innovation (average of 3.3 on a scale of 1 to 5) and lower on the ability to change quickly (technically; 2.1 average on a scale of 1 to 5) as compared to larger organizations. However, the smaller organizations rated their agencies better (average 4 on a scale of 5) on being *collaborative* with other organizations on management/administrative issues as compared to larger organizations (rating of 3.3 on a scale of 5). The average of the responses is presented in Figure 24.

In comparing to the technical realm, interviewees from larger plants (greater than 20 MGD) rated their organization higher for *quick to change* than those from small and medium plants and more *innovative* as presented in Figure 25. However, respondents from larger plants ranked their organization lower on the collaboration scale compared to those from medium and small plants.

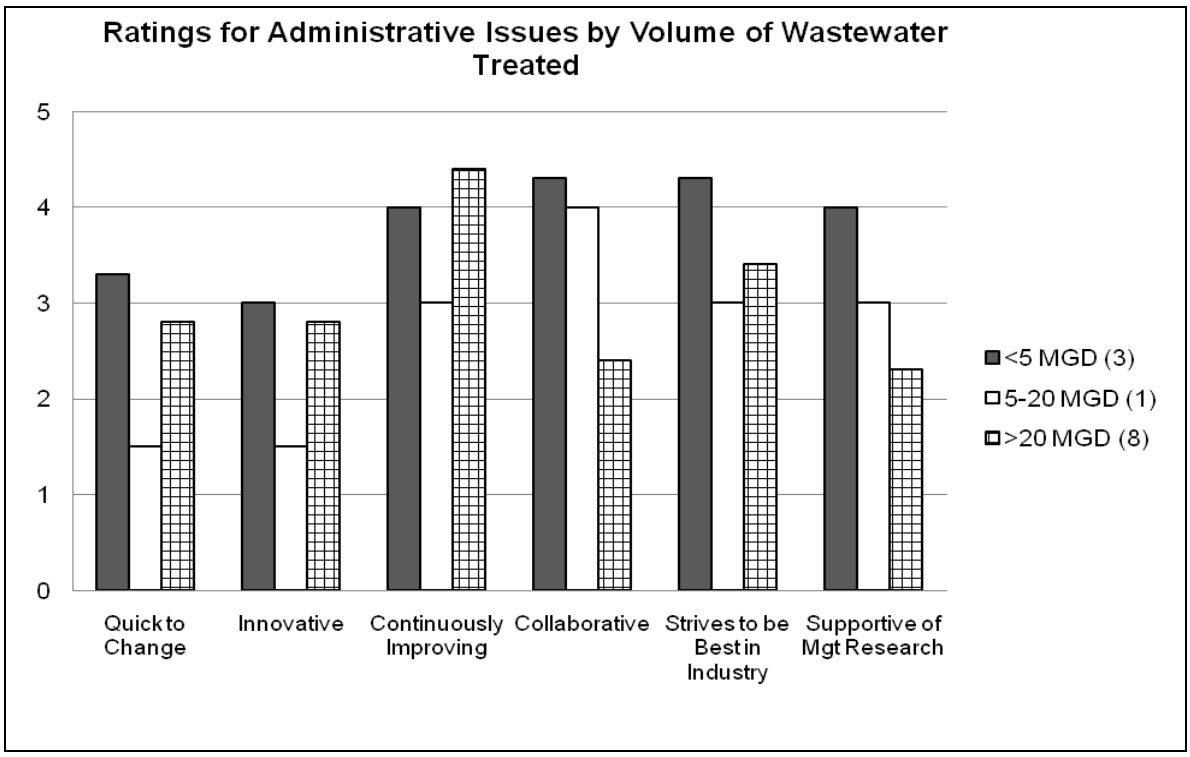

Figure 24. Average self-assessment scores by volume of wastewater treated for administrative issues.

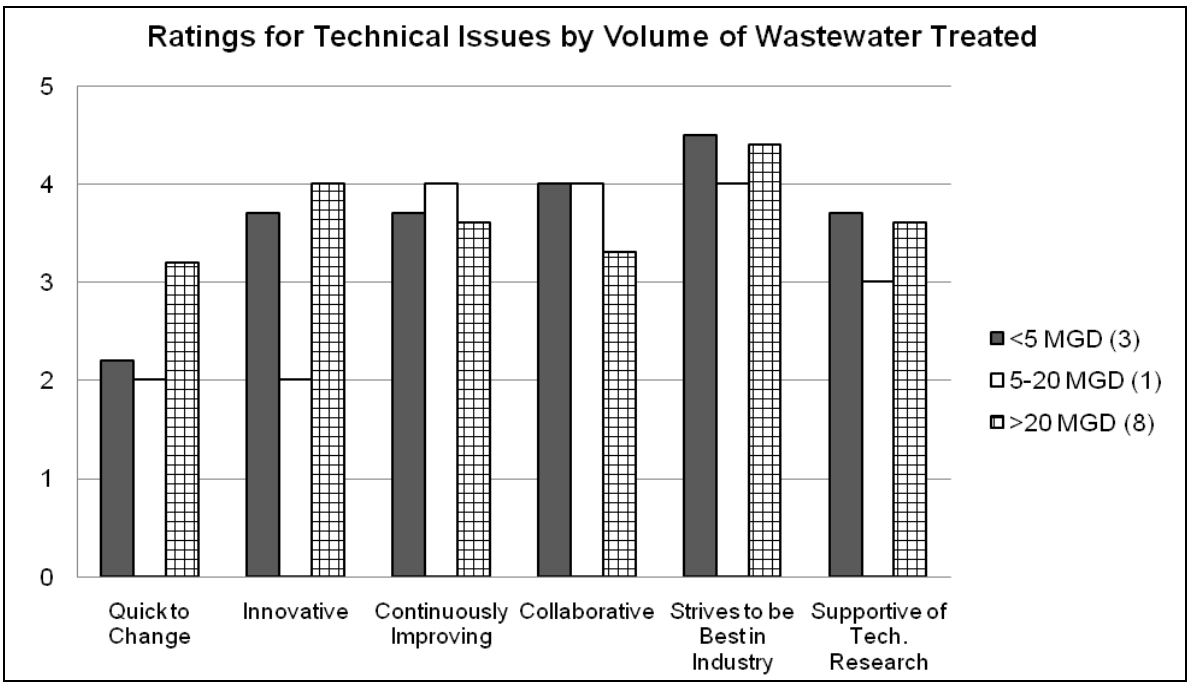

Figure 25. Average self-assessment scores by volume of wastewater treated for technical issues.

Responders from smaller organizations (500 or fewer employees or less than 20 MGD of treated wastewater) reported that they utilized less technical research. Responses included *very little*, 20%, 10-20%, and 5%. Responders from larger organizations indicated a greater level of utilization of technical research.

Evaluation by geographic location. The states composing each of the five regions were presented earlier in this chapter. Descriptive statistics are presented by region for utilization of administrative and technical research, Tables 19 and 20, respectively. This information was based upon self-reported utilization.

For the utilization of administrative research, four responses were excluded from the summary analysis. One participant did not give a clear numeric response, and three participants stated that all administrative research is implemented since it is mandated or directed by management. These interviewees saw implementation of administrative research as out of their control and something they were directed to do. These three participants all had two levels of management above them and less than 10 years with their organizations. Although the averages show large differences by region, the ranges are broad. Responses to self assessments of administrative and technical issues were presented in Figures 26 and 27.

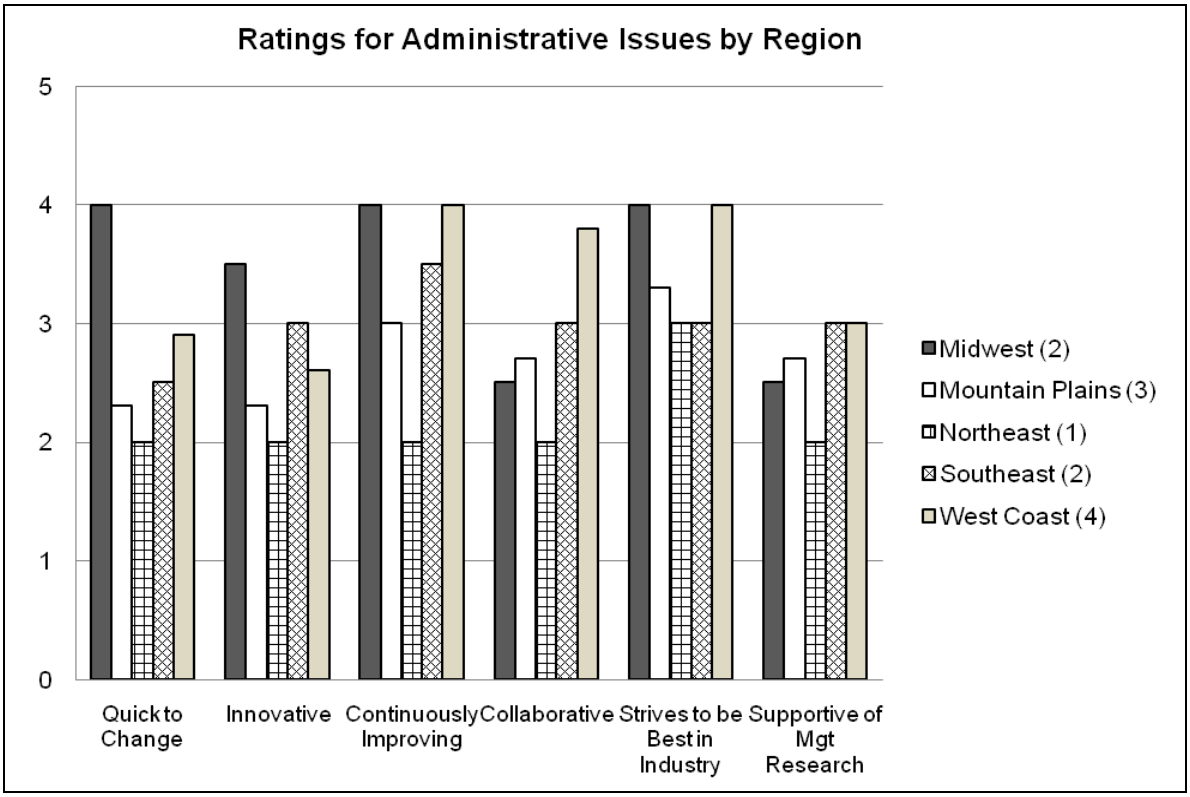

Figure 26. Average self-assessment scores by region for administrative issues.

Table 19

Self-Rating of Administrative Research Utilization

Region	Utilization average	Utilization range	No. in each region
Northeast	--	--	0
Southeast	47.5	25-70	2
Midwest	62.5	50-70	2
Mountain plains	17.5	5-30	2
West Coast	38.3	25-60	3

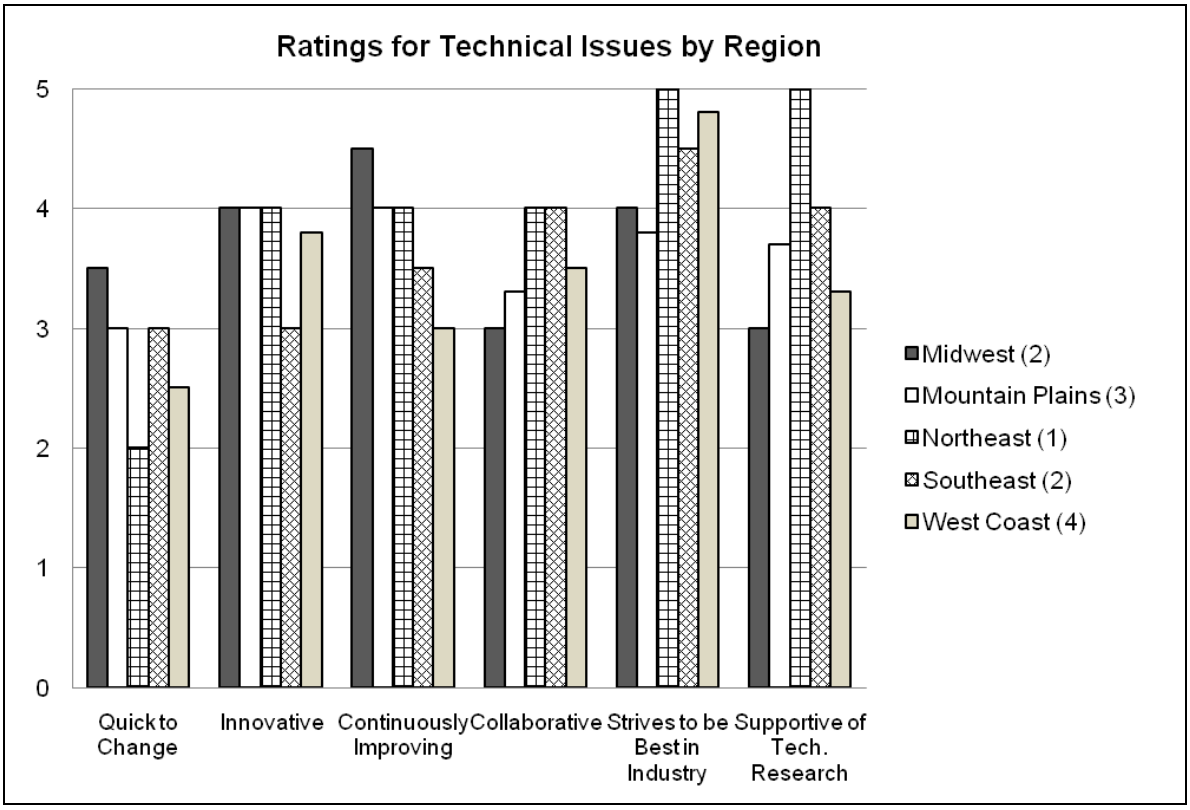

Figure 27. Average self-assessment scores by region for technical issues.

Table 20

Self-Rating of Technical Research Utilization

Region	Utilization average	Utilization range	No. in each region
Northeast	25	25	1
Southeast	7.5	0-15	2
Midwest	50	20-80	2
Mountain Plains	58.3	5-100	3
West Coast	33.8	5-55	4

Evaluation by type of governing structure. The next organizational characteristic reviewed was the type of governing structure. Two of the organizations interviewed were

cities, and 10 were special districts or authorities formed under state legislation. The two cities represented smaller facilities in terms of volume of wastewater treated and the number of employees.

Participants from cities cited trade and professional organizations for sources of administrative information. This may be due to cities' strong sense of networking in order to accomplish its mission. State and federal organizations were specifically referred to as top sources for information on administrative or management information. The respondents from cities were also more apt to obtain information through management journals. One hundred percent (2 of 2) of the city responders read management journals, whereas 30% (3 of 10) of the respondents from special districts read management journals.

Involvement in management organizations and attendance at conferences was supported for the city responders. For those in special districts, only 40% were supported for involvement in management organizations, 40% thought others at higher levels in the organization might be supported, and 20% were not aware of organizational support. City responders both indicated that their organizations paid for and supported staff presenting management research, whereas 30% (3 of 10) of special district responders indicated support for such involvement. The city responders all indicated higher levels of innovation, continuous improvement, collaboration, support for administrative/management research, being the *best in industry*, and *quick to change*. This information is presented in Figure 28.

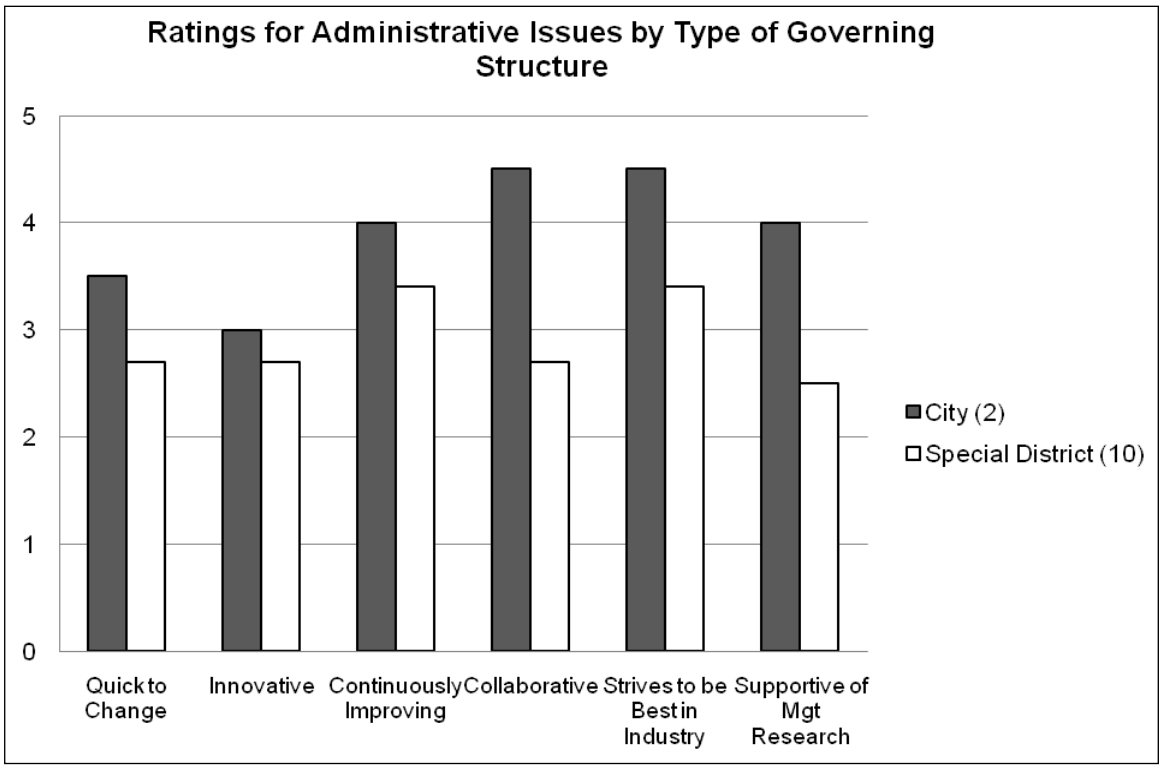

Figure 28. Average self-assessment scores by type of governing structure for administrative issues.

In comparing the responses of the management self-assessment to the technical self-assessment, cities rated higher on collaboration; however, special districts rated themselves higher on *supportive of technical research* and *quick to change*. The results are tabulated in Figure 29.

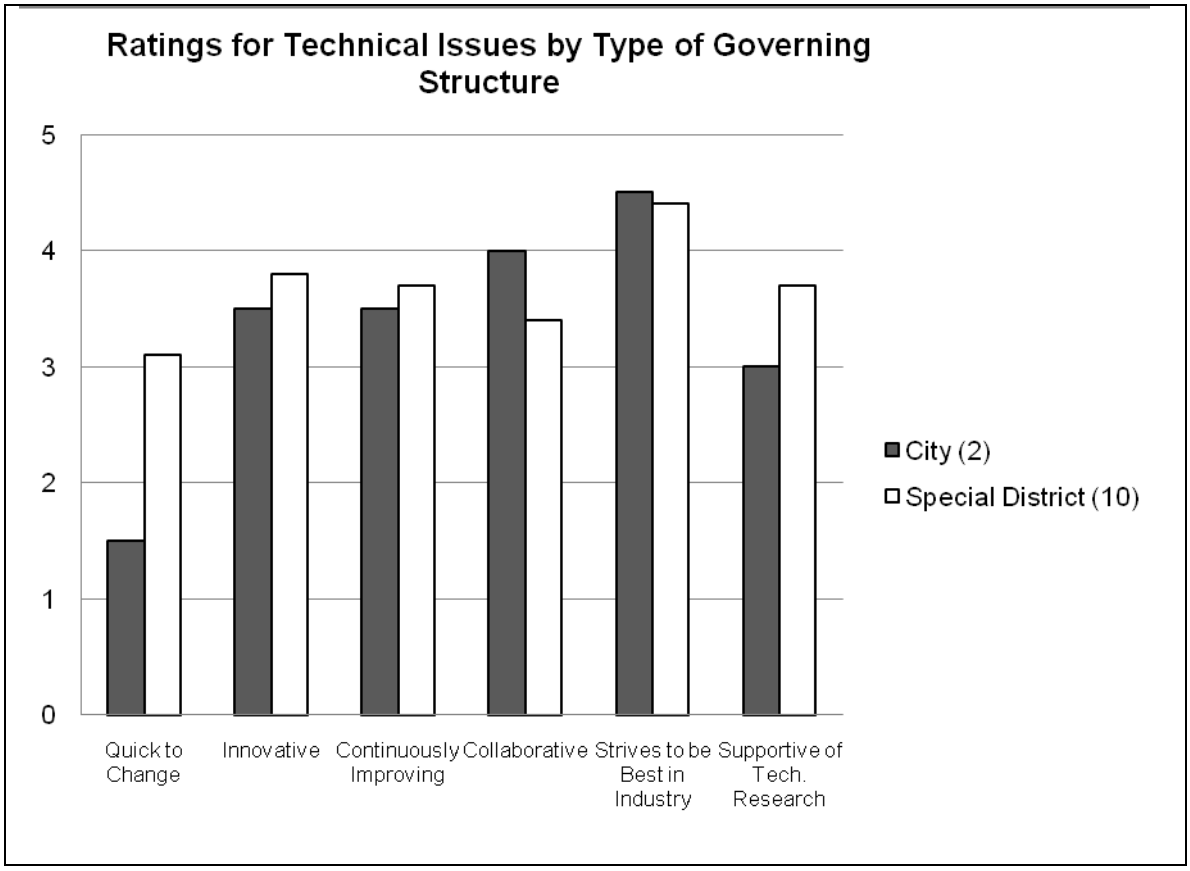

Figure 29. Average self-assessment scores by type of governing structure for technical issues.

Evaluation by services provided. When looking at responses based upon type of services offered, the participating agencies were categorized into wastewater treatment, water and wastewater treatment, and multiservices, meaning that wastewater plus at least two other services were provided. These other services included street maintenance, trash service, or multimedia regulatory services. For those agencies providing multiservices, all the responders indicated that their agencies supported or promoted involvement in management organizations and attendance at conferences; whereas two of the four wastewater-only organizations supported this. This may be due to other factors, such as multifunctional organizations, which are likely to have included the respondents

from cities, which was already identified as supportive of involvement in management organizations.

For collaboration on a management research project, journal submittal or conference presentation, none of the four multifunctional organization responders observed this in their organizations. Six out of nine of the wastewater and wastewater plus water organizations attested to collaboration occurring in their agencies for management research, journal submission, or conference presentations. Those with multifunctions were more likely to read administrative journals. Three of the four indicated that they reviewed journals and the fourth stated that he did, but not regularly. Only one of the four of water-plus-wastewater treatment agencies read administrative journals, and only one of the wastewater-only organizations.

For the self-assessment based upon the managerial and administrative realm, those with multifunctions rated themselves highest on striving to be the *best in the industry* and *collaboration* (Figure 30). The wastewater-only organizations rated themselves highest on *innovation* and *continuously improving*. The responders from organizations with water and wastewater treatment rated themselves lowest in all categories based upon the self-assessment.

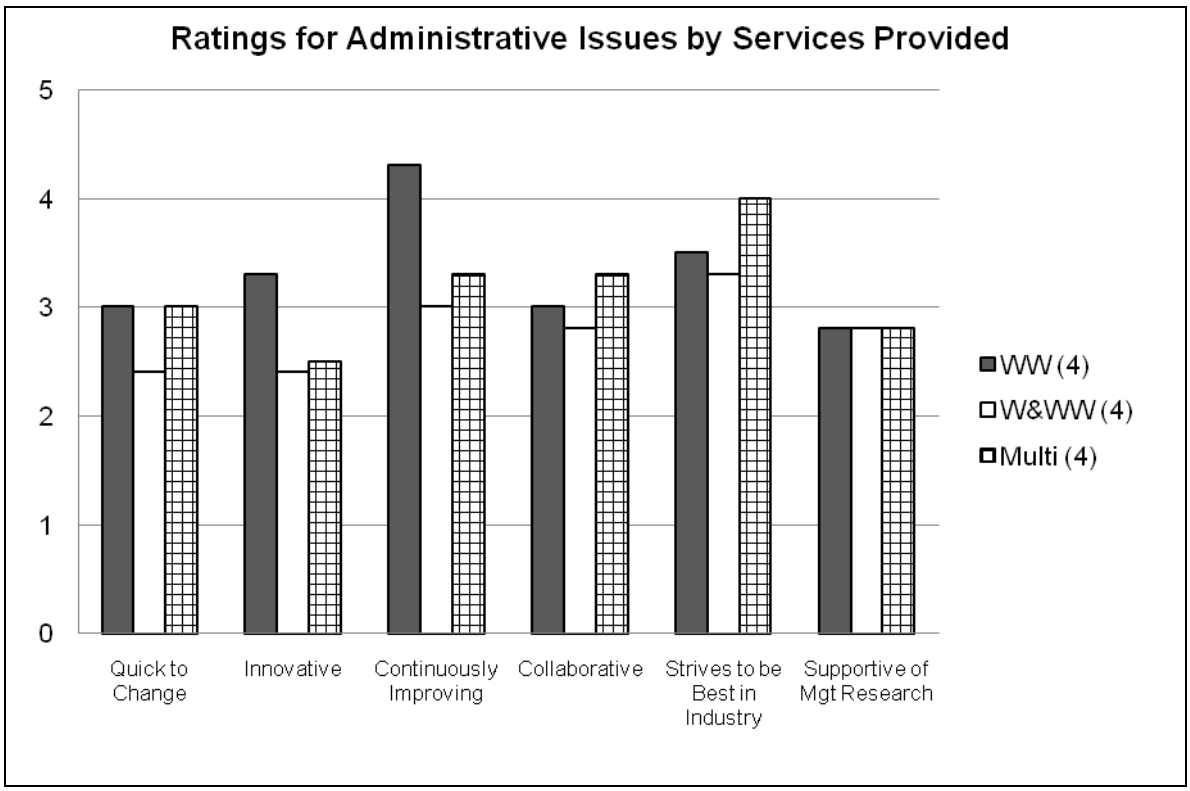

Figure 30. Average self-assessment scores by services provided for administrative issues.

When comparing to the technical self-assessment, the wastewater-only group gave the highest average responses for all categories except innovation, where all three groups equally rated themselves. Figure 31 presents the results of the average scores categorized by service type for technical issues.

The interviewees from organizations with multifunctions ranked lowest in *quick to change*, *collaboration*, *best in industry*, *supporting of technical research*. For the combined water and wastewater organizations, respondents rated their agencies lowest on *continuous improvement*.

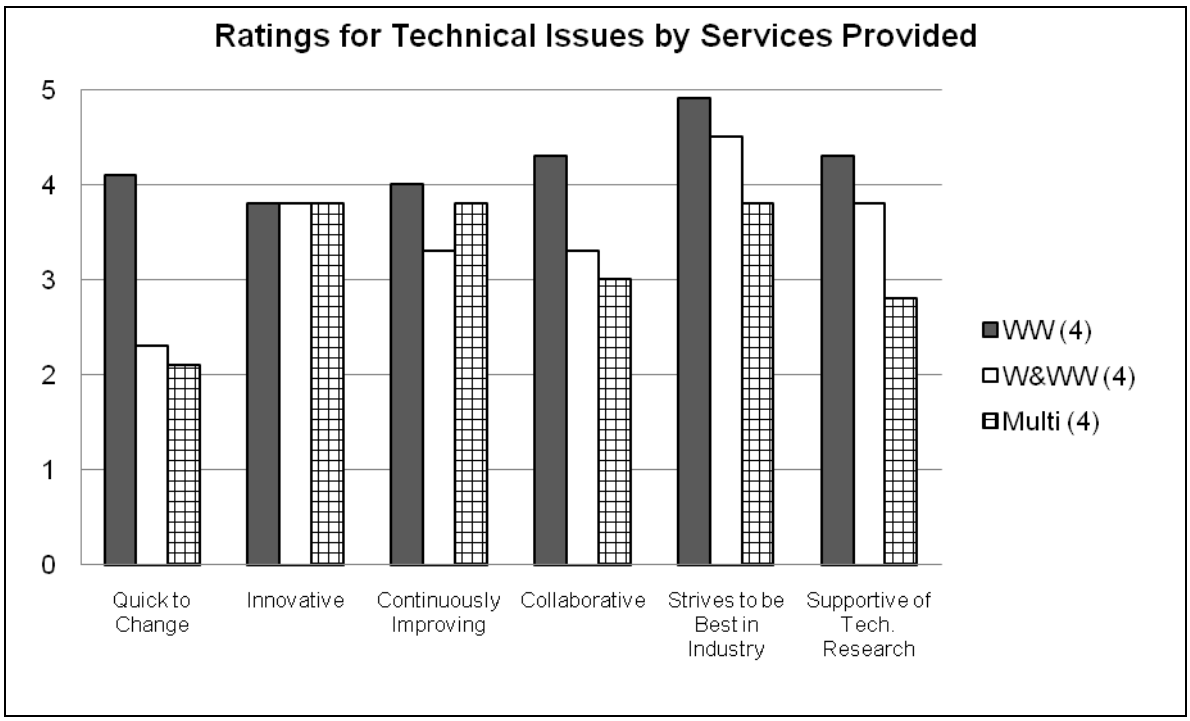

Figure 31. Average self-assessment scores by services provided for technical issues.

Evaluation by board of director type. The next organizational characteristic reviewed was by the type of board member, elected or appointed. Elected boards were further categorized into directly elected and indirectly elected. Indirect election was considered as a board member that is not directly elected to that position for that agency. An example of this includes an individual who is elected as a city council member or county commissioner, and then one person on that council or commission is allowed a seat on a special district's board. In contrast to this, a direct election would entail someone running for a position on a special district's board. Both cities represented by interviewees had directly elected board members. When evaluating organizational characteristics by type of governing board, the two agencies with indirectly-elected officials, neither had a central library, nor did their organizations support, pay for, or

promote involvement in management organizations or attendance at management conferences, or giving presentations at management conferences. In all areas of self-rating except innovation, members of organizations with elected officials viewed their agencies more positively in terms of *quick to change*, *continuously improving*, *collaborative* with other organizations, striving to be *best in industry* and *supportive of management research*. Members of organizations with indirectly elected board members rated themselves next highest, with the exception of innovation. Those with appointed officials rated their organizations lowest in all organizational traits. Figure 32 presents self-ratings, by type of governing board, for administrative characteristics.

For administrative information utilization, there was a slight inverse relationship for organizations with higher ratings of *collaborative* with other organizations, *supportive of administrative research*, and *best in industry*. A slight increasing trend in utilization of administrative information was observed for organizational characteristics of *innovation*, *quick to change*, and *continuously improving*.

In comparing to the technical arena (Figure 33), interviewees who were part of an organization with indirectly elected board members saw their agency as *quicker to change*, more *collaborative*, and more *innovative*, based on averages, than those from directly elected or appointed boards. Those from organizations with directly-elected boards rated themselves highest in striving to be the *best in the industry*. Those from organizations with appointed boards rated themselves highest in supporting technical research and continually improving.

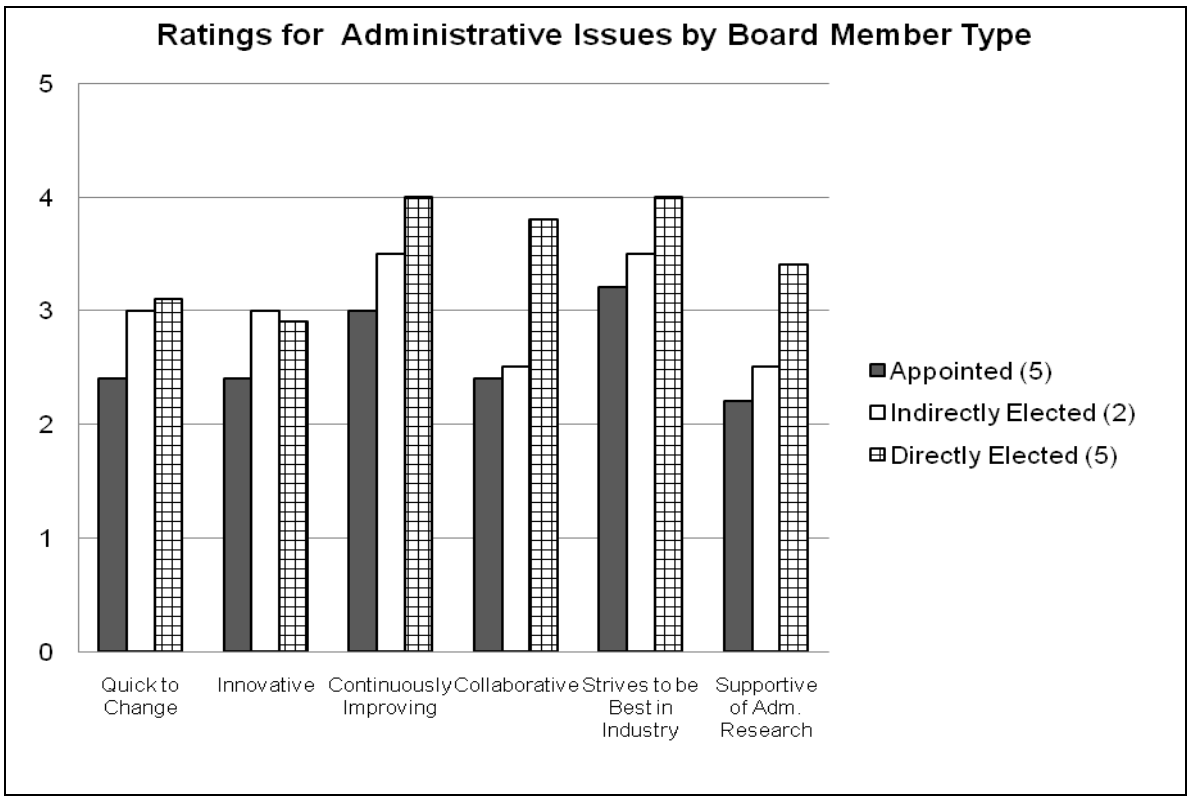

Figure 32. Average self-assessment scores by board member type for administrative issues.

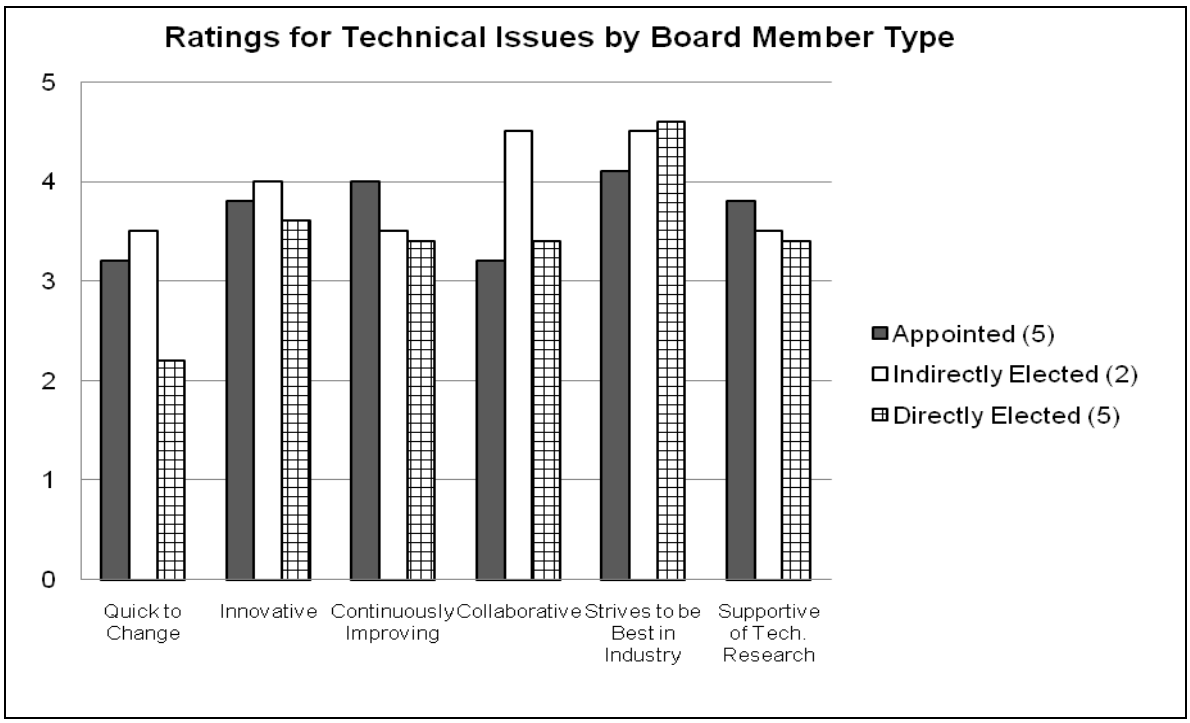

Figure 33. Average self-assessment scores by board member type for technical issues.

There was a slightly decreasing trend of technical research utilization for organizations that rated themselves higher in being *quick to change*. A slightly increasing trend in technical research utilization was observed for organizations rated highest in technically *innovative*.

Research question 6. *What are the prevalent knowledge transfer mechanisms within wastewater treatment organizations for administrative-type research?*

The purpose of this question was to identify the typical means for professionals in the wastewater industry to obtain administrative or managerial information. This may give insight to academics on how to reach practitioners who have a technical focus. The most repeated mechanisms for obtaining administrative-type research were training (75% of responders) and upper management (42%). Additional responses included mentoring, publications such as books and magazines, databases, regulators professional associations, and trade organizations, technical assistance programs, and consultants. Specific types of training mentioned were in-house training, human resource training, external training, webinars, and professional management or leadership courses. Two organizations had leadership programs specifically developed for staff.

When asked for the top two or three sources of management information/research, 58% of the interviewees relied on training, including in-house training, external training, webinars, and professional business/management courses. Direction from management and human resources was also cited as a top source by 42% of the responders. This may come in the form of direct communication, the internal website, a newsletter, or organizational policies or a handbook. Other sources included regulatory and trade

organizations, professional associations, conferences, the 360 review process, and assistance programs. The assistance programs were cited by two respondents and could be operated by a university, state, or city. These often enabled access to other resources, such as databases, specific feedback, publications, and conferences.

Five interviewees read administrative journals; the remaining seven did not. The journals that were read included *Leading for Results* from Lawrence Ragan Communications and *WEF Utility Management*, *WEF - Manuals of Practice*; two interviewees stated that they read *Harvard Business Review*. Others referred to publications of the International City/County Management Association, Public Works from American Public Works Association, American City & County, League of Cities (national and state), American Water Works Association, and a state advisory service.

Collaborative research was not a prevalent means to transfer knowledge related to managerial information. Only one organization cited a joint effort with a consultant to develop and implement a leadership training program.

Of the 12 respondents, 7 indicated access to an online library or hard copy library for information. Those that did not stated that employees had Internet access, but hard copy libraries were mostly available on an individual basis rather than for the entire organization. One organization had electronic access to internally generated information. One advantage to those organizations affiliated with cities was the availability of city library resources.

While four organizations had collaborated on a management project, journal submittal, or conference presentation, only two organizations were able to state that they

worked with a university to solve an administrative problem. Two others had worked with consultants to solve an administrative problem.

Ten of the organizations paid for, promoted, or otherwise supported involvement in management organizations. One of those was conditional on a joint partnership with other cities, and four others stated that this was only supported to a small degree and for those at higher levels of the organization. One respondent stated that this type of involvement would only be for those in human resources.

Five organizations unconditionally supported attendance at management conferences, and two did not support staff attendance. Of the others that gave qualified answers, one stated that support was only given if the conference was local. Four respondents stated that this type of involvement would only be for those at higher levels in the organization or human resources staff. Another indicated support if it was specifically related to the management system that was in use. Four interviewees relayed organizational support for giving presentations at management conferences. Another stated this was reserved for human resources staff.

All but one organization brought in outsiders to present on management or administrative topics. These outsiders include law firms, consultants, state and university technical assistance programs, and industry leaders. The responses to the question about bringing in outsiders for administrative and management topics yielded very general answers by most, and many of the interviewees had to take some time to think of any examples. The general theme was summed up in one response to the question, does your

organization bring in outsiders to present on management/administrative topics, "some, but not as much as technical."

When contrasting this to technical research utilization, several of those interviewed tended to rely more upon upper management, human resources, and training provided by the organization for administrative/management information. On the other hand, for technical information, respondents took initiative, networked, conducted research, and read many journals.

Research question 7. *What criteria enable utilization of research?* This question served to explain what factors enable research utilization and includes the processes of d knowledge production, transfer, and implementation.

Seven of the 12 interviewees estimated that they utilized 25% or less of the technical research that they reviewed. Three individuals indicated that they used between 50% and 75%, and two interviewees utilized between 75% and 100%. When focusing on technical research, those who utilized greater than 50% of the research they reviewed, all (5 of 5) held engineering degrees.

All of the medium and small plants (<20 MGD) stated they utilized less than 25% of technical research. This may be due to a lower level of resources, such as staffing or funding. Those who utilized the highest level of technical research utilization (>75%), cited conferences as a top method for obtaining technical information and research. In this same technical utilization bracket (> 75%), outsiders were brought in to present on technical topics. Low utilization of technical research cannot be explained by either the

type or size of organization. The participants who utilized 25% or less of technical research included large and small organizations as well as cities and special districts.

For those with greater than 50% utilization of technical research, the responses were mixed for library access. Some had libraries and some did not, so this does not appear to be a critical factor.

In addition, utilization of technical research does not appear to be consistent or parallel to utilization of managerial or administrative research within an organization. For utilization of administrative research, the brackets had three responders each for utilization of 25% or less, greater than 25% but less than 50%, and greater than 50% but less than 75%. The final group of three respondents indicated this type of information was mandated and the decisions were made by the time they received the information or that they relied on human resources so they implemented 100%. They perhaps saw seeking and implementing new managerial tools as outside of their scope. The three who relied on management or human resources did not read administrative journals, and did not partner with universities. In addition, these three all held engineering degrees, and no management degrees.

When reviewing descriptors used for technical research, respondents indicated they tested and implemented that which had a low risk, demonstrated success elsewhere, was financially defensible, made sense, had support from upper management, had on-site successful field-testing, was reliable, and whose references provided sound support; in addition, they obtained a third party review of the proposed endeavor. For implementation of administrative research to succeed, the factors appeared to be upper

level acceptance and support, consensus, and it made sense. In many cases, it appeared that utilization occurred only when management directed change and implementation of a new practice.

Other Issues

In addition to the information obtained in support of each of the major research questions, several other issues were evaluated. These include the comparison of responses of pressing administrative issues facing practitioners to the topics presented in wastewater publications and a discussion of a concern that was not raised by participants.

In order to assess how well the technical wastewater association, the Water Environment Federation (WEF), was doing in addressing administrative and managerial topics in their publications, participants were asked about topics presented in journals and magazines of WEF. In Chapter II, an evaluation of the WEF publications, *Water Environment & Technology* (*WE&T)* and *Utility Executive* were reviewed to assess the composition of administrative topics. To compare how well these topics were aligned with the issues facing practitioners, participants were asked to rank on a scale of 1 to 10 the importance of (a) staffing and succession planning; (b) revenue, rates, and financial stability; (c) community support, and (d) employee training and education. These four topical areas were the most the most commonly recurring subject of administrative articles in *WE&T* and *Utility Executive*. Participants rated the financial category highest, with a mean rating of 8.7 out of 10. Community support received an average rating of 7.5 of 10. Both categories of staffing, succession planning and revenue, as well as

employee training and education received an average rating of 7.4 of 10. The descriptive summary data of participant rating of issues are presented in Table 21.

Table 21

Ranking of Issues Facing Wastewater Practitioners

	Mean	Standard deviation	Minimum	Maximum
Staffing, succession planning	7.4	1.6	4.0	10.0
Revenue rates financial stability	8.7	0.89	7.0	10.0
Community support	7.5	2.1	4.0	10.0
Employee training and education	7.4	1.9	5.0	10.0

When asked if there were other topics of importance facing their organizations, six participants stated that they saw no other issues of major concern. Three participants stated concern with issues that the researcher considered to actually fall into the presented administrative topic areas including public relations, meeting community demands, and long-term funding. Three other participants stated issues that the researcher categorized as technical topics, including asset management, infrastructure, and regulatory compliance. Based upon these responses, it appears that the administrative articles in *WE&T* and *Utility Executive* are addressing the most pressing issues facing wastewater organizations.

Although not originally anticipated, the research revealed insight to the influence of individual leadership and collective leadership. Many of those with engineering degrees or no advanced management or administration degree saw learning about or

improving their management/administrative skills as outside their scope. In addition, there are differences in leadership characteristics when utilizing technical research versus administrative research.

The researcher anticipated that participants may state that administrative research is not conducted in their organizations since outsiders studying and observing employees may create an uncomfortable environment and lead to lowered morale. No one, however, mentioned a concern for employee confidentiality or skepticism as a reason for low rates of administrative research.

Summary

This chapter presented characteristics of those interviewed by individual and organizational traits. A wide variety of participants were selected for interviews. Responses to the interviews were categorized by applicability to each of the major research questions. Lastly, findings that were not covered by research questions were discussed. The major research findings are presented in Table 22.

Participants were asked to rate the percentage of technical research and administrative research that they utilize and the ratings were compared. Overall, those interviewed saw their organizations as more *supportive of technical research* than of *administrative or managerial research*. A reliance on upper management and human resources was observed for the source of administrative information including sources of information, validity, and quality control. Conferences and networking were predominant means for knowledge transfer in the technical arena. Bringing in outsiders to present was stated as methods for both technical and administrative knowledge

acquisition. The participants were not able to elaborate or state as many examples for administrative sources of information. Training and management were the most common sources of administrative information. In general, there was mixed or limited support for participation in management conferences or associations, whereas involvement in technical associations was supported by all of the participants' organizations.

Several key trends were noted related to research utilization by organization size, education background of individuals, and type of agency. There was increasing use of research for both technical and administrative research utilization with increasing size of organizations based on the number of employees. Engineering degrees led to greater technical research utilization. For administrative utilization, three of the seven with engineering degrees saw this as the responsibility of others in the agency. Small plants (and organizations) showed lower technical research utilization. Cities were more collaborative and sought administrative information through professional associations, trade associations, and state and federal agencies. They are part of a government network, whereas special districts being somewhat independent from county or city government often have different rate payers, boundaries, and networks. City staff were also more likely to get information through management journals.

Two groups with similar rankings for utilization of research have commonalities on both the organizational and individual characteristics as well as methods to obtain information. The group with the greater degree of administrative utilization held many self-ratings in common. Technical journals within the wastewater field cover administrative topics that are a priority to practitioners. However, it is unknown how

Table 22

Summary of Major Findings

No.	Major research findings
1	Networking and conferences are prevalent means for technical knowledge transfer
2	Third party evaluation of research is common
3	The sources of information and certifications are important
4	Technical research is highly scrutinized and often re-tested
5	Conferences and networking are predominant means for knowledge transfer in the technical arena
6	Engineering degrees lead to greater technical research utilization
7	Small organizations show lower technical research utilization
8	Training and management are prevalent means for sources of knowledge or information
9	Implementation depends on 'if it made sense' or a management directive
10	The quality of research does not appear to be as important for administrative research implementation
11	A reliance on upper management and human resources was observed for the source of administrative information including for sources of information, validity and quality control
12	Training and management were the most common sources of administrative information
13	Cities were more collaborative and sought administrative information through professional associations, trade associations, and state and federal agencies
14	City staff were more likely to get information through management journals
15	Those interviewed saw their organizations as more *supportive of technical research* than of *administrative or managerial research*
16	There was mixed or limited support for participation in management conferences or associations, whereas, involvement in technical associations was supported by all of the participants' organizations
17	There was an increasing use of research for both technical and administrative research utilization with increasing size of organizations based on the number of employees

well they are doing in addressing the root cause or adequate solutions. Finally the researcher expected participants to express a concern for confidentiality if in-house administrative research were conducted, but this issue did not surface.

Chapter VI follows and presents the conclusions, implications, and recommendations of this study.

CHAPTER VI

CONCLUSIONS

This chapter presents the highlights of the findings, implications, and recommendations of this comparative analysis of wastewater practitioners' utilization of technical research versus administrative research. Highlights revolve around sources of knowledge, methods and modes of acquiring knowledge, and organizational characteristics that influence knowledge utilization.

Major Findings and Revision of Utilization Model

This section presents a summary of the implications related to the theoretical implications. Much of the theory and literature review from Chapters II and III can be reaffirmed or furthered by this research. These are related to knowledge production, transfer, utilization, and organizational and individual characteristics.

Outside sources are necessary for organizations to advance their knowledge. Santoro and Saparito (2006) described the need for outside sources for organizations to advance their knowledge. This was observed in interview responses for both technical and administrative knowledge. Individuals described training, conferences, networking, and research outside of their organization.

Acquiring tacit knowledge through on-the-job training was confirmed for administrative training since sources were often managers. Lynn (1996) described

acquiring tacit knowledge through on-the-job training. In the administrative arena, this study confirmed that individuals looked to management, peers, and communities of practice for gaining new information. This was also seen in mentoring and management directives.

Communities of practice attain sponsorship and are successful in transferring information for technical issues, and to a limited extent, administrative information. Knowledge transfer through communities of practice was prevalent. Snyder and Briggs (2003) cited the need for these communities of practice to have sponsorship or leadership. All other communities of practice were part of formal associations or organizations with people often in paid or volunteer positions. The communities of practice appear to be successfully providing a forum for knowledge transfer for technical information and, to a limited extent, administrative information.

Organizations participate in technical and administrative research projects out of goodwill. Rynes and McNatt (2001) noted that organizations tend to partake in research out of goodwill. This was experienced by the researcher. There was nothing offered for participating in this research, however, people agreed. In addition, 11 of the 12 participants expressed interest in receiving the final report.

In contradiction to literature review findings, this research found greater collaboration by smaller organizations on administrative topics. In comparing to factors in Chapter II, collaboration was proposed as being more likely with larger organizations, those open to the outside, innovative, supportive of research, and developing concrete products. This research found that smaller organizations were much more *collaborative*

on administrative issues. This may be explained by the fact that smaller organizations may be part of cities, which may be a more important factor than organization size. The responses related to assessing organization *innovation* and *collaboration* did not show a positive or negative relationship. Organizational support for administrative research was positively associated with *collaboration* for administrative issues, but not so for technical issues. There was also a higher average rating for technical *collaboration* than administrative *collaboration*.

Huff (2000) suggested many ways to connect practitioners and researchers, such as ideas coming from practitioners. In the management-type publications of technical associations, this appears to be happening. Data are coming from practice for technical studies and research, for instance, project management case studies or wastewater full-scale operational tests. Case studies for management issues do not yet seem to involve academics in developing definitions, frameworks, or crossing boundaries of fields to compare research.

Van de Ven and Johnson (2006) proposed that researchers broaden the scope of their work to incorporate perspectives of different practitioners and academics. This was not observed, but would be valuable in light of patterns and traits of those interviewed in this study.

A learning organization is characterized by optimizing and improving organizational performance (McNabb, 2007). To evaluate in light of this research study, the organizational characteristics of *continuously improving* and *innovative* were reviewed. A slightly increasing trend was seen between administrative research

utilization and *continuously improving,* but when including those who saw implementation as mandated, there was a decreasing relationship. It may be that practitioners do not agree with the management directives or do not believe in the benefits gained by implementing the new administrative or management concepts. *Innovation* was shown to be positively related to research utilization from a technical perspective. Those who rated themselves highest in *innovation* also had the highest research utilization. This was supported by examples cited by study participants. From the administrative perspective, most rated their organizations as mediocre (three of five), and no patterns were observed for *innovation*.

The source of information appears to be highly important for utilization of technical research, yet for administrative research, the source does not appear to be as critical. A research project through the National Institute on Disability and Rehabilitation (2010) stated that the source is more important than the quality. This was observed for technical research, but it was not as obvious for administrative information. If the source was a work directive (from management or human resources) then it was utilized and implemented. Outside of this circumstance, it was not apparent if the source was more important than the quality for administrative topics. However, in this study the source of information was often cited as a means to determine the quality and validity of technical research or information.

When reviewing administrative information, participants did not question the quality or source. If this is generally true of practitioners, then public administration research could be easily accepted by technical practitioners. Alternatively, public

administration research could have a difficult time gaining acceptance by those who affiliate more closely with another field as the end user would not necessarily be familiar with the researcher if applying the same criteria as done for technical research. The latter would support the idea that end users are more likely to utilize information from a national bestselling book if there was name recognition of the author.

A researcher would need to know the end user and understand his or her concerns and needs. This is similar to business where the customer is a priority. For public administration, it is difficult to understand those outside of the field as each field or industry has its own culture and nuances that one would not know unless submerged in that field. Often, public administration practitioners more closely identify with another field, for instance accounting or a scientific field, or an engineering discipline.

Direct involvement in research was important for technical work, but does not appear to be a concern by practitioners for administrative research. The National Institute on Disability and Rehabilitation (2010) work also concluded that utilization is improved by having the end users involved in the research. This clearly seemed to apply to technical research, but was not common for administrative. For technical research, many agencies wanted to re-test the technology prior to implementing, and see for themselves. Direct involvement in research would satisfy this need. No research questions in this study would have elicited information to link specific administrative research projects to implementation. One interviewee discussed how after implementation of administrative research that he would go back and evaluate if it achieved the intended goals. This would

almost seem as though implementation was actually a step in the research process through validation.

This research revealed that individual and organizational leadership factors impact research utilization. Those with engineering degrees or no advanced management or administration degree saw learning about or improving their administrative skills as outside their scope. In addition, there are differences in leadership characteristics when utilizing technical research versus administrative research.

The complexities described in the leadership theory section (Lawler, 2008; McGurk, 2010; Ross et al., 2005a, 2005b; Van Wart, 2003) included the context of the organization, distributive leadership, situations, and tensions from past experiences. Anderson (2010) found that leaders relied highly on intuition for decision making. This research showed that there may be differences in decision making based on the type of material that is being reviewed: if the material is from the technical area or is administrative, such as managerial or leadership.

This research also confirms the findings of Bonsall (2010) where "many managers within the organization were not taking ownership for their own learning" (p. 12). This research found many who simply relied upon upper management or human resources to provide information on managerial skills yet took a more active role in learning for technical information. This finding may also be due to the conflict of innovation with government work (Borins, 2002; Van Wart, 2003); however, there was a greater propensity to innovate and self-learn on issues of a technical nature.

On an organizational level, special districts and those agencies with fewer services provided a higher degree of knowledge production for technical information. For production of administrative knowledge, those organizations that had directly-elected boards and cities enabled a higher degree of knowledge production.

McGurk's (2009) finding that practitioners did not find value in theoretical explanations when receiving training, in addition to this work revealing that practitioner leaders with technical backgrounds relied on intuition and others for administrative information, would support linking theory to application when relaying information.

Revisiting the framework presented in Chapter III, modifications are necessary based upon what was learned in this study. The model was split into two, for technical and administrative versions (see Figures 34 & 35).

Key changes include more clearly delineated pathways. Knowledge may be directly produced by an individual then utilized without requiring a transfer phase, or the knowledge may be produced then transferred to another individual who utilizes it. Organizational and individual characteristics impact the production and transfer stages. Many different paths were observed for producing technical knowledge among wastewater practitioners including internal, external, and collaborative, or by simply providing data for another party to use. For practitioners to find an interest in producing knowledge, they want to know that it has a practical application. The prevalent knowledge transfer mechanisms for technical information were through networking and conference attendance; however, many other methods were cited. For utilization to occur, the research is scrutinized to see that it makes sense, the data and conclusions are

reviewed by other parties, the source of the information is carefully considered, and ultimately, it is a business decision to implement the research.

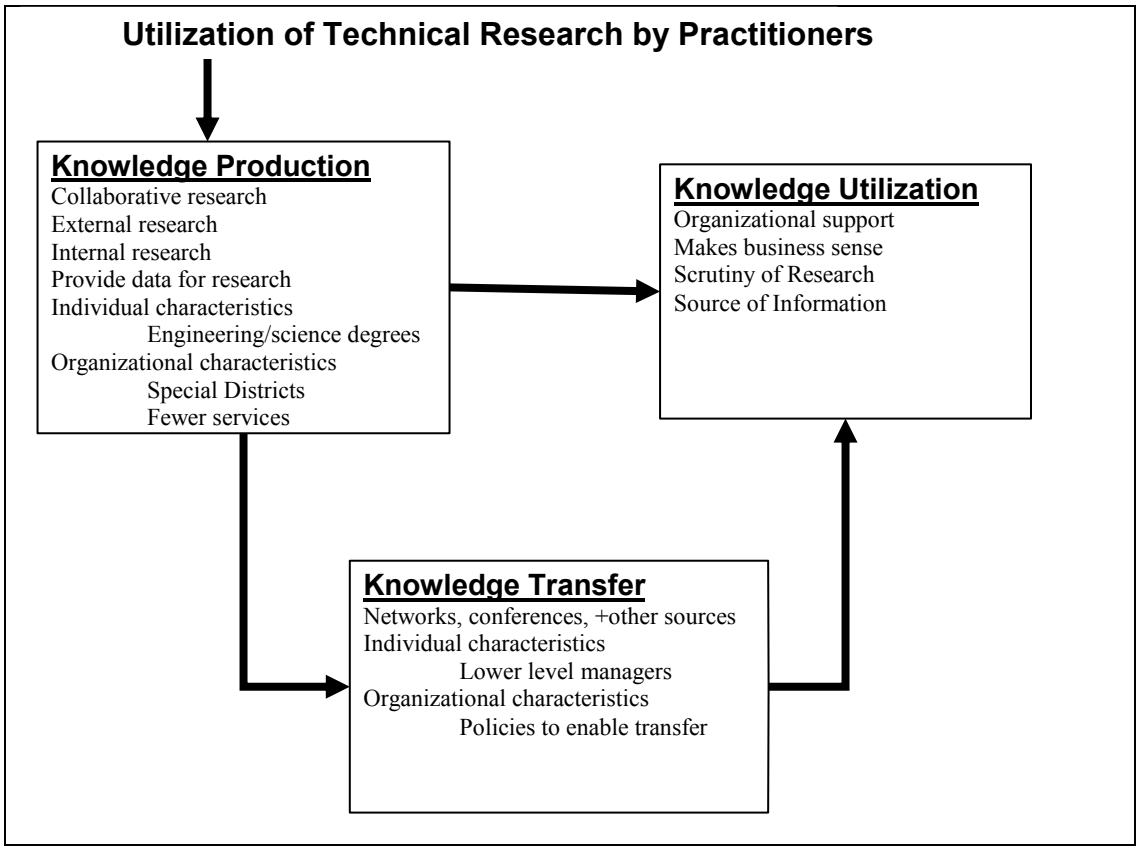

Figure 34. Revised framework for utilization of technical research by practitioners. Developed by the researcher.

For the administrative framework, organizational and individual characteristics still impact the processes. As with technical knowledge, administrative knowledge may be directly produced by an individual then utilized without requiring a transfer phase, or the knowledge may be produced then transferred to another individual who utilizes it. A cyclical path was considered with a directional arrow from knowledge utilization to knowledge production, but was not used since this would be considered the initiation of

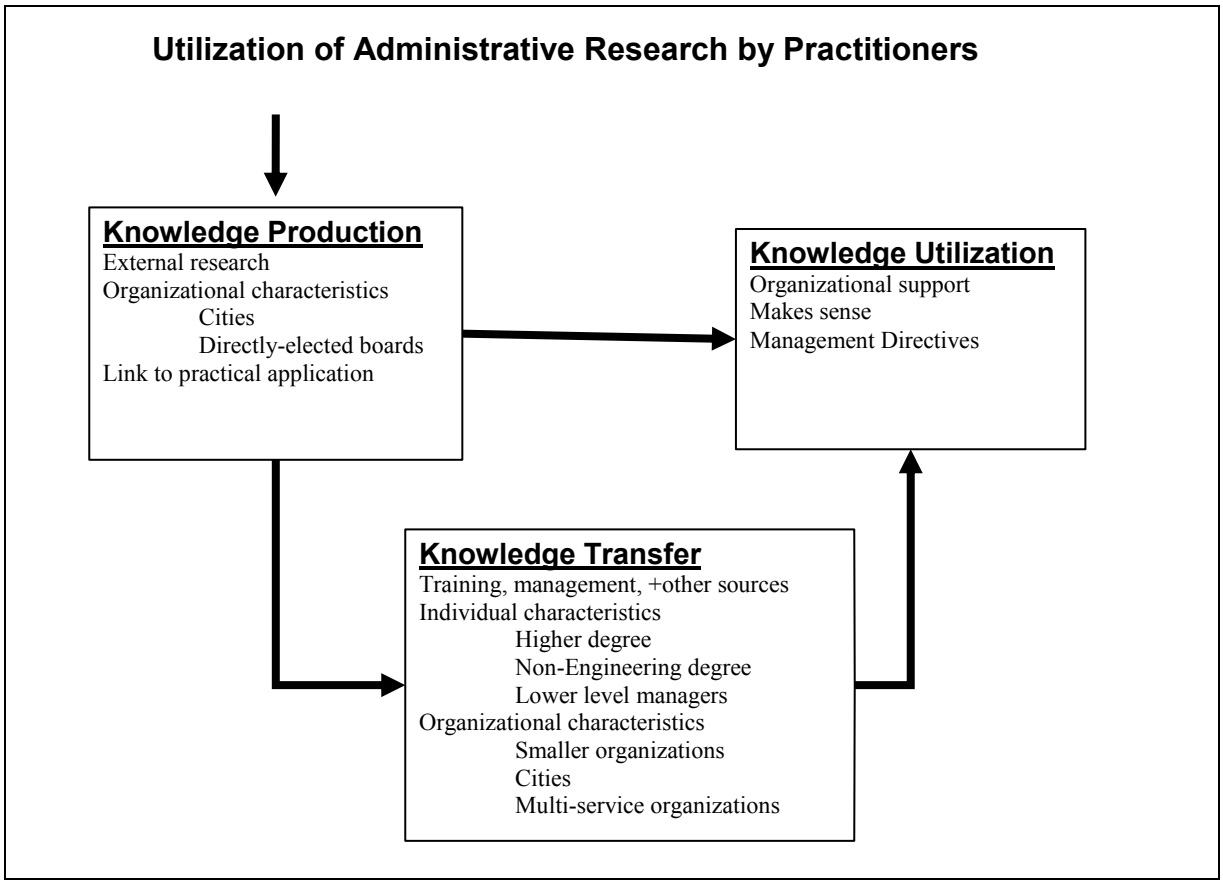

Figure 35. Revised framework for utilization of administrative research by practitioners. Figure developed by this researcher.

new knowledge production. As an example, one interviewee responded that his organization validates administrative research by critiquing a new program or process after one year of implementation. If the organization did not achieve the results that were expected, then the prior knowledge or claims about the program were not correct, and this was a full-scale research project producing new knowledge. The path for producing administrative information was external research. For practitioners to find an interest in producing knowledge, they want to know that it has a practical application. The

prevalent knowledge transfer mechanisms for administrative information were training courses and their management, but other methods were also stated. For utilization to occur, the research needs to makes sense, or implementation be directed by management.

Recommendations

Based on the information gained through interviews with practitioners, several recommendations are presented to improve the connection of research to practice within public administration. This section presents a bullet-point summary of the findings followed by a discussion of recommendations specific for practitioners then for researchers and academics.

The key findings related to variation in the utilization of research included the following:

- There was less reliance on human resources and managers by interviewees with more years of experience in the wastewater field.
- Engineers often conduct their own technical research.
- Engineers prefer to validate research with hands-on testing.
- Engineers tend to rely on management for administrative directives.
- Engineers are less likely to read administrative journals.
- The higher the degree individuals have, the more they scrutinize technical research.
- The more advanced the degree individuals have, the more they utilize administrative research.
- The lower level managers indicated greater utilization of administrative research.

- Agencies offering multiservices (wastewater plus at least two other services) stated no collaboration on administrative projects.
- Multiservice agencies provided more support for involvement in management or administrative associations and conference attendance than wastewater or water plus wastewater organizations.
- Wastewater-only agencies provided the highest level of support for technical research.
- Wastewater-only agencies were most collaborative on technical issues.
- Cities rated highest in *innovation*, *continuously improving*, *supporting management research*, *striving to be best in the industry*, *collaborative*, and *quick to change* for administrative issues.
- Cities were most supportive of staff involvement in management associations.
- Small organizations rated higher than large organizations in being collaborative for both technical and administrative issues.
- Small organizations rated themselves higher than large organizations for *continuously improving, supportive of management research*, and *striving to be best in the industry* for administrative issues.
- Large organizations rated themselves highest in utilizing more administrative research.
- Organizations with directly-elected board rated themselves highest in *innovation*, *continuously improving*, *supportive of management research*, *striving to be best in the industry*, *collaborative*, and *quick to change* for administrative issues as compared with appointed or indirectly-elected boards.
- The quality of technical research is highly scrutinized and often re-tested.

- The source of information and certifications of the presenter are important.
- Third-party assessment of technical research is common.
- The quality of administrative research does not appear to be as important as it is for technical research.
- Implementation depends on *if it made sense* or it is directed by management.
- Networking and conferences are the prevalent sources for technical knowledge.
- Training and management are the prevalent sources for administrative knowledge.

Recommendations for Practitioners

Practitioners should apply similar scrutiny to administrative information and be open to partnerships with administrative associations to broaden managerial skills outside of their institutional framework. Additionally, practitioners independently seeking management techniques may further build their skills through subscriptions to publications or membership in administrative associations.

Practitioners could shift their perspective on management information as something they have control over and are responsible for, rather than something that is provided by human resources or executive management. If a researcher planned his or her research by thinking more like a practitioner in a specific field, it may also promote utilization of the final results and products. It may be difficult to overcome the perception by many of the managers, who were technically trained, that management and administrative skills are something they would need or want to take ownership of.

For future research, it may be beneficial to specifically probe whether poor quality of research was the cause of nonimplementation. This did not surface during the

research project; however, several authors in the literature review site quality as an issue (Adams & White, 1994; McCurdy & Cleary, 1984; McNabb, 2007; Stallings, 1986). If it is not truly an issue, then past findings may need to be re-evaluated.

If there are possible practitioner applications of research findings, researchers should seek to incorporate administrative literature into professional technical association publications (focused on an individual field). Another possible approach may be to develop linkages of ASPA or ICMA to technical associations with drop-in articles. Forming alliances such as these would enable a one-stop location for busy practitioners. They may not have time to read multiple journals and their organization may only pay for a limited number of memberships or subscriptions.

A logical outline of how the conclusions were drawn would aid practitioners in understanding the rationale if they are not immediate apparent. In addition, a proposed method to evaluate the effectiveness after implementation would be beneficial as interview participants relayed the need to show the benefits of implementation in order to justify the change. Research publications should propose a means to measure success after implementation.

Recommendations for Both Academics and Researchers

The literature, theory, and proposed frameworks were evaluated in light of this study and recommendations made to improve the connection between academic administrative research and the practice. Key recommendations included:

- For future research, investigate if poor quality research was the cause of nonimplementation.

- Researchers should know the end user and understand their concerns and needs prior to research.
- Researchers should seek to incorporate administrative literature into professional technical association publications. This could be accomplished by administrative associations developing relationships with technical associations and routinely providing template articles that could be customized for the technical group.
- Researchers should present a logical outline of how the conclusions were drawn.
- Researchers should propose methods to measure success after implementation.
- Academic researchers should seek out partnerships, looking to field-specific technical publications for the greatest problems and concerns to evaluate, and study the most pressing issues.
- A certification should be developed for administrative researchers who focus on practitioner problems.
- Researchers should show a practical link of theory to application when sharing research with practitioners.
- Research should be conducted that synthesizes practitioner case studies across several fields.
- Mainstream books, practitioner courses, webinars, short-term training courses delivered at the practitioners' site, websites with information, or participation in management track sessions of technical conferences should be developed.

Another option would be a certification for administrative researchers who focus on practitioner problems. This would give credibility especially if the conclusions of the

research are counterintuitive. Many interviewed cited having a known expert or certificate holder review or prepare reports for technical research; this same approach of certifying experts for administrative research may help practitioners gain confidence in the researcher who would otherwise be unknown to them.

Van de Ven and Johnson (2006) suggest that researchers should present their findings in a way that practitioners and academics can apply. They also propose that the questions be grounded in concrete phenomena and that models be plausible. These suggestions are consistent with needs and patterns observed. The technical practitioners have standardized work approaches, and it would be beneficial to consider these in advance of conducting research. If not obvious, then the researcher should lay out the rationale in clear terms for conclusions or recommendations. Due to the number of fields and specializations, this is asking a lot of administrative researchers to adapt to the many others' framework. It may be realistic for researchers to identify one or two closely related fields and become experts in administrative research related to those fields. This would allow them to become known to the practitioners as reliable sources of administrative research and the researcher would be able to learn the style and nuances of the practitioners through ongoing research in the field.

Since many of those interviewed relied on training, developing practitioner training would help share concepts and reach end users. The training could be directly delivered or in modules for others to deliver. The administrative topics in technical journals are often case studies of how one agency addressed a specific issue and are written by practitioners. Research that synthesized these case studies across several

fields would be beneficial to get ideas from different fields and for researchers to draw conclusions or trends from multiple areas, then incorporate new theory or drive novel research related to the issue.

Although journal publications are often the target for academic success, they may not the best way to reach practitioners. Beyer and Trice (1982) suggest texts and teaching. In light of this study, texts may be useful; they may aid in developing practitioner courses, mainstream books, webinars, short-term training courses delivered at the practitioner's site, websites with information, or participation in management track sessions of technical conferences.

Future Research

There are several recommendations for future research based upon the results of this work. These include the following questions/goals:

- Evaluate if poor quality research causes non-implementation of research.
- Evaluate if proposing measures for success increase would increase the use of research.
- Evaluate how organizational culture/climate influences operation and use of research.
- Synthesize research across several specialized fields

Although this study asked what actions individuals took to validate the research, it did not ask if the quality of the research was ever the cause of not implementing results or new information. Information obtained in this study suggests that measurement is important. A study designed to determine how important this factor is would aid in understanding how to be reach practitioners. Organizational culture may highly influence

the utilization of research, although it is very difficult to categorize organizational cultures. Finally, utilization of research, as well as many other specific areas of study are being researched in many different fields. Unique findings may be identified by periodically reviewing and synthesizing research results across fields.

Conclusion

This study contributes a better understanding of the reasons for the perceived lack of connection between academics and practitioners in public administration. In the wastewater field, practitioners mostly interact with and identify with technical associations. Many of the managers have technical backgrounds and rely on human resources staff and management for administrative information and ideas rather than the public administration academic community. The study sought to identify if wastewater practitioners perceived issues of quality in academic research from public administration or if there were suitable avenues to reach or "transfer" the knowledge to practitioners in the wastewater industry. This study revealed no issues of quality or concerns with the research methods. Those managers who worked for cities were well connected with management organizations and received information from management associations. Alternatively, those with technical backgrounds who also had a management or public administration degree sought out information from management associations.

In this chapter, major conclusions, implications, and recommendations were made. In summary, research participants saw their organizations as more supportive of technical research than of administrative research based on ratings they assigned to their organization for *continuously improving*, *striving to be the best in the industry*,

innovative, *collaborative*, *supportive of research*, and *quick to change*. There was also less collaboration and research on administrative topics than technical topics. Although this would seem discouraging, practitioners appear to be less critical of administrative information compared to technical information. This will enable practitioners to be more receptive to utilization of administrative research.

For technical information, engineers sought tools they were comfortable with, such as validating, field-testing, and using plans and specifications. Those with nonscience or nonengineering degrees referenced seeking others, such as technical experts, for validation of technical information as well as for certifications of preparers. Those with degrees may scrutinize technical research more rigorously and the higher the degree, the more detailed and extensive the review. Practitioners from this study exhibited habits and patterns related to technical issues. They tended to rely on testing for themselves and plans and specifications, questioning the results and using secondary and tertiary verification. Those with engineering degrees tended not to read administrative journals unless they held an advanced degree in management or administration. Engineering degrees led to greater technical research utilization. This information will enable a focused approach to presenting administrative research findings. If articles or presentations are made at professional or practitioner associations, the material and depth can be geared toward the audience so it will be better received.

For the review of organizational characteristics, an increasing use of research was seen for both technical and administrative areas with size of organization (number of employees) meaning the larger the organization, the more research was utilized. In

addition, large organizations, based on both the number of employees and the daily average volume of wastewater treated, were *quicker to change* on a technical basis. This information will aid researchers to seek larger organizations to test and implement research.

Cities were more collaborative than special districts and sought administrative information through professional associations and trade associations as well as state and federal agencies. City participants were also more likely to get information through management journals than were special district employees. This may be an area of opportunity for administrative researchers to find avenues to reach the special districts through technical associations.

Best practices and knowledge transfer mechanisms of those interviewed included conferences and networking in the technical area. Bringing in outsiders to present information was stated as a method for both technical and administrative knowledge transfer. Training and management were the most common sources of administrative information. A reliance on upper management and human resources was observed for the source of administrative information including for sources of information, validity, and quality control. Support for participation in management conferences or associations was mixed or limited. This provides further support for the need to distribute research findings through avenues other than management association conferences and journals.

This comparative analysis shows that the traditional approach of distributing administrative research findings through professional associations associated with the field may not reach technical practitioners. There are opportunities for improving

knowledge transfers and utilization of administrative research. Finally, this study identified opportunities and recommendations for changes to enhance research utilization.

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APPENDICES

APPENDIX A

INFORMATIONAL E-MAIL AND CONSENT
FORM FOR INTERVIEWS

CONSENT TO PARTICIPATE IN RESEARCH

You are being asked to participate in a research study conducted by Carla Dillon, from the College of Business and Public Management at the University of La Verne. The results will contribute to her doctoral dissertation. You were selected as a possible participant in this study because you are in a leadership role of a public agency responsible for conveyance or treatment of wastewater.

PURPOSE OF THE STUDY
This study will compare the utilization of technical research to the utilization of research that is focused on administrative functions and management. This research effort will characterize the differences and also identify factors that may cause the differences.

PROCEDURES
If you decide to participate in this study, you will be asked to respond to questions about yours and your organization's utilization of research. A few questions will also be asked to characterize your organization and your professional experience. The interview will be audio recorded and is expected to last 30 to 40 minutes.

POTENTIAL RISKS AND DISCOMFORTS
If at any time during the interview you need to take a break or become uncomfortable, you may terminate or reschedule the interview.

POTENTIAL BENEFITS TO PARTICIPANTS AND/OR TO SOCIETY
As a participant, the final dissertation and a summary report will be made available to you upon request.

This study will contribute to the body of knowledge in the field of Public Administration and management. In addition, it will serve to narrow the gap between academic researchers and practitioners.

PAYMENT FOR PARTICIPATION
Payment is not offered for participation in this research.

CONFIDENTIALITY
Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. Confidentiality will be maintained by means of giving a numeric code to each participant. The code sheet will be retained by the principal investigator in a secure location and destroyed upon completion of the research.

Participants may review the audio transcript at any time and audio recording will be deleted or erased following the completion of the final report.

Mr./Ms. _____,

Thank you for agreeing to participate in this study on research utilization in public administration. The interview will last approximately 30 minutes, and you will be asked a series of questions on technical research and administrative research as well as general information about your professional background and your organization.

Attached is a document furthering explaining the interview process and consent to participate in the study. Prior to our interview, I will ask for your verbal confirmation that you have read and agree to the conditions.

I will be contacting you soon to confirm our interview date and time. Please do not hesitate to contact me if you have any questions.

Sincerely,

Carla Dillon, P.E.

Title
Organization
Street Address
City, State zip

(xxx) xxx-xxxx
e-mail

Doctoral Candidate
University of La Verne
College of Business and Public Management
1950 Third Street
La Verne, CA 91750

(xxx) xxx-xxxx (alternate phone)
alternate e-mail

PARTICIPATION AND WITHDRAWAL

You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may also refuse to answer any questions you don't want to answer and still remain in the study. The investigator may withdraw you from this research if circumstances arise which warrant doing so.

IDENTIFICATION OF INVESTIGATORS

If you have any questions or concerns about the research, please feel free to contact Carla Dillon, Principal Investigator or Faculty Sponsor, Marcia Godwin, Ph.D.

Carla Dillon
(xxx) xxx-xxxx
xxxx Street Address
City, State zip

Marcia Godwin, Ph.D
(909) 593-3511, ext. 4103
1950 Third Street
La Verne, CA 91750

RIGHTS OF RESEARCH PARTICIPANTS

You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights or remedies because of your participation in this research study. If you have questions regarding your rights as a research participant, contact Fred L. Yaffe, PhD, Director of IRB at 909-593-3511, extension 4996, (fyaffe@laverne.edu). Institutional Review Board, 1950 Third Street, La Verne, CA 91750.

SIGNATURE OF RESEARCH PARTICIPANT OR LEGAL REPRESENTATIVE

I understand the procedures described above. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been given a copy of this form.

_____
Printed Name of Participant

_____
Printed Name of Legal Representative (if applicable)

**Acceptance will be gained verbally prior to interview*
Signature of Participant or Legal Representative Date

SIGNATURE OF INVESTIGATOR (If required by the IRB)

In my judgment the participant is voluntarily and knowingly giving informed consent and possesses the legal capacity to give informed consent to participate in this research study.

_____ _____
Signature of Investigator Date

APPENDIX B

INSTITUTIONAL REVIEW BOARD APPROVAL

University of La Verne
Institutional Review Board

February 23, 2010

TO: Carla Dillon

FR: University of La Verne, Institutional Review Board

RE: Application Number **#869-Dillon - Research Utilization in Public Administration: A Comparative Analysis of Wastewater Practitioners' Utilization of Technical Research Versus Administrative Research**

The research project, cited above, was reviewed by the College of Business and Public Management IRB Representative and was subsequently available for comments by the entire IRB. The college review determined that the research activity has minimal risk to human participants, and the application received an expedited review and approval with no additional comments from the entire IRB.

The project may proceed to completion, or until the **date of expiration of IRB approval, February 23, 2011.** Please note the following conditions applied to all IRB submissions:

No new participants may be enrolled beyond the expiration date without IRB approval of an extension.

The IRB expects to receive notification of the completion of this project, or a request for extension within two weeks of the approval expiration date, whichever date comes earlier.

The IRB expects to receive prompt notice of any proposed changes to the protocol, informed consent forms, or participant recruitment materials. No additional participants may be enrolled in the research without approval of the amended items.

The IRB expects to receive prompt notice of any adverse event involving human participants in this research.

All expedited approvals are subject to review by the full IRB. The IRB may rescind expedited approval and proceed to full standard review, if it determines that the protocol did not meet criteria for expedited review.

There are no further conditions placed on this approval.

The IRB wishes to extend to you its best wishes for a successful research endeavor. If you have any questions, please do not hesitate to contact me.

Approval Signature	Fred L. Yaffe, Ph.D. IRB Chairman	February 23, 2010 Date

For the Protection of Human Participants in Research

fyaffe@laverne.edu
(909) 593-3511, ext. 4996

APPENDIX C

CODEBOOK FOR DATA ANALYSIS

Information presented in this Appendix provides a link for each question to the related proposition, unit of analysis and method of analysis following research.

1a Describe your position within organization
Proposition: Position/title influences knowledge production, transfer, and utilization
Unit of Analysis: Individual
Method of Analysis: Categorize and correlate with responses to questions 4-22

1b Describe your years in the field
Proposition: Years in field influences knowledge production, transfer, and utilization
Unit of Analysis: Individual
Method of Analysis: Ratio data; categorize and correlate with responses to questions 4-22

1c Describe your years with organization
Proposition: Years with organization influences knowledge production, transfer, and utilization
Unit of Analysis: Individual
Method of Analysis: Ratio data; categorize and correlate with responses to questions 4-22

1d Describe your education, degrees, certifications
Proposition: Educational background influences knowledge production, transfer, and utilization
Unit of Analysis: Individual
Method of Analysis: Categorize (nominal) and correlate with responses to questions 4-22

2 What is your organization's size (number of employees, service area)?
Proposition: Size influences knowledge utilization
Unit of Analysis: Organization
Method of Analysis: Arithmetic mean, range, correlate with response from questions 4-22

3 What is the governing structure?
Proposition: Organization's governing structure influences knowledge utilization
Unit of Analysis: Organization
Method of Analysis: Qualitative description; correlate with response from questions 4-22

4 How (where, source, method of obtaining) do you obtain technical information to use on job? This could be for new designs, operational methods, troubleshooting problems.
Proposition: Organizational culture influences knowledge transfer
Unit of Analysis: Individual and Organization
Method of Analysis: Categorize responses if possible

4a What are the top 2-3 sources or paths for obtaining technical research?
Proposition: To gain information
Unit of Analysis: Individual and Organization
Method of Analysis: Categorize responses and use descriptive statistics

5 Do you read technical journals?
Proposition: Organizational culture influences knowledge transfer
Unit of Analysis: Individual and Organization
Method of Analysis: Code: yes, no, other. Percent response for each

6 Does your organization conduct technical research related to wastewater?
Proposition: Organizational culture influences knowledge production
Unit of Analysis: Organization
Method of Analysis: Code: Yes, no, other. Use qualitative descriptors for additional information

7 Does your organization pay for, promote, support involvement in technical organizations?
Proposition: Organizational culture influences knowledge transfer
Unit of Analysis: Organization
Method of Analysis: Code: Yes, no, other. Use qualitative descriptors for additional information

7a Does your organization pay for, promote, support involvement in technical organizations through attendance at conferences? And what types of staff attend?
Proposition: Organizational culture influences knowledge transfer
Unit of Analysis: Organization
Method of Analysis: Code: Yes, No. Percent response for each

7b Does your organization pay for, promote, support involvement in technical organizations through the giving of presentations of research or studies?
Proposition: Organizational culture influences knowledge transfer
Unit of Analysis: Organization
Method of Analysis: Code: Yes, No. Percent response for each

8 In your current capacity, have you worked with a university partner to solve a technical problem?
Proposition: Attitude difference of technical versus administrative research influences knowledge production, transfer, and utilization
Unit of Analysis: Individual and Organization
Method of Analysis: Descriptives

9 Does your organization bring in outsiders to present on technical topics?
Proposition: Organizational culture influences knowledge transfer
Unit of Analysis: Organization
Method of Analysis: Code: Yes, no, other. Percent response for each. Use qualitative descriptors for additional information

10 What is required of technical research prior to deciding to implement it?
Proposition: Quality of research and other factors are steps for successful knowledge transfer and utilization
Unit of Analysis: Individual and organization
Method of Analysis: Descriptives

10a What steps do you take to validate the quality?
Proposition: Quality of research is one step of successful knowledge transfer and utilization
Unit of Analysis: Individual
Method of Analysis: Descriptives

10b Approximately what percentage of the technical research that you review do you implement?
Proposition: Very little is implemented
Unit of Analysis: Individual and organization
Method of Analysis: Descriptive statistics

11 Have you or others in your organization collaborated on a technical research project, journal submittal, or conference presentation? What type of partners?
Proposition: Organizational culture influences knowledge production and transfer
Unit of Analysis: Individual and organization
Method of Analysis: Code: Yes, no, other. Percent response for each. Use qualitative descriptors for additional information.

Questions Related to Management
12 How do you obtain management information to apply on the job?
Proposition: Organizational culture influences knowledge transfer
Unit of Analysis: Individual and Organization
Method of Analysis: Code Yes, no, other. Percent response for each. Use qualitative descriptors for additional information

12a What are the top 2-3 sources or paths for obtaining management or administrative information?
Proposition: To gain information
Unit of Analysis: Individual and Organization
Method of Analysis: Categorize responses and use descriptive statistics

13 What is required of management/administrative research prior to deciding to implement it?
Proposition: Quality of research and other factors are steps for successful knowledge transfer and utilization
Unit of Analysis: Individual and organization
Method of Analysis: Descriptives

13a What steps do you take to validate the quality?
Proposition: Quality of research is one step of successful knowledge transfer and utilization
Unit of Analysis: Individual
Method of Analysis: Descriptives

13b Approximately what percentage of the administrative/management research that you review do you implement?
Proposition: Very little is implemented
Unit of Analysis: Individual and organization
Method of Analysis: Descriptive statistics

14 Do you read administrative/management journals?
Proposition: Organizational culture influences knowledge transfer
Unit of Analysis: Individual and Organization
Method of Analysis: Code: Yes, no, other. Percent response for each. Use qualitative descriptors for additional information.

15 Does your organization conduct research or studies related to management, business practices, or leadership?
Proposition: Attitude difference of technical versus administrative research influences knowledge production, transfer, and utilization
Unit of Analysis: Individual and Organization
Method of Analysis: Code: Yes, no, other. Percent response for each. Use qualitative descriptors for additional information.

16 Does your organization have a library or access to on-line journals?
Proposition: Organizational culture influences knowledge transfer
Unit of Analysis: Organization
Method of Analysis: Code: Yes, no, other. Percent response for each. Use qualitative descriptors for additional information.

17 In your current organization, have you worked with a university partner to solve a management or administrative problem?
Proposition: Organizational culture influences knowledge production, transfer, and utilization
Unit of Analysis: Organization
Method of Analysis: Code: Yes, no, other. Percent response for each. Use qualitative descriptors for additional information.

18 Have you or others in your organization collaborated on a management or administrative research project, journal submittal, or conference presentation?
Proposition: Organizational culture influences knowledge production, transfer, and utilization
Unit of Analysis: Organization
Method of Analysis: Code: Yes, no, other. Percent response for each. Use qualitative descriptors for additional information.

19 Does your organization pay for, promote, or support involvement in management organizations?
Proposition: Organizational culture influences knowledge production, transfer, and utilization
Unit of Analysis: Organization
Method of Analysis: Code: Yes, no, other. Percent response for each. Use qualitative descriptors for additional information.

19a Does your organization pay for, promote, or support involvement in management organizations through attendance at related conferences?
Proposition: Organizational culture influences knowledge transfer
Unit of Analysis: Organization
Method of Analysis: Code: Yes, no, other. Percent response for each. Use qualitative descriptors for additional information.

19b Does your organization pay for, promote, or support involvement in management organizations by encouraging employees to give presentations of research?
Proposition: Organizational culture influences knowledge transfer
Unit of Analysis: Organization
Method of Analysis: Code: Yes, no, other. Percent response for each. Use qualitative descriptors for additional information.

20 Does your organization bring in outsiders to present on management/administrative topics?
Proposition: Attitude difference of technical versus administrative research influences knowledge production, transfer, and utilization
Unit of Analysis: Organization
Method of Analysis: Arithmetic mean, range, correlate to response from 10-18 and 21.

Likert Scale – Technical

21 With respect to technical/core business issues, would you describe your organization as? (5 point Likert scale, from 1-5, where 5 is the highest rating)

21a Quick to change
Proposition: Organizational culture influences knowledge production, transfer, and utilization
Unit of Analysis: Organization
Method of Analysis: Code: 1-5. Correlate with responses to 1-11, 16

21b Innovative
Proposition: Organizational culture influences knowledge production, transfer, and utilization
Unit of Analysis: Organization
Method of Analysis: Code: 1-5. Correlate with responses to 1-11, 16

21c Continuously improving
Proposition: Organizational culture influences knowledge production, transfer, and utilization
Unit of Analysis: Organization
Method of Analysis: Code: 1-5. Correlate with responses to 1-11, 16

21d Collaborative with other organizations
Proposition: Organizational culture influences knowledge production, transfer, and utilization
Unit of Analysis: Organization
Method of Analysis: Code: 1-5. Correlate with responses to 1-11, 16

21e Strives to be one of the best in industry
Proposition: Organizational culture influences knowledge production, transfer, and utilization
Unit of Analysis: Organization
Method of Analysis: Code: 1-5. Correlate with responses to 1-11, 16

21f Supporting technical or core business research
Proposition: Organizational culture influences knowledge production, transfer, and utilization
Unit of Analysis: Organization
Method of Analysis: Code: 1-5. Correlate with responses to 1-11, 16

Likert Scale - Management
22 With respect to management/administrative issues, would you describe your organization as? (5 point Likert scale, from 1-5, where 5 is the highest rating)
Research Questions: R2
Unit of Analysis: Organization
Method of Analysis: Code: 1-5. Correlate with responses to 1-9

22a Quick to change
Proposition: Organizational culture influences knowledge production, transfer, and utilization
Unit of Analysis: Organization
Method of Analysis: Code: 1-5. Correlate with responses to 1-3, 12-20

22b Innovative
Proposition: Organizational culture influences knowledge production, transfer, and utilization
Unit of Analysis: Organization
Method of Analysis: Code: 1-5. Correlate with responses to 1-3, 12-20

22c Continuously improving
Proposition: Organizational culture influences knowledge production, transfer, and utilization
Unit of Analysis: Organization
Method of Analysis: Code: 1-5. Correlate with responses to 1-3, 12-20

22d Collaborative with other organizations
Proposition: Organizational culture influences knowledge production, transfer, and utilization
Unit of Analysis: Organization
Method of Analysis: Code: 1-5. Correlate with responses to 1-3, 12-20

22e Strives to be one of the best in industry?
Proposition: Organizational culture influences knowledge production, transfer, and utilization
Unit of Analysis: Organization
Method of Analysis: Code: 1-5. Correlate with responses to 1-3, 12-20

22f Supporting administrative/management research
Proposition: Organizational culture influences knowledge production, transfer, and utilization
Unit of Analysis: Organization
Method of Analysis: Code: 1-5. Correlate with responses to 1-3, 12-20

23 On a scale of 1-10, with 10 as the highest rating, how important would you rank the importance of:
23a Staffing and succession planning
23b Revenue, rates, financial stability
23c Community support
23d Employee training and education
23e Other issues of high importance?
Proposition: Technical professional organizations are serving administrative/management needs of specialized organizations where knowledge transfer is occurring
Unit of Analysis: Individual and organization
Method of Analysis: Code: 1-10. Compare with percent of articles on topics in WEF publications.