UNIVERSITY OF CALIFORNIA, SAN DIEGO

Making sense of competing organizational goals:

Perspectives of practice that affect coordinated efforts and organizational learning

A Dissertation submitted in partial satisfaction of the requirement for the degree

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in

Teaching and Learning

by

Joanne Kirkpatrick Price

Committee in charge:

Paula Levin, Chair
Gerald J. Balzano
Michael Cole
James A. Levin

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The Dissertation of Joanne Kirkpatrick Price is approved, and it is acceptable in quality and form for publication on microfilm:

Chair

University of California, San Diego

2007

DEDICATION

I have been blessed with the enfolding, supportive love of my family. For that I am eternally grateful. And it is to each of them that I dedicate this dissertation:

- To my late husband, Benton Charles Price, my soul mate and best friend, who knew that I would walk down this path before I did.

- To my four precious children and their spouses, whose laughter fills my heart and whose love I cherish daily: Lisa and Ken Raines, Derek and Mia Price, Kimberly and Brian Crossley, and Corinne and Cody Rush.

- To my three adorable grandsons, who make the world sparkle with wonder: Zachary Raines, Nicholas Raines, and Hayden Price.

- To my mother, Adele Linden, whose never-failing love, friendship, and constant support have been a gift of God; and to Joseph Linden, whose graciousness is extended to me daily.

- To my talented siblings, each of whom fills my heart to overflowing: Bobbie Hickin, Curry Kirkpatrick III, and Bill Kirkpatrick.

- And to every other member of my family, each so dear to me.

EPIGRAPH

He has told you, O man, what is good;

And what does the Lord require of you

But to do justice, to love kindness,

And to walk humbly with your God?

— *Micah 6:8*

Do all the good you can, by all the means you can, in all the ways you can, in all the places you can, at all the times you can, to all the people you can, as long as ever you can.

John Wesley (1703 - 1791)

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

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VITA AND PUBLICATIONS

Degrees

1970	Bachelor of Arts, Stanford University
2001	Master of Arts, University of California, San Diego
2007	Doctor of Education, University of California, San Diego

Career History

1970	Student Research Analyst Stanford Research Institute, Stanford, California
1970-1973	Instructional Associate, Environmental Studies Orange Coast College, Costa Mesa, California
1973-1974	Training Officer State Water Resources Control Board, Sacramento, California
1974-1977	Project Manager VTN Colorado, Costa Mesa, California
1977-1980	President The Merriwood Corporation, Denver, Colorado
1980-1982	Technical Editor and Trainer Technical Management Services, Inc., San Diego, California
1982-1998	President The Merriwood Corporation, Fallbrook, California
1998-Present	President ActivManuals, Inc., Fallbrook, California

Textbooks

Price, J. K. (1973). *Fundamental Mathematics for Water and Wastewater Treatment Plant Operators.* Ann Arbor, MI: Ann Arbor Science Publishers.

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ABSTRACT OF THE DISSERTATION

Making sense of competing organizational goals:

Perspectives of practice that affect coordinated efforts and organizational learning

by

Joanne Kirkpatrick Price

Doctor of Education in Teaching and Learning

University of California, San Diego, 2007

Paula Levin, Chair

Coordinated activity is a fundamental principle of effective workplace practice. However, coordination of activities is difficult to achieve given the complex and dynamic conditions that characterize many workplace environments. And maintaining coordinated activity within organizations appears to be equally challenging. In fact,

various factors and conditions present in organizations seem to work against both establishing and maintaining coordinated activity.

This study used an ethnographic case study approach to investigate how the understandings of overarching organizational goals vary among different groups within an organization and how these understandings affect coordinated efforts and organizational learning. The research focus for this study was how different groups within an organization make sense of the overarching organizational goals; that is, how do the understandings of the overarching organizational goals vary among different groups, how do these understandings affect coordinated efforts, and how do these understandings affect organizational learning?

The two theoretical frameworks that informed this study are activity theory and theory of action.

The research site was a pubic water reclamation agency in California with over 300 employees. Nine participants—three engineers, three managers, and three operators—were interviewed and then shadowed in workplace practice. In addition, each group of three met separately to discuss a hypothetical workplace scenario.

Findings of the study indicate an alignment in awareness of overarching organizational goals among the people in the three groups studied: operators, engineers and managers. Differences occurred, however, in how the understandings of these goals were enacted in everyday practice. Such differences could potentially result in miscommunication, thus negatively impact coordinated activity. As well,

misunderstandings could arise from miscommunication between individuals and even groups, impacting relationships and the desire to collaborate.

A workplace environment that supports open inquiry enhances organizational learning. In addition, when individuals within an organization share a similar awareness of goals yet engage in different practices associated with those goals, collaborative inquiry could result in innovative solutions or more comprehensive and enduring solutions to complex problems.

INTRODUCTION

Catastrophes, whether natural or manmade, have a way of focusing attention on coordinated activity by agencies and organizations, or in some cases, the lack of it. Under such circumstances, it is imperative that multiple organizations work together effectively. Typically after such events, there is a brief revisiting of issues of coordination, what was lacking in a given circumstance and how coordination could be improved. While, admittedly, the imperative for coordinated activity is paramount for such catastrophic events, coordinated activity is also an essential part of effective routine workplace practice. Continued discoordination of activities can have significant procedural and economic impacts for an organization.

Surprisingly, measures taken to ensure that coordinated and focused actions are in alignment with an organization's stated vision, mission, and strategic goals can often interfere with the most critical factor in maintaining long-term effective activity: organizational learning. This is because the same processes that link organizational goals with routine processes and performance measures are the very processes that tend to discourage inquiry into those processes and performance measures, once established. Organizational learning is likely protected when the processes and values that support open inquiry in the various organizational settings are protected as well.

CHAPTER 1 – STATEMENT OF THE PROBLEM

1.1 Complex, Dynamic Workplace

The typical American workplace today is vastly different from that of even 35 years ago. The complexity of day-to-day activities has grown significantly. Technological advances, coupled with increasingly stringent environmental regulations, and changes in requirements pertaining to human resources and workplace standards, have resulted in interdependent (nested), dynamic responsibilities for organizations—responsibilities that cross highly specialized disciplines of practice. In an attempt to address these massive changes, management practices have varied widely as well. Figure 1 illustrates just four of the multiple subsystems that comprise the nested, interdependent, dynamic system of workplace practice.

In this section, changes within three of these subsystems will be discussed: technological change, regulatory requirements change, and human resources and workplace environment change. Each of these subsystems has specific practices and requirements for desired outcomes within the workplace setting. A fourth, and significant, source of change pertains to management strategies. This source of change and its impact on workplace practice will be discussed separately in Section 1.3.3.

1.1.1 Changes in Technological Practices

Technological practices (Figure 1) are perhaps the most visible area of change in an organization. This is because technological changes often include changes in physical conditions, such as software or hardware, as well as in processes. Change builds upon change, and nowhere is this more evident than in technological change. Within the past 35 years, there has been an explosion of increasingly sophisticated technology that has changed the face of workplace. Table 1 lists a few of these technological innovations.

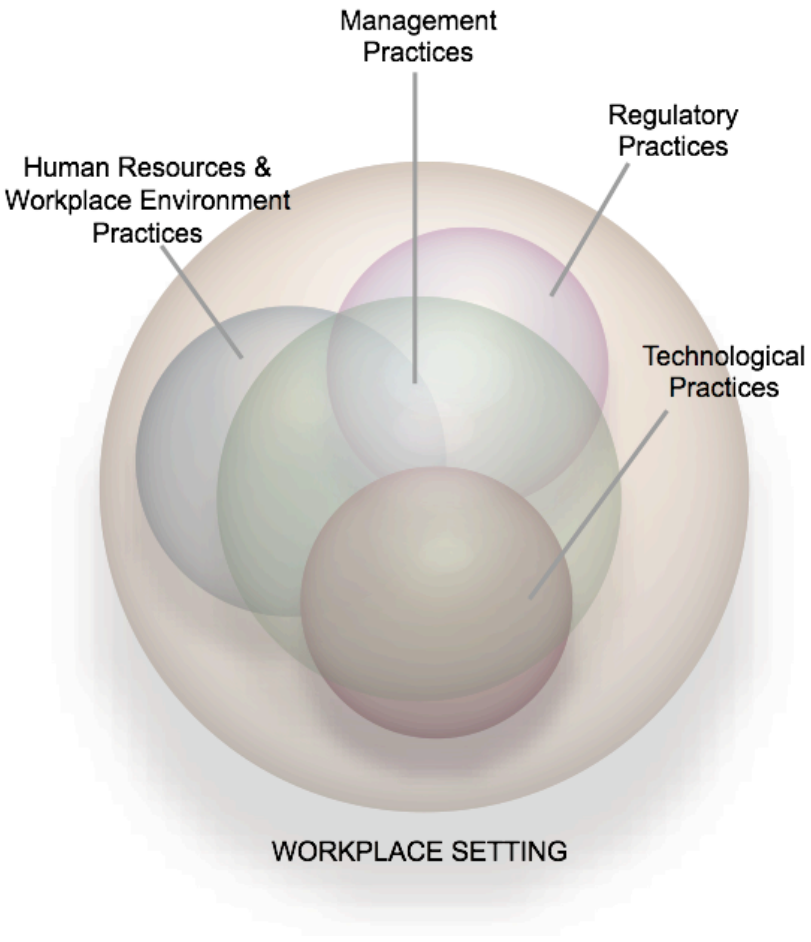


Figure 1. Nested Interdependent Practices and Complexity in the Workplace

Table 1. Selected Technological Innovations in the Past 35 Years

Year	Technology	Comments
1969	ARPANET - Precursor to the Internet	On October 29, 1969 the first message was transmitted across the ARPANET, the precursor to the Internet.
1977	Personal Computers	Introduction of the personal computer (Apple II and Commodore PET).
1981	Digital Cameras	Introduction of the Sony Mavica in 1981.
1983	Camcorders	Sony introduced the first camcorder, followed by Kodak in 1984.
Mid-1980s	Mobile Phones	The first widespread us mobile phones were in automobiles, then handheld.
1985	Facsimile Machine (FAX)	The first computer fax board.
1990s	World Wide Web (WWW)	Beginning of widespread use of Internet.
1990s	Distributed Control System (DCS)	Introduction of commercial-off-the-shelf (COTS) components for remote control of equipment.
1990s	Notebook Computers	In 1981 there was the introduction of laptop computers; the term is now 'notebook' computers and most computer companies offer this format.
1992	Personal Digital Assistants (PDAs)	Introduction of the Apple Newton, the first personal digital assistant.
1993	Global Positioning System	In June 1993, the last of the 24 satellites of the Global Positioning System was placed into orbit, completing a satellite network capable providing position data to locate a position anywhere on Earth within 30 meters.
Mid-1990s	Windows Operating System	While there was an earlier version of Windows OS in 1990, Windows 95 was the first version that did not rely on DOS file management.
Late 1990s	Networking Software	By the 1990s there was widespread use of a variety of network software: local area networks (LAN); wide area networks (WAN); wireless versions of
2003	Microsoft Office Outlook	Contacts and scheduling software introduced as part of the Microsoft Office Suite.

Source: Word search on www.wikipedia.com for each innovation Downloaded 5/20/06.

These and other technological changes have been incorporated within workplace practice, influencing expectations about both the scope and speed of workplace processes. Such changes affect not only organizational processes, they affect the very nature of communication and social interaction within and between organizations. In fact, according to the ideas of cultural-historical activity theory (Cole, 1996; Vygotsky, 1978; Wertsch, 1991), such changes profoundly affect and reflect how people think as well as how they act.

1.1.2 Changes in Regulatory Practices

Within roughly the same 35-year timeframe, there have been correspondingly massive changes in both the scope and degree of regulatory purview. In the area of environmental regulations alone, for example, in 1970, the Environmental Protection Agency (EPA or USEPA) was established and charged with protecting human health and safeguarding the natural environment: air, water, and land. Since that time, there have been scores of environmental regulations enacted that pertain to every area of the environment. And there have been corresponding regulations within each state as well that refine or clarify specific application of the national regulations within that state. (State regulations can be more stringent but not less stringent than the national regulations.)

In California, a leader in environmental regulation, the multiple state agencies responsible for environmental compliance were integrated in 1991 when CalEPA was established. CalEPA is now comprised of six Boards, each with a specific area of responsibility. The six Boards and their purpose as stated in their respective Mission Statements (available at the CalEPA website: www.calepa.ca.gov) are as follows:

- Air Resources Board (ARB)
    - "Promote and protect public health, welfare and ecological resources through the effective and efficient reduction of air pollutants while recognizing and considering the effects on the economy of the state."
- Department of Pesticide Regulation (DPR)
    - "Our mission is to protect human health and the environment by regulating pesticide sales and use, and by fostering reduced-risk pest management."
- Department of Toxic Substances Control (DTSC)
    - "The Department of Toxic Substances Control protects you from toxics from the past, in the present, and into the future."
- California Integrated Waste Management Board (CIWMB)
    - "Reduce waste, promote the management of all materials to their highest and best use, and protect public health and safety and the environment, in partnership with all Californians."

- Office of Environmental Health Hazards Assessment (OEHHA)
    - “Protect and enhance public health and the environment by scientific evaluation of risks posed by hazardous substances.”
- State Water Resources Control Board (SWRCB)
    - "Preserve, enhance and restore the quality of California's water resources, and ensure their proper allocation and efficient use for the benefit of present and future generations."

A review of this list of environmental Boards might give one the impression that environmental regulations and compliance are clearly divided among various environmental categories: air quality, pesticides, toxic substances, solid wastes, and water resources. In the field, however, where the environment is not so neatly segmented, there are occasions when the regulations either overlap or are in conflict, resulting in conflicting compliance requirements. Such circumstances are frustrating and stressful for staff.

And environmental regulations are just one area, albeit a large area, of regulations that must be addressed and adhered to as part of routine workplace practice. City and county regulations of many types must be considered. In addition, as with all spheres of organizational practice, the regulatory sphere is not static. These regulations continue to be refined and extended in response to technological changes and advances in scientific knowledge, as well as through public and political processes. And while the regulatory Boards and their staffs concentrate on individual areas of responsibility, the organizations and agencies in the workplace must know

about, address, and conform to these regulations. Ensuring that workplace staff is aware of existing and new regulations and incorporating these regulations into day-to-day practice require vigilant, constant attention and follow-up. The pressure of these shifting regulatory requirements and the consequences of violation are felt by individuals at multiple levels within the organization.

1.1.3 Changes in Human Resources and Workplace Environment Practices

During the past 35 to 40 years, various legislative measures designed to establish human resources and workplace environment standards for the workplace have been enacted. Such legislation includes the Civil Rights Act of 1964 (followed by Equal Opportunity and Affirmative Action legislation), minimum wage level legislation, and legislation establishing the Occupational Safety and Health Administration (OSHA), in 1970, to guarantee a safe and healthy workplace for employees. Organizations must operate in compliance with these various statutes, adding yet another sphere of responsibility, another sphere influencing organizational structure and processes.

1.2 Complexity and Specialization

Complex environments often require specialized knowledge and skills for particular disciplines, particular spheres of practice, within that complex environment. This specialization has other attending issues. This section describes some of the interconnected features of complexity and specialization and how, together, they seem to create a collaboration paradox.

1.2.1 Specialization that Leads to Fragmentation

To accomplish the many complex and specialized tasks required to meet organizational goals, the tasks are 'divided up' and assigned to various individuals and groups within that organization. Engeström (2005) cites Leont'ev's description of the 'tribal hunt' to describe the concept of division of labor and the coordination of tasks that occurs in efforts to accomplish a complex task (which Leont'ev calls an 'activity system'):

> When the object of the hunt is demanding enough, members of the tribe divide the labor: some chase the game away, while others wait in ambush and kill it. Taken in isolation, the action of chasing away the game makes no sense. Seen against the background of the collective activity system and its division of labor, the action is perfectly sensible. (Engeström, 2005, p. 147)

This division of labor then tends toward fragmentation, or a lack of connection, between the individual tasks and the overall goal or 'object.'

> …in complex activities with fragmented division of labor, the participants themselves have great difficulties in constructing a connection between the goals of their individual actions and the object and motive of the collective activity. This is what gives rise to alienation and various tensions in organizations. (Engeström, 2005, p. 147)

Differences in day-to-day responsibilities and practices, coupled with the specialized speech that develops around those practices, tend to lead to organizational fragmentation along departmental and discipline speciality lines. Figure 2 illustrates the relationship between complexity, specialization and the ensuing fragmentation.

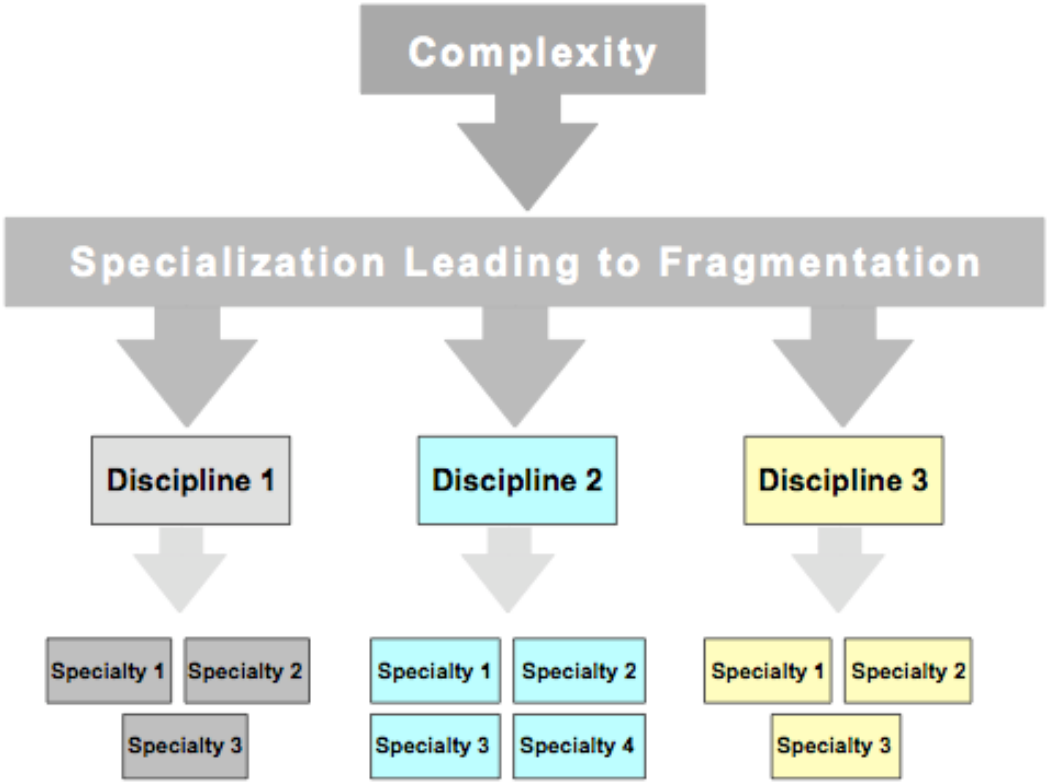


Figure 2. Complexity Leads to Specialization and Fragmentation

1.2.2 The Collaboration Paradox

Researchers in such areas as collaborative activity and organizational learning have acknowledged the rapid emergence of complexity and dynamic conditions in the workplace setting (Argyris & Schön, 1996; Engeström, 2005). As well, researchers have shown an interest in the connection between increasing specialization and the attending fragmentation (Nonaka & Takeuchi, 1995, Engeström, 2005 #79). What has perhaps received less attention is that these conditions—complexity,

rapid change, specialization, and fragmentation—tend to create a 'collaboration paradox.' In other words, the existence of these conditions creates both the need for collaboration as well as the difficulty in attaining or maintaining it (Figure 3).

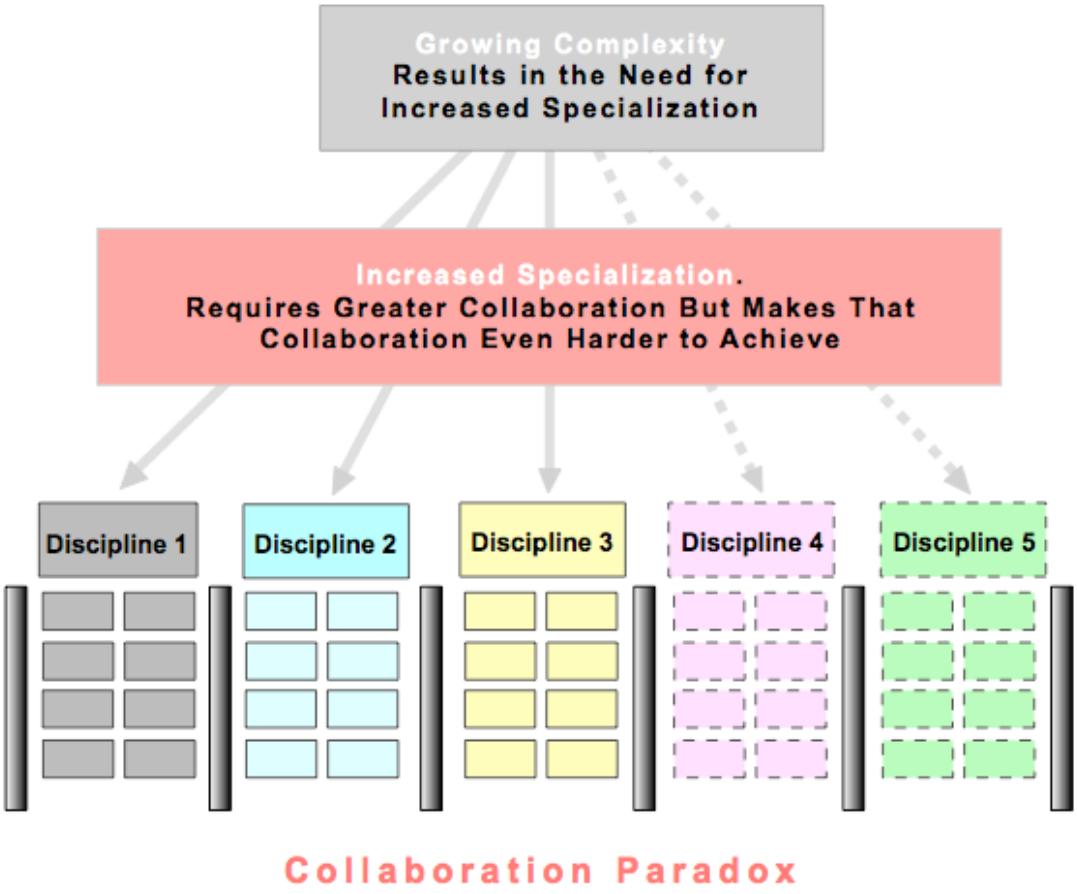


Figure 3. The Interplay of Complexity, Specialization, and Collaboration

1.3 Organizational Responses to the Problem of a Complex, Dynamic Workplace

As an added factor to the complex and dynamic workplace environment, organizations have the pressure of operating with the least possible cost, either in response the competitive nature of free market enterprise or in response to public

concern with the cost of services.

The response of organizations to these various factors has been to economize, downsize, and streamline, on the one hand—that is, to 'tighten the belt,' so to speak—and to increase efficiency or productivity, on the other hand. The following sub-sections describe several of these organizational responses.

1.3.1 "Tighten the Belt"

In order to ensure a clear understanding of overarching goals for the organization, a standard industry practice became the development and communication of vision and mission statements for the organization. These statements are intended to provide a means of integrating and coordinating organizational activity. Typically, once an overall mission statement has been prepared for an organization, each department then prepares a mission statement for their department that in some way reflects or supports the overall organization mission statement. Mission statements are thus intended as a measuring rod of activities, a means of guiding and directing daily decisions within the complex, dynamic environment of the organization. To illustrate this connection between mission statements and the 'measuring rod,' the following is an excerpt from the Operating and Capital Program budget, prepared for Fiscal Year 2006/07, for the Agency that is the setting of this research study.

> Using the Agency's vision and mission statements as a guide, the budget has revised and updated goals for FY 2006/07…. From the policy goals, each department developed measurable goals and objectives along with key performance indicators for the fiscal year. At fiscal year end, policy makers, management and stakeholders can use these indicators as criteria in determining and measuring the degree of goal attainment.

> Each division and department develops individual mission statements in support of the Agency's overall goals. Each department then developed goals and measurable performance objectives. These goals and objectives provide a roadmap as to how each department will contribute to achieving the Agency's policy goals, mission, and ultimately its vision. The end result of this entire process is to achieve a performance driven, results based work program. This will ensure that efforts and resources are being effectively directed toward accomplishment of the mission and vision.
>
> The cascading effect of this methodology commits all levels of the organization to performance goals that ensure a coordinated effort toward goal accomplishment. Individual staff members can clearly identify what is required within their own performance plans to ensure that departments goals are met. Key performance indicators can be established and measured at selected intervals to keep the organization on track or to make course corrections if results are not as expected. It enables policy makers. (Agency, 2006)

While organizational mission statements are viewed as essential instruments of organizational coordination, just how these goals are interpreted and enacted in specific ways by staff with varying responsibilities and perspectives across the organization may or may not support such a viewpoint.

1.3.2 Take a System Perspective

Another response of organizations to the complex, dynamic workplace environment has been to take a system perspective on the many issues facing the company. Peter Senge's (1990) book, *The Fifth Discipline*, specifically identifies 'systems thinking' as an integral characteristic for innovative, adaptive, 'learning' organizations. Albeit the other four basic disciplines (or skills) are important (personal mastery, mental models, building shared vision, and team learning), Senge (1990) cites the role of 'systems thinking' as the most critical to long-term organizational effectiveness.

1.3.3 Institute Organizational Change Initiatives

With the massive technological and regulatory changes that organizations have had to assimilate in the past 35 to 40 years, it is little wonder that there have been numerous 'management approaches' (sometimes referred to as organizational change initiatives) that have rippled through organizational management circles in an attempt to find the best means of steering the organization through these turbulent times while still remaining fiscally solvent. The number of relatively recent (1980s and later) change initiatives that have swept over the workplace landscape is numbing. A few of the more prominent (though not all) of these initiatives include:

- Re-Engineering (Hammer, 1990; Hammer & Champy, 1993),
- Fifth Discipline (Senge, 1990),
- Total Quality Management (TQM) (Deming, 1993; Feigenbaum, 1961),
- Six Sigma, (Summers, 2007; Welch & Byrne, 2001)
- Balanced Scorecard, (Kaplan & Norton, 2001) and
- Lean Manufacturing (Feld, 2001).

Many of these initiatives embraced substantial organizational restructuring, adding more change and chaos to an already chaotic environment. But even if organizations have been successful in streamlining their processes, this does not mean that they will succeed in today's economic climate.

1.3.4 Focus on Organizational Knowledge Creation and Learning

While continuing to underscore the importance of achieving process efficiency, the focus of 'organizational effectiveness' has moved from processes to information, knowledge, and innovation ('knowledge creation'). In a chapter entitled, "Introduction to Knowledge in Organizations,' Nonaka and Takeuchi (1995) describe the success of Japanese companies as a result of the companies' skills in 'organizational knowledge creation:'

> Why have Japanese companies become successful? In this book we offer a new explanation. We argue that the success of Japanese companies is not due to their manufacturing prowess; access to cheap capital; close and cooperative relationships with customers, suppliers, and government agencies; or lifetime employment, seniority system, and other human resources management practices-although all of these factors, of course, are important. Instead, we make the claim that Japanese companies have been successful because of their skills and expertise at "organizational knowledge creation." By organizational knowledge creation we mean the capability of a company as a whole to create new knowledge, disseminate it throughout the organization, and embody it in products, services, and systems. (Nonaka & Takeuchi, 1995, p. 3)

The Japanese model of knowledge creation, particularly as implemented in the 'Toyota Production System' (TPS), captured the attention of many practitioners and researchers in organizational development and organizational learning. In fact, Engeström (2005) cites the Nonaka and Takeuchi (1995) research as one of the few studies that has produced conceptual tools by which cycles of organizational knowledge creation in organizations can be modeled:

> Innovative organizational learning is collaborative learning in work organizations which produces new solutions, procedures, or systemic transformations in organizational practices (Engestrom, 1995). Studies of innovative organizational learning have thus far produced

> relatively general conceptual tools (e.g. Argyris & Schön, 1978, Senge, 1990). While it is commonly acknowledged that innovative learning at work has a complex cyclic character (e.g., Dixon, 1994), there are few detailed attempts at theorizing such cycles and modeling their steps.
>
> One of the most interesting attempts is the recent book by Nonaka and Takeuchi (1995). These authors focus exclusively on innovative learning, which they prefer to call knowledge creation in organizations. (Engeström, 2005, p. 307)

Stewart (2001) describes 'three big ideas' that, in the past two decades, have transformed organizational practices: total quality management, reengineering, and intellectual capital. He notes that W. Edwards Deming and Joseph M. Juran were the architects of total quality management (TQM), first implemented in Japan during the postwar era and immediately following. In fact, in 1960, Deming was awarded Japan's Order of the Sacred Treasures, Second Class, by the Prime Minister of Japan on behalf of Emperor Hirohito. This medal was given to Deming in recognition of his contribution to the industrial success of Japan worldwide. Interestingly, the concepts embodied in TQM, ideas from Deming, an American statistician and college professor, began to be implemented in the United States during the 1970s, in response to the economic competition posed by products of Japanese companies.

Reengineering, according to Stewart (2001) was the second 'big idea:'

> Conceived by the academically minded Thomas Davenport and popularized by the evangelizing, best-selling author Michael Hammer (Hammer & Champy, 1993), reengineering used the emerging power of information technology as a sledgehammer with which to demolish old bureaucracies and paper-pushing management systems. At its virtuous best, reengineering helped executives and managers improve the processes that snake through organizations—that is, to see organizations as pipelines of horizontal processes rather than as towering arrays of vertical departments. At its virulent worst,

> reengineering decimated workforces and destroyed the social coherence and intellectual integrity of organizations. (Stewart, 2001, p. x)

This passage is particularly poignant as it notes the varied outcomes of implementing organizational change initiatives within the workplace. There are often unintended consequences of such implementations.

The third 'big idea' of the past two decades suggested by Stewart (2001) has, I believe, the potential for even greater 'virtue' or deeper 'virulence:' the idea of intellectual capital.

> The third big idea is intellectual capital, and it is the idea provoking the richest and deepest discussions in business and economics today. At its core is the simple observation that organizations' tangible assets—cash, land and buildings, plant and equipment, and other balance sheet items—are substantially less valuable than the intangible assets not carried on their books. Among these are "hard" intangibles like patents and copyrights, information-age assets such as databases and software, and—most important of all—"soft" assets such as skills, capabilities, expertise, cultures, loyalties, and so on. These are knowledge assets—intellectual capital—and they determine success or failure. (Stewart, 2001, p. x)

Word choices such as "assets" and "capital" make one ponder the potential nefarious consequences that might attend implementation of organizational development initiatives associated with these concepts. A quote in Peter Senge's book, *The Fifth Disciple* (Senge, 1990) highlights the connection between changes in organizational processes and structures and changes in individuals' 'mental models:'

> The central message of *The Fifth Discipline* is more radical than "radical organizational redesign" —namely, that our organizations work the way they work, ultimately, because of *how we think and how we interact* [italics in original]. Only by changing how we think can we change deeply embedded policies and practices. Only by changing how we interact can shared visions, shared understandings,

> and new capabilities for coordinated action be established. This notion is pretty new for most of us. We have a deep tendency to see the changes we need to make as being in our outer world, not in our inner world. It is challenging to think that while we redesign the manifest structures of our organizations, we must also redesign the internal structures of our "mental models." But anything less will fall short of the changes required. (Senge, 1990, p. xiv)

Discussions of 'intellectual capital,' as well as those of related topics such as 'organizational learning,' often enter the arena of values. Since organizations embody the collective values of a society, this is no surprise. Thus, an attending, though sometimes silent, subtext to discussions and research associated with workplace practice and organizational learning is that of societal values.

1.4 Focus of this Research Case Study

As noted in the foregoing discussion, organizational knowledge creation (innovation) and organizational learning are topics of interest to both researchers and practitioners alike. This case study is focused on one aspect of organizational learning; that is, on the connection between the understandings of organizational goals and organizational learning. Specifically, this study investigates how the understandings of overarching organizational goals, such as those embedded in mission statements, vary among groups within an organization and how those understandings may affect coordinated activity and organizational learning. The three research questions addressed by this study are:

- How do the understandings of overarching organizational goals vary among different groups within an organization?

- How do the understandings of overarching organizational goals affect coordinated efforts within the organization?
- How do the understandings of overarching organizational goals affect organizational learning?

The theoretical framework and design for this study as well as the findings, discussion, and conclusions are presented in the following chapters.

CHAPTER 2 – LITERATURE REVIEW: WHAT DO WE KNOW ABOUT ORGANIZATIONAL LEARNING?

2.1 Two Branches of Literature Focused on Organizational Learning

Organizational learning is clearly on the minds of many in the workplace. A repeated theme in scores of organizational management articles and texts is that organizations must be more skilled in managing knowledge and more adaptive and innovative as part of their routine practices. For example, using a 'survival of the fittest, metaphor, Wheatley (2002) says that organizations will either learn (adapt and change) or they will die:

> We all know we need to be much more skilled at the organizational survival skills that parade under the banner of Knowledge Management. Organizations need to be smarter, faster, more innovative, and more agile. The complexity of the twenty-first century world has speeded up the pace of evolution, and those who cannot learn, adapt, and change simply will not survive. (Wheatley, 2002, p. 3)

Stewart (2001) points out that the focus on knowledge is important for all types of organizations, '…knowledge matters to low-tech companies as well as nonprofit organizations and to government agencies as much as it does to high-tech outfits" (Stewart, 2001, p. xii).

According to Argyris and Schön (1996), the literature surrounding organizational learning in the past 30 years may be divided into two branches. One branch is prescriptive and practice-centered, and often uses the term, "learning organization." Discussions of organizational learning by this branch tend to focus more on methods (prescriptions) than on theory. The other branch treats

"organizational learning" as a topic for scholarly research, and remains somewhat skeptical of the claims of the 'learning organization' adherents and unconnected from practical application.

Argyris and Schön (1996) point out that although the two approaches to understanding organizational learning have a different focus, they do, in fact, share some ideas, including:

- It is important to recognize and investigate the assumptions that underlie action ('theories-of-action,' or the similar concept, 'mental models'), and
- There is a distinction between lower level learning (learning that is directed toward finding and correcting errors—also called 'instrumental' learning or 'single-loop' learning) and higher level learning (learning that is directed toward revising organizational values or norms—also called 'double-loop' learning).

While many of the practice-oriented discussions of organizational learning were reviewed as part of the literature review for this research study, it is the theoretical branch that forms the foundation of this study. The theoretical frameworks described in this chapter inform the particular design and analysis of this case study. Connections of this study to practice are discussed in various parts of Chapter 4 – Findings and Discussion.

Of the many powerful theories of organizational learning that have their basis in educational and organizational research, the theories that seem most promising for providing insight to coordinated activity and organizational learning are those that take

a socio-cultural-historical perspective of learning. Such theories are able to address the complex, dynamic environments characteristic of today's workplace.

Some studies using a socio-cultural-historical approach have investigated the mediated characteristics of activities within complex organizations and collaborative activities (Cole, 1996; Engeström, 2005; Vygotsky, 1978). Other studies have focused on the socially-situated (Lave & Wenger, 1991) or distributed (Hutchins, 1995; Salomon, 1993) nature of activities. The affect of various artifacts on activities, and vice versa, have been additional areas of research (Kaptelinin & Nardi, 2006; Nardi, 1997). And the ways in which various groups within an organization ('communities of practice') integrate and enculturate new members (novices) into that group has been studied as well (Etienne Wenger, 1998; E. Wenger, McDermott, & and Snyder, 2002).

Two theories with a socio-cultural-historical perspective that seem particularly well-suited to the research questions posed in this study are those of activity theory and theory of action. Each of these theories has been used for several years in intervention or developmental research within the workplace setting and each has a particular focus on organizational learning. These two theories, therefore, have been selected to comprise the theoretical frameworks that inform this study.

A discussion of each of these two theories is provided in the remainder of this chapter. The key concepts associated with activity theory are described in Section 2.2, and the central concepts that constitute theory in use are included in Section 2.3. The implications of these two theories to the design and analysis of this case study are presented in Section 2.4

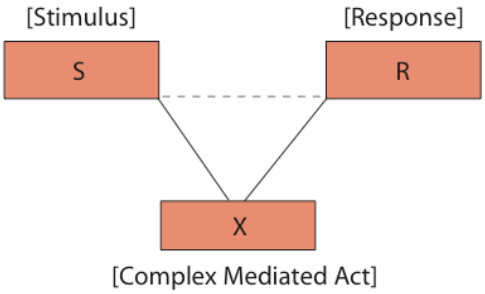
2.2 Activity Theory

2.2.1 Foundations – Vygotsky and Mediated Activity

Activity theory, often referred to as Cultural-Historical Activity Theory (CHAT), is a theory about people engaged in activity, It is a theory about how individuals act, interact, are acted upon, and learn in the world. The ideas of the Russian psychologist Lev Semyonovich Vygotsky form the core, the foundation, upon which activity theory is constructed and from which refinements of the ideas of activity theory have proceeded. An understanding of these core ideas is therefore essential to an understanding activity theory.

The work of several translators, including Michael Cole, James Wertsch, Michael Holquist, Martin Lopez-Morillas, and Alex Kozulin, provided the Western world three invaluable resources of Vygotsky's ideas and writings: *Thought and Language* (Vygotsky, 1986), *Mind in Society* (Vygotsky, 1978) and *Culture, Communication, and Cognition: Vygotskian Perspectives* (Vygotsky, 1986). The following summary of key concepts highlights important foundational ideas that derive from Vygotsky's writings.

Key Concept 1: Action is mediated through tools and signs. A centerpiece concept of Vygotsky's work revolved around the idea of mediated activity (Figure 4), in which the previous approach to understanding human activity—direct and conditioned stimulus–response activity—was replaced by a new construct: "a complex, mediated act." (Vygotsky, 1978, p. 40).



Source: (Vygotsky, 1978, p. 40)

Figure 4. A Complex Mediated Act

Vygotsky's ideas were revolutionary because they challenged the prevailing Western notion of individuals as apart and separated from societal structure. With mediation of tools and signs, the individual was inherently connected to his or her cultural means; and conversely, cultural means and society were inherently connected to individuals who use and create the artifacts. Vygotsky makes a clear distinction between two types of mediational artifacts: tools and signs, each with specific characteristics. He describes how the use of signs and tools are similar, how they are different, and then how they are related.

First, the use of signs and tools are similar in that they both serve the function of mediating activity. Whereas tools are a mediational means to control nature, signs are a mediational means to control behavior.

Speaking of the differences in the use of signs and tools, Vygotsky (1978) points out that the use of the tool is externally oriented (the mastery over nature), whereas the use of signs is internally oriented (the mastery of oneself).

> A most essential difference between sign and tool, and the basis for the real divergence of the two lines, is the different ways that they orient human behavior. The tool's function is to serve as the conductor of human influence on the object of activity; it is *externally* oriented; activity is aimed at mastering, and triumphing over, nature. The sign, on the other hand, changes nothing in the object of a psychological operation. It is a means of internal activity aimed at mastering oneself; the sign is *internally* oriented. These activities are so different from each other that the nature of the means they use cannot be the same in both cases. (Vygotsky, 1978, p. 55)

Vygotsky (1978) further describes the internally-oriented aspect of signs as a process that occurs in a series of transformations from the external to the internal. He suggests that different types of speech are used during different stages of practical activity (problem solving). There is 'communicative speech' that accompanies the attempt to accomplish a desired task, such as questions a person directs to those around him or about the object or about other aspects of the task. In another phase of activity, there is 'egocentric speech,' the speech described by Piaget (1959) as the person talking to himself, in a monologue, as though he were thinking aloud, not addressing anyone. Vygotsky's experiments indicate that the relative amount of egocentric speech increases as the difficulty of the task increases. This egocentric speech is considered the link between external speech and inner speech:

> On the basis of these experiments, my collaborators and I developed the hypothesis that children's egocentric speech should be regarded as the transitional form between external and internal speech. Functionally, egocentric speech is the basis for inner speech, while in its external form it is embedded in communicative speech. (Vygotsky, 1978, p. 27)

Signs, such as language, have both an interpersonal and intrapersonal dimension. During practical activity (sometimes referred to as 'technical activity'),

language tends to move from the interpersonal dimension to the intrapersonal dimension. In addition, the relationship between the speech and the particular actions in an activity seems to follow a developmental pattern. During the early stages of a given type of activity, speech and action are mixed and somewhat chaotic. At a later stage in that activity—that is, with more familiarity with the context and scope of that activity—speech moves more toward the beginning of the activity, thus supporting planning behavior before the action begins. This represents the 'planning' aspect of speech. Whereas in the early stages activity dominates speech, in later stages speech dominates activity:

> Initially speech follows actions, is provoked by and dominated by activity. At a later stage, however, when speech is moved to the starting point of an activity, a new relation between word and action emerges. Now speech guides, determines, and dominates the course of action; *the planning function of speech* comes into being in addition to the already existing function of language to reflect the external world. (Vygotsky, 1978, p. 28)

The third characteristic of tools and signs highlights the connection between these two types of mediating artifacts. The use of tools in mediated activity broadens the range of available activities within which the use of signs for control of behavior can operate.

In a chapter entitled, "Putting Culture in the Middle," Michael Cole (Cole, 1996) describes mediational artifacts as both ideal and material, consistent with signs and tools, noted by Vygotsky. But Cole suggests the addition of 'secondary artifacts' to the 'primary artifacts' of signs and tools. These secondary artifacts, inherently tied to signs and tools, include culturally-derived processes and their associated systems of

meaning, such as schemas, scripts, and contexts. Such a concept broadens the reach of the individual, through culture, and vice versa, within a given activity.

Key Concept 2: Word Meaning is the Required Focus to Understand the Connection Between Thought and Language. Vygotsky (1986) highlights the importance of understanding the relationship between thought and language. He notes that although the field of psychology had not given this interrelation much attention, an understanding this interrelationship was critical: "As long as we do not understand the interrelation of thought and word, we cannot answer, or even correctly pose, any of the more specific questions in this area" (Vygotsky, 1986, p. 1). Vygotsky further notes that the methods of analysis used to research this interrelationship were so segmented and isolated from original context as to no longer shed light on the properties of the interrelationship being studied. He suggests that the proper analytical focus for understanding the connection between thought and language is *word meaning.*

> Psychology, which aims at a study of complex holistic systems, must replace the method of analysis into elements with the method of analysis into units. What is the unit of verbal thought that is further unanalyzable and yet retains the properties of the whole? We believe that such a unit can be found in the internal aspect of the word, in *word meaning*. (Vygotsky, 1986, p. 9)

For Vygotsky, word meaning connects not only thought and language (speech), but thought and communication as well: "Therefore, we all have reasons to consider a word meaning not only as a union of thought and speech, but also as a union of generalization and communication, thought and communication" (Vygotsky, 1986, p. 9).

Wertsch (1991) describes the work of Bakhtin and others as both extending the theories of Vygotsky regarding the connection between language and mental functioning (semiotic mediation) and describing a dialogic-centered methodology consistent with a socio-cultural-historical perspective of learning.

Key Concept 3: The Intersection of Speech and Practical Activity Provides a Valuable Window on Development. Vygotsky's (1978) experimental work led him to identify the intersection of speech and practical activity as particularly significant to both intellectual development and the accomplishment of goals. His experiments indicated that as the task required by a particular goal became more complex, speech played a correspondingly greater role in attaining that goal.

Key Concept 4: Intellect and Affect Should be Considered as Integrally-Related Concepts. A concept that seems to be gaining interest in current studies of organizational learning is the relationship between intellect and affect. In current day discussions, this connection might be termed 'knowledge and affect.' In my readings, I have found relatively little discussion of affect in texts and articles on activity theory. Yet, for Vygotsky (1986), intellect and affect were inseparable:

> When we approach the problem of the interrelation between thought and language and other aspects of mind, the first question that arises is that of intellect and affect. Their separation as subjects of study is a major weakness of traditional psychology, since it makes the thought process appear as an autonomous flow of "thoughts thinking themselves," segregated from the fullness of life, from the personal needs and interests, the inclinations and impulses, of the thinker. (Vygotsky, 1986, p. 10)

Lave and Wenger (1991) come close to suggesting a unity between intellect and affect in their work pertaining to 'communities of practice.' The connection

between intellect and affect is particularly cogent to this research study of this dissertation insofar as the affective element and the behavioral world surrounding thought and conversation is a focal point in the work of Argyris and Schön (1996), discussed below in Section 2.3, Theory of Action.

Key Concept 5: Development and Learning are Inherently Social in Nature.

The link between the individual and the object is not only cultural, via mediating artifacts (signs and tools), it is inherently social as well.

> From the very first days of the child's development his activities acquire a meaning of their own in a system of social behavior and, being directed towards a definite purpose, are refracted through the prism of the child's environment. The path from object to child and from child to object passes through another person. This complex human structure is the product of a developmental process deeply rooted in the links between individual and social history. (Vygotsky, 1978, p. 30)

According to this viewpoint, learning channels through others. The mediational aspect of activity would suggest that learning for adults is an equally social process. Thus, changes in the structure or processes of a workplace setting that discourage social interaction are likely to negatively impact the learning potential of that particular setting as well.

Key Concept 6: Zone of Proximal Development. Vygotsky points out a "well known and empirically established fact…that learning should be matched in some manner with the child's developmental level."(Vygotsky, 1978, p. 85) The question for Vygotsky is just how that developmental level should be determined. He notes that in typical studies of the mental development of children, it is assumed that the developmental level of the child is indicated by the tasks that can be completed

independently by that child. Vygotsky questions this assumption by focusing on significant differences in a child's achievement that surrounds 'partial help:'

> On the other hand, if we offer leading questions or show how the problem is to be solved and the child then solves it, or if the teacher initiates the solution and the child completes it or solves it in collaboration with other children—in short, if the child barely misses an independent solution of the problem—the solution is not regarded as indicative of his mental development. This 'truth' was familiar and reinforced by common sense. Over a decade even the profoundest thinkers never questioned the assumption; they never entertained the notion that what children can do with the assistance of others might be in some sense even more indicative of their mental development than what they can do alone. (Vygotsky, 1978, p. 85)

Vygotsky's concept of the zone of proximal development (ZPD) was, thus, an attempt to measure what might be considered the current range of the developmental level for an individual; that is, development 'under construction.' ZPD was intended to locate the child's 'learning zone.' Vygotsky defined the ZPD as, "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978, p. 86).

Considered against a developmental process that proceed from interpersonal to intrapersonal (described above in Key Concept 4), a progressive internalization of learning, the ZPD makes perfect sense as a measure of the 'developmental zone' of the individual. While Vygotsky applies the concept of the ZPD to learning in individuals, Engeström (2005) extends this idea and applies the concept of the ZPD to organizations (refer to Section 2.2.3 below).

The Research Approach of Vygotsky. The research methods used in any given study must be in alignment with the theoretical framework selected for that study. And since Vygotsky's (1978) theoretical framework was intended to break from the behaviorist theories of psychological development, his methods of research were also divergent from the previous approach to research. Vygotsky was attempting to replace the stimulus–response methodology (the 'stimulus–response' framework) with an approach grounded in mediated activity.

The three principles that formed Vygotsky's (1978) 'experimental-developmental' approach to the analysis of higher psychological functions are as follows (Vygotsky, 1978, p. 61):

1. Analyze process, not objects. The idea of this principle is to focus on the process unfolding, not on a singular object in the process. The timeframe of the psychological development under investigation might range from only a few seconds (for simple mental processes) to several weeks (in the case of complex mental processes). The desired outcome for this stage in the experimental-developmental approach is a reconstruction of the stages in development of the process.
2. Explanation versus description. This principle emphasizes the importance of explaining the development, that is, finding causal-dynamic relations associated with the psychological development, rather than just describing it. Descriptions do not generally include such 'causal' or 'dynamics' considerations.

3. The problem of 'fossilized behavior.' This principle suggests that behavior does not always mean what it appears to mean. Some behavior may be a part of processes that have become 'automatic,' at least in part, if not primarily. This means that the connection between the behavior of an individual (outer appearance) and the internal processes associated with that behavior have been broken or at least are unclear. Thus, according to Vygotsky, the analysis of a behavior should include a historical analysis of that behavior to better understand the associated psychological processes.

Using these three principles, Vygotsky (1978) developed an approach to research he called, "*the functional method of double stimulation*" (Vygotsky, 1978, p. 74). For experiments using 'double stimulation,' a task was given a child that was beyond his current skills and capabilities (first stimulation). In addition, however, a neutral object of some type was placed near the child (second stimulation). The problem solving activity was then observed, including whether or how, the child used that neutral object to solve the problem posed.

Since learning, in Vygotsky's perspective, is presumed to proceed from the external to the internal, observation of the external (behavior and use of signs and tools) would thus provide a window on the internal psychological processes.

2.2.2 'Three Generations' of Activity Theory

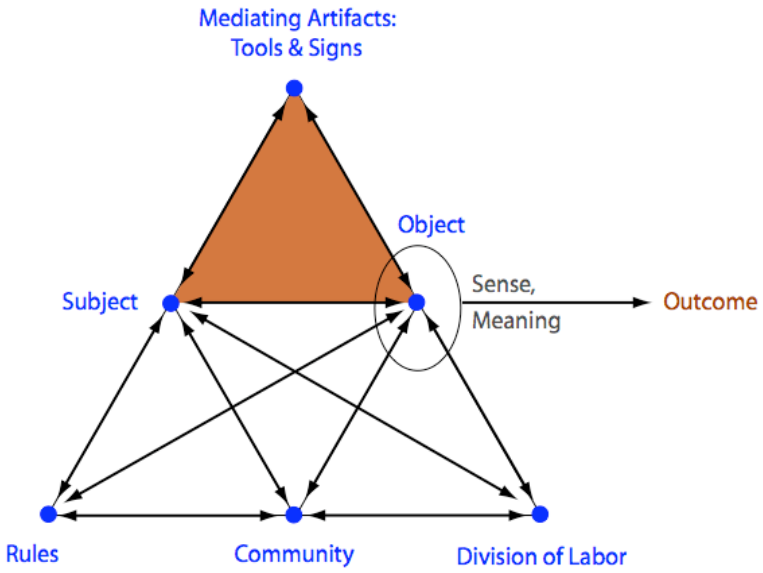
Engeström (2005) describes the developments activity theory in terms of 'three generations' of activity theory. The 'first generation' of activity theory is comprised of the ideas of Vygotsky (1978, 1986). Although Vygotsky (1978, 1986) never uses the term 'activity theory' in his writings, he does use the term 'mediated activity' and this concept is foundational to activity theory constructs.

The 'second generation' of activity theory, according to Engeström (2005), is represented by the work of Leont'ev (1981), who followed in the theoretical footsteps of Vygotsky by broadening the scope of the activity theory to include 'collective' activity. In Leont'ev's (1981) famous example of the "primeval collective hunt," he describes the crucial difference between an individual action and a collective activity:

> When the object of the hunt is demanding enough, members of the tribe divide the labor: some chase the game away, while others wait in ambush and kill it. Taken in isolation, the action of chasing away the game makes no sense. Seen against the background of the collective activity system and its division of labor, the action is perfectly sensible. (Engeström, 2005, p. 147)

It is precisely this point, understanding individual actions in the light of collective activity, that necessitates a 'system view' of activities in the workplace to understand the connections to the whole activity, the organizational practice.

Leont'ev never provided a graphical representation of his broadened viewpoint of mediated activity, the 'collective' activity system; however, Engeström (2005) developed such a graphic, shown in Figure 5:



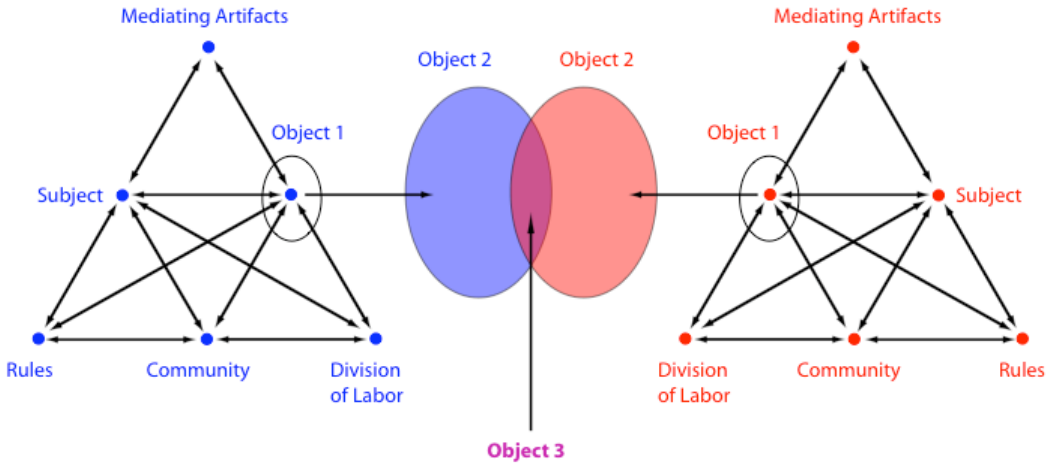
Source: Engeström (1987), p. 78

Figure 5. The Structure of an Activity System

As the graphic illustrates, Vygotsky's mediated activity triangle that focused on the individual, has been expanded to incorporate a wider perspective, a 'cultural-historical' perspective. Among researchers, this 'wider perspective' is also sometimes referred to as the 'socio-cultural' perspective.

Engeström (2005) suggests that activity theory is beginning to transcend the second generation (expansion from focus on the individual to a wider context) and is in the formative stages of a 'third generation' of activity theory. In the third generation of activity theory, the activity system model is expanded to include multiple

interacting activity systems, as shown in Figure 6. Since even organizations are part of nested, interdependent, dynamic systems, this depiction is helpful in considering the actions of an organization in the context of this larger system.



Source: Engeström, 1987, p. 63

Figure 6. Interacting Activity Systems

Engeström (2005) outlines five principles that define the key dimensions of activity theory 'in its current shape' (p. 63):

Principle 1: A collective, artifact-mediated and object-oriented activity system, seen in its network relations to other activity systems, is taken as the prime unit.

Principle 2: An activity system is multi-voiced; that is, it is always a community of multiple points of view, traditions and interests.

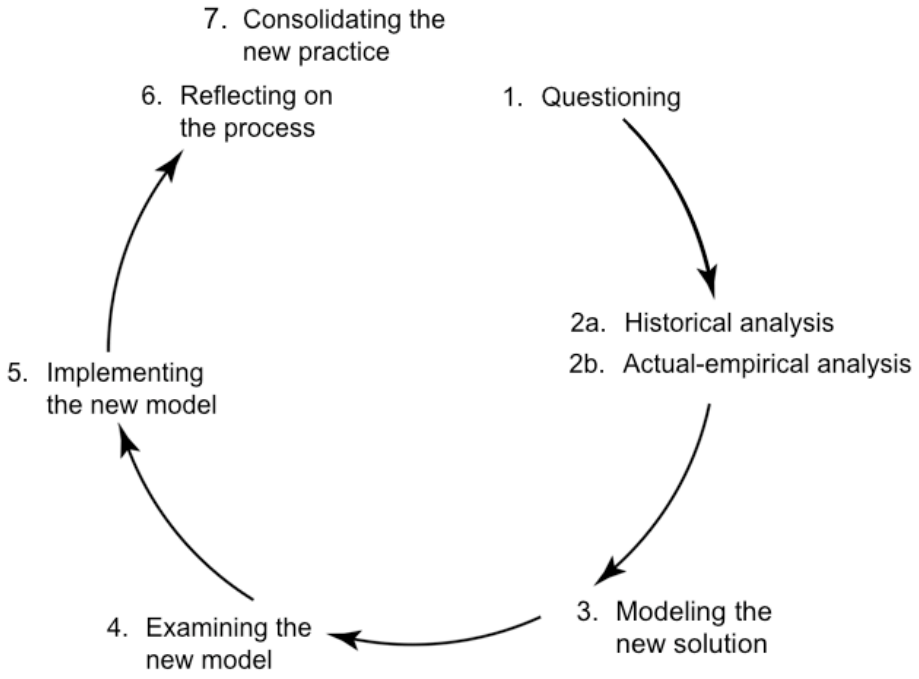
Principle 3: Activity systems take shape and get transformed over lengthy periods of time. Their problems and potentials can only be understood against their own history.

Principle 4: Contradictions play a central role as sources of change and development in activity systems. Contradictions are not the same as problems or conflicts. Contradictions are historically accumulating structural tensions within and between activity systems.

Principle 5: There is the possibility of expansive transformations in activity systems. An expansive transformation is accomplished when the object and motive of the activity are reconceptualized to embrace a radically wider horizon of possibilities than in the previous mode of the activity.

2.2.3 Activity Theory and the Zone of Proximal Development

Engeström (2005) extends Vygotsky's (1978) idea of the zone of proximal development (ZPD) and applies it to the activity system. Collaboration with a 'more capable peer' (a peer 'activity system' in this case) necessitates interaction with at least one other activity system. An activity system ZPD could, for example, be represented by a conflict between the organizational 'status quo' (such processes, practices, artifacts) and some new element or stimulus that begins to create tension with that status quo—thus conflict and contradictions. According to Engeström, such a scenario holds the potential for expansion to a new status quo. The resulting 'expansive learning cycles are illustrated in Figure 7.



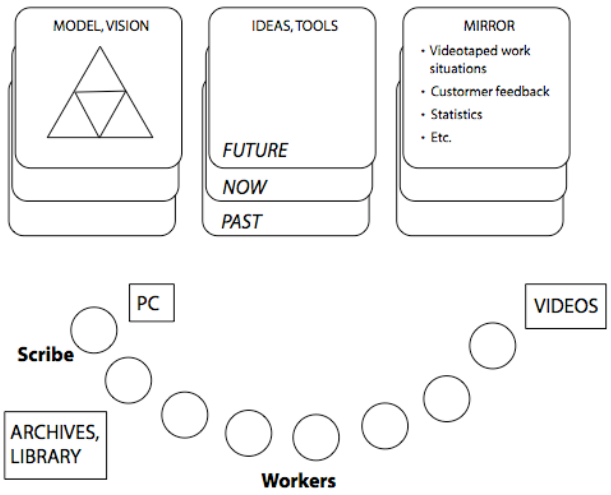
Source: Engestrom, 2005, p. 323

Figure 7. Expansive Cycle of Learning Actions

2.2.4 The Research Approach of the Change Laboratory

A primary focus of the Center for activity theory and Developmental Work Research at the University of Helsinki, Finland is to use the theoretical framework of activity theory in developmental work research. In addition to assisting agencies and organizations with developmental change, the interventions designed by this group are intended to further develop the theory of Cultural-Historical Activity Theory (CHAT). Engeström (2005) describes the intervention methodology embedded in the Change Laboratory approach used by the Center.

The Change Laboratory research methods are based on the Vygotkian concept of dual (or 'double') stimulation; that is, while attempting to identify and resolve current problems ('inner contradictions') within the activity system, various means are available that may used as mediational artifacts in the process. The Change Laboratory is a room or space set up close to the work area (such as the shop floor) of the group that will be participating in the Change Laboratory. The room is furnished with certain mediational tools to aid in the developmental process. A typical layout of the Change Laboratory is shown in Figure 8.



Source: Engestrom, 2005, p. 293

Figure 8. Layout of the Change Laboratory

The front of the room includes three surfaces, or flip charts, as mediational means during Change Laboratory sessions. To the far right is the 'mirror,' the 'reflective surface' used for identifying current disturbances and novel solutions

within the activity system. Videotaped sessions and stories are a part of this 'mirror' segment of the Change Laboratory environment.

To the far left is the area for considering theoretical connections (past, present and future) and related conceptual foundations. By considering various nodes in the activity system triangle, a variety of perspectives on the disturbance or contradiction is available. Next steps in the development of the activity system are considered on this surface. The middle surface is used to capture 'tools' and ideas used to further development of the solutions. These tools could include sketches, calculations, or analyses of various types.

Change Laboratory activities typically begin with a focus on identifying ('mirroring') current conflicts or disturbances within the system. After tracing these conflicts into the past, to understand the roots of the issues, Change Laboratory participants attempt to theorize the current activity system with its tension points and disturbances. The final step is to begin to construct a future models of the activity system in which these conflicts are first partially then finally resolved.

2.3 Theory of Action

2.3.1 Perspectives on Organizational Learning: Similarities and Differences

As noted in Section 2.1 above, Argyris and Schön (1996) point out the common ground between 'practice-centered' and 'scholarly research-centered' approaches to organizational learning: they recognize the importance of mental

constructs, and, they acknowledge the distinction between lower level (instrumental) learning and higher level (values and norms) learning.

What is more important, according to Argyris and Schön (1996), is that these two branches also seem to "converge on a certain blindness toward, or avoidance of, the factors we regard as most critical to the successful achievement and maintenance of higher-level organizational learning: the behavioral world of the organization and the theories-in-use of individuals that reinforce and are reinforced by it." (Argyris & Schön, 1996, p. xix)

A further concern of Argyris and Schön (1996) regarding the literature surrounding Theory of Action is that two concepts foundational to understanding organizational learning seem to be missing in these discussions: (1) the definition of organizational learning; and (2) the link between organizational learning and the thoughts and actions of individuals. They suggest that these two concepts must be addressed in order to provide a coherent and robust theory about organizational phenomena:

> If theorists of organizational learning seek to be of use to practitioners, they must somehow link organizational learning to the practitioners' thought and action. And even if they do not wish to be of use to practitioners, as we shall argue in Chapter 9, they should explore these linkages if only to provide a coherent and robust theoretical account of the aggregate organizational phenomena they *do* seek to explain. (Argyris & Schön, 1996, p. 6)

Argyris and Schön (1996) therefore begin their discussion of organizational learning by first clarifying what is meant by the term 'organization,' and then suggest the linkage between the individual and the organization—the ways in which an

individual's thoughts and actions are connected to those of an organization. Finally, they explore the term 'learning' and what it means when applied to an organization.

2.3.2 Defining Organizational Learning

In describing 'organizational learning,' Argyris and Schön (1996) begin with the definition of what constitutes an organization, and then build on that foundation by considering how such an entity can learn. Argyris & Schön (1996) distinguish the difference between an 'organization' and a 'collection of individuals." Organizations, in contrast to collections of individuals, form a vehicle for collective decision and action (a 'polis'); they establish rules that govern the collective's behavior as well as that of its 'agents'; and agents of the organization act on behalf of the organization:

> Before an organization can be anything else, it must be 'political,' because it is as a political entity that the collectivity can take organizational action. Then it is the individuals who decide and act, but they do these things on behalf of the collectivity, as its agents. And in order for individuals to be able to decide and act in the name of the collectivity, there must be rules that determine the boundaries of the collectivity, when a decision has been made and when authority for action has been delegated to individuals. (Argyris and Schön, 1996, p. 9)

A collective is a group of individuals with a common interest, often acting collaboratively toward a common purpose. This purpose can be in response to immediate situation or interest, and thus ephemeral, or it can be a longer-term and result in a collectivity that survives over time. A collective begins to become similar to an organization when the following three conditions are met:

- There are established procedures for making decisions in the name of the collectivity,

- There is delegated authority to individuals to act for the collective, and
- Boundaries have been set between the collective and the rest of the world.

According to Argyris and Schön (1996), when collectives of people have met these three criteria, they have become what the ancient Greeks referred to as a 'polis,' a political unit. The delegation of authority and the assignment of roles for tasks that are part of routine practice is the organization's task system. (Argyris & Schön, 1996)

> The organization's "task system ," its pattern of interconnected roles, is at once a division of labor and a design for the performance of work. This design shares the properties of other designed artifacts. It is more or less complex; it involves a multiplicity of variables, values, and constraints; it is subject to variation and change; and it may be represented prior to its enactment—"planned in advance"—or designed and redesigned while in operation. (p. 10)

2.3.3 The Link Between the Individual and the Organization

Since the organization is a 'polis,' with rules and a division of labor, individuals (agents) can act on behalf of the organization, in accord with their delegated role. This, then, is the connection between an individual's thoughts and actions and the organization. "If a collectivity meets these conditions, so that its members can *act* for it, then it may be said to learn when its members *learn* for it, carrying out on its behalf a process of inquiry that results in a learning product…Inquiry does not become organizational unless undertaken by individuals who function as agents of an organization according to its prevailing roles and rules." (Argyris & Schön, 1996, p. 6)

Just because an individual is employed (i.e., contracted to be an agent) by an organization, does not mean that henceforth all actions of that individual are thus

'organizational actions.' It is only as that individual acts on behalf of the organization that the acts become 'organizational acts,' the inquiries become 'organizational inquiries,' or the learning becomes 'organizational learning.'

According to Argyris and Schön (1996), "an organization can be said to learn when it acquires information (knowledge, understanding, know-how, techniques, or practices) of any kind and by whatever means" (Argyris & Schön, 1996, p. 3). This does not suggest, however, that they believe all learning is 'good' (in terms of values) or profitable (in terms of effect). In fact, they highlight a particular kind of learning as important to organizations: improvement of its task performance. This, in turn, is tied to the organization's ability meet its stated objectives, its goals.

Another question that often arises with respect to a discussion of what constitutes 'organizational learning' is 'where does organizational learning reside in the organization?' Argyris and Schön (1996) suggest that organizational knowledge resides in three places:

1. In people's heads. – While some organizational knowledge can be codified, some can not be. This is the knowledge that resides as fluid tools gained by experience and used for a given situation (sometimes experienced before, sometimes not), the 'know how.'
2. In the organizational records. – This includes the codified information such as reports, policies, regulations, databases, schematics, drawings, etc.
3. In organizational strategies and procedures.

2.3.4 Types of Organizational Learning

Having established the conceptual foundations for organizational learning, Argyris and Schön (1996) then describe three types of organizational learning: single loop learning, double loop learning, and deuterolearning. The characteristics and conditions that give rise to these types of learning, as well as the importance of each type of learning in achieving effective action by the organization, has been the focus of their work of more than thirty years.

In single-loop learning, the primary focus of the organization is in identifying and correcting error. The degree to which this behavior is codified and valued by the members of the organization, is generally reflective of the organization's effectiveness in accomplishing specific tasks.

Double-loop learning includes not only identifying and correcting error, as is characteristic of single-loop learning, but it also includes looking for changes that need to be made with respect to norms, values, or rationales of the organization. The prospect for long-term survival of an organization are increased if it can address and change values and norms as needed to better achieve its overall goals.

A term coined by Bateson (1972), 'deuterolearning' was adopted by Argyris and Schön (1996) to describe learning how to learn (a similar concept to the metacognitive aspect of teaching and learning principles). This 'learning to learn' capacity can be associated with either single-loop or double-loop learning.

2.3.5 The Organizational Learning System

Argyris and Schön (1996) suggest that people go about their various organizational tasks using a particular ideas or beliefs about the best way to get those tasks done. These ideas then shape the ways and means that the individuals carry out their work, as suggested in the following passage:

> Such organizational task knowledge may be variously represented as systems of beliefs that underlie action, as prototypes from which actions are derived, or as procedural prescriptions for action in the manner of a computer program. We have chosen to represent such knowledge through what we call "theories of action," which have the advantage of including strategies of action, and the assumptions on which they are based. (Argyris & Schön, 1996, p. 13)

Theories of action can be of two types: espoused theory (the theory of action that people give to explain or to justify their actions), and theory-in-use (the theory implied by their actual behavior). This theory is not stated directly, for a 'stated theory' is the espoused theory. The theory-in-use is constructed from evidence provided by observation of an individual's actions.

Argyris and Schön (1996) connect the two ideas (theory of action and organizational learning) through the concept of organizational deuterolearning.

> An organization's *learning system* is made up of the structures that channel organizational inquiry and the behavioral world of the organization, draped over these structures, that facilitates or inhibits organizational inquiry. Together, structural and behavioral features of an organizational learning system create the conditions under which individuals interact in organizational inquiry, making it more or less likely that crucial issues will be addressed or avoided, that dilemmas will be publicly surfaced, held private, and that sensitive assumptions will be publicly tested or protected. (Argyris & Schön, 1996, p. 28)

The organizational structures to which they refer include various means of communication, the information systems, the physical facilities (as they influence staff communication), procedures and guidelines that pertain to individual and group inquiry, and the system of incentives that are used to influence, in one way or another, the inquiry process. The behavioral world refers to the feelings about and meaning inferred from patterns of interactions, particularly those that are associated with inquiry.

Organizational environments that may be characterized as 'win/lose' or 'power play' environments, that is, environments that tend to pose potential threat or embarrassment, are considered by Argyris and Schön (1996) as 'anti-learning' environments. "We have found that when human beings deal with issues that are embarrassing or threatening, their reasoning and action conform to a particular model (Model I Theory-in-Use)" (Argyris & Schön, 1996, p. 92). Table 3 summarizes the characteristics of these 'anti-learning' environments. Such environments shut down the inquiry process and create the conditions that preclude organizational inquiry, and thus the possibility of productive organizational learning.

The characteristics of a behavioral environment that promotes productive organizational learning are summarized in Table 4. This type of environment is supportive of inquiry, allows for the identification and correction of errors in both the instrumental as well as the values and norms levels of organizational practice. Argyris and Schön (1996) have termed this type of environment Model II Theory-in-Use.

Table 2. Model I Theory-in-Use

Characteristics of Anti-Learning Environments			
Governing Variables	Action Strategies	Consequences for Behavioral World	Consequences for Learning, Effectiveness
Define goals and try to achieve them	Design and manage the environment unilaterally (be persuasive, appeal to larger goals, etc.)	Actor seen as defensive, inconsistent, incongruent, controlling, fearful of being vulnerable, withholding of feelings, overly concerned about self and others, or unconcerned about others.	Self-sealing. Decreased long-term effectiveness.
Maximize winning and minimize losing	Own and control the task (claim ownership of the task, be guardian of the definition and execution of the task).	Defensive interpersonal and group relationship (depending on actor, little help to others).	Single-loop learning.
Minimize generating or expressing negative feelings	Unilaterally protect yourself (speak in inferred categories accompanied by little or no directly observable data, be blind to impact on others and to incongruity; use defensive actions such as blaming, stereotyping, suppressing feelings, intellectualizing).	Defensive norms (mistrust, lack of risk taking, conformity, external commitment, emphasis on diplomacy, power-centered competition and rivalry.)	Little testing of theories publicly. Much testing of theories privately.
Be rational	Unilaterally protect others from being hurt (withhold information, create rules to censor information and behavior, hold private meetings).		

Source: Argyris & Schön (1996), p. 93.

Table 3. Model II Theory-in-Use

Characteristics of Productive Learning Environments			
Governing Variables	Action Strategies	Consequences for Behavioral World	Consequences for Learning, Effectiveness
Valid information	Design situations where participants can be origins of action and experience high personal causation.	Actor experienced as minimally defensive.	Increased long-term effectiveness
Free and informed choice	Task is jointly controlled.	Minimally defensive interpersonal relations and group dynamics.	Disconfirmable processes.
Internal commitment to the choice and constant monitoring of its implementation	Protection of self is a joint enterprise and oriented toward growth.	Learning-oriented norms.	Double-loop learning. Frequent public testing of theories.
Be rational	Bilateral protection of others.	High freedom of choice, internal commitment, and risk taking.	

Source: Argyris & Schön (1996), p. 118.

2.3.6 The Research Approach Using Theory of Action

Similar to the Change Laboratory design for research, the research approach used by Argyris and Schön (1996) is an interventionist approach with a developmental intent. They describe their approach as operating on an "interdependent, double-track strategy through which we attempt to engage with practitioners in collaborative action research" (Argyris & Schön, 1996, p. 75). One track of this intervention is designed to describe the current context of the organization or selected segment of the organization. This activity establishes the 'current reality' of the organization. A second track of the intervention is focused on assisting practitioners better reflect on their practice so that they can detect and correct errors, thus increasing the likelihood of achieving and maintaining single-loop and double-loop learning. Argyris and Schön (1996) point out a 'generic dilemma' of this double-track research approach:

> As researchers, we are therefore likely to be faced with a dilemma: Individuals may unknowingly provide us with distorted information, and these same individuals may hesitate to engage in the dialogue that is required to explore the possibility of such distortions. If we persist in exploring these issues, practitioners may become defensive—their defensiveness leading, in turn, to new distortions, both recognized and unrecognized.
>
> The research dilemma is systematic. It is unlikely to be overcome by the use of better sampling procedures. Nor can it be overcome by the use of the accepted methods of normal social science because embedded in the execution of these methods, with the reliance on research strategies of secrecy and unilateral control, is the same theory-in-use as the one that causes the dilemma in the first place. (Argyris & Schön, 1996, p. 76)

The way around this rather intractable dilemma is to begin the construction of 'current reality' using a collection of 'relatively observable data.' That is, the current context of the organization is constructed not from individuals' accounts of current realities (since they would likely provide 'espoused theories' of action), but rather, from observations of actual behavior as well as recorded conversations of 'everyday events.' These observations and conversations are then connected with objectives to which the individuals' are highly committed, an 'object' of value. The problems raised ('conflicts' or 'disturbances') must be those that the individuals consider important and central to their work. This provides the motivation for the second track of the research, learning to be more effective inquirers, to monitor, identify, and correct errors or problems within the system.

This method of constructing the 'current realities' of the organization helps identify current problems within the system. It does not prevent entirely the defensive reactions by some individuals. Argyris and Schön (1996) suggest such defensive behavior simply becomes part of the overall data to consider in the intervention:

> The practitioners realize that research of this kind may generate a variety of costs for them, triggering defenses at all levels of their organizations.
>
> Such defenses should not be avoided or suppressed. When they occur, they become additional data that can be used to test diagnoses of individual, interpersonal, and organizational phenomena. In order to deal with defenses effectively, however, the researcher must possess the necessary skills, the same skills the practitioners will have to learn if they are to deal with defenses in their organization. The theory of action the researcher uses to obtain valid information becomes a model available for use by practitioners. (Argyris & Schön, 1996, p. 77)

Thus, the goal of this approach is not only to identify problems within the system and correct them, but also to improve the organization's 'learning system.'

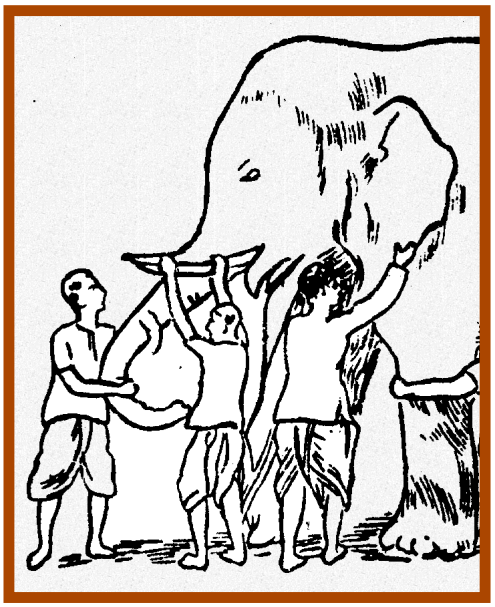
2.4 Implications of the Theories to This Study

Sections 2.2 and 2.3 have outlined the central concepts of activity theory and theory in use, respectively. These frameworks have certain implications for both the design and analysis of this case study. The remainder of this section describes some of these implications. First, however, the matter of perspectives taken by these theories is discussed.

2.4.1 Perspectives of the System: Levels of Aggregation

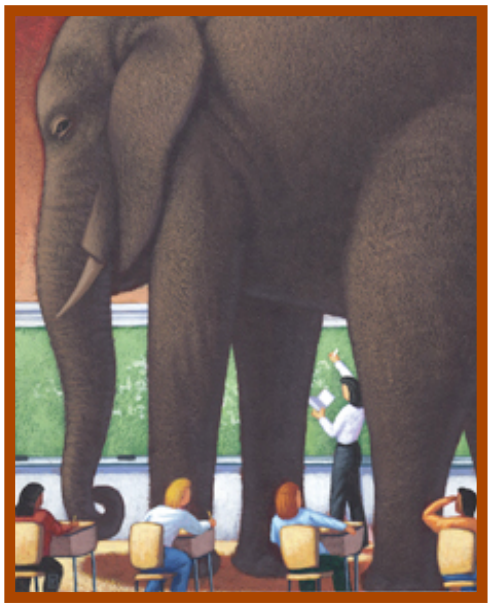
What one sees in an activity, in an organization, or anywhere for that matter, depends on many factors including the perspective that is taken, the level of detail that is desired, the 'level of aggregation' that is of interest: for example, individuals, groups, or the organization.

In thinking about what the 'preferred' level of aggregation is for each of the two theoretical frameworks, two images came to mind, images I call 'the 'metaphors of the elephants,' shown in Figure 9 and 10. (It did not escape my attention that I was using symbols to extend the potential range of my thinking about these matters, a Vygotskian concept by itself.)



Source: www.jainworld.com/literature

Figure 9. The Blind Men and the Elephant



Source: www.tc.columbia.edu

Figure 10. The Elephant in the Room

My initial thought was that activity theory tended toward a more aggregated perspective of the organization, a 'system-level' viewpoint (Figure 9), whereas theory of action took a more group, inter-personal, perspective of the organization (Figure 10).

Activity theory holds as a primary tenet that the activity system is the smallest unit of analysis that can be analyzed that still maintains the characteristics of the system; that the system can only be understood by understanding its components in relationship to each other, as mutually-affecting and defining each other dynamically (a mutually-constitutive system). Thus, the metaphor of the "Blind Men and the Elephant" seemed an appropriate one for the perspective taken by activity theory.

After further consideration, however, it appears that each theory takes multiple perspectives of the organization in attempting to understand coordinated activity and organizational learning.

Whereas the expansive learning focus of Engeström (2005), encompassing the entire organization, is certainly consistent with activity theory ideas, Vygotsky's perspective is often at a much lower level of aggregation—the individual—in considering the mediation of signs and tools by an individual in the system. And while Argyris and Schön (1996) often focus at the interpersonal level, in evaluating discourse relative to espoused theories versus theories-in-use, their 'object' in intervention research is productive organizational learning, system-level learning. From the foregoing, it is clear that this study should incorporate multiple levels of aggregation.

That said, however, insofar as activity theory takes the unit of analysis of activity system, it tends to view organizational learning from the system downward. Theory of action, on the other hand, takes inter-personal action as the unit of analysis and thus tends to view organizational learning from the inter-personal perspective upward. Such differences may prove beneficial in examining coordinated activity and organizational learning in complex workplaces.

2.4.2 Implications of the Activity Theory Framework

The activity theory framework suggests that the unit of analysis should be an activity system, rather than an individual. Further a setting with multiple interacting activity systems would provide a view of a network of interacting systems. The

selection of an activity system that has been in existence for some while would be preferable to a newly-formed activity system as the historical analysis of system contradictions as well as artifacts and objects would not be possible with a newly-formed system. Selection of participants from different groups of the activity system would allow a contrast and comparison among groups and the rules and roles associated with the division of labor within the activity system.

Data collection that captures speech in an everyday setting would help provide raw data that could be analyzed with respect to word meaning, types of speech (communicative versus ego-centric) associated with various types of practical activity, as well as instances of conflicts, disturbances or innovations within the system. Moments at which individual's feelings are discussed could also shed light on important aspects of the activity system. Data collection should also include observations of the use of various tools as this will further reflect characteristics of sub-groups within the activity system. Overall, the focus of the analysis should be on developmental aspects of the activity system.

2.4.3 Implications of the Theory of Action Framework

The unit of analysis suggested by the theory of action framework is a group within an organization. Some of these groups are part of a special group assembled for the intervention while others represent existing functional units of the organization. Data collection should include observations of actual behavior and, if possible, recorded conversations of 'everyday events.' These data may then be analyzed to help characterize the 'current realities' of the system.

Interviews represent a data collection strategy that can provide insight into the ‘espoused theories’ of the individual. Then similar ‘espoused theories’ across several individuals within a group may be an indication of an ‘espoused theory’ for that group. Comparisons of data from direct observations with that of data from interviews can help provide a basis for identifying behavioral patterns that are either supportive or limiting to organizational learning.

CHAPTER 3 – RESEARCH DESIGN AND METHODOLOGY

3.1 Study Approach

This research study investigates coordinated activity and organizational learning within the setting of a complex workplace. The unit of analysis for the study is an activity system—in this case, an organization. In order to study the multiple layers of interdependent interactions within the activity system, I have chosen to conduct the study at a single site. Thus, case study methodology was selected as an appropriate approach for this study. In addition, since both theoretical frameworks for this study, activity theory and theory of action, suggest that research consistent with these frameworks is best done within a naturalistic setting, an ethnographic approach to data collection and analysis has incorporated as part of the design of this study. Further details of the research design for this ethnographic case study are described in the remainder of this chapter.

3.2 Research Setting

In order to investigate the complex interactions within an activity system, it was important to select a research setting of sufficient size and comprised of multiple functional groups to provide a window on complex interactions among and between group members. Further, since familiarity with the general organizational practice could provide a window into the general 'historicity' associated with the activity system, I decided to select a research study site in alignment with my experience as a consultant to the water and wastewater industry.

The research setting selected is a public water reclamation agency (referred to in this study as the 'Agency') of over 300 employees, located in California. The Agency is a regional system serving eight surrounding communities and comprised of eight separate regional facilities operated by Agency staff, including five regional wastewater treatment facilities, two regional groundwater desalting facilities, and one regional composting facility.

The Agency is governed by an elected five-member Board of Directors representing the eight member cities. The Chief Executive Officer is assisted by four Executive Managers who head the Agency's four divisions: Finance and Administration, Operations, Engineering, and Policy. A total of 15 departments are spread across those four divisions.

Multiple capital improvement projects ongoing at various Agency facilities also provide a level complexity at the research site. The ten major projects ongoing for FY 2006/07 include over a hundred associated contracts, requiring project coordination with consulting engineers as well as with construction managers and contractors.

A further source of complexity in the research setting pertains to new technologies projects. The Agency is committed investigating and, when appropriate, incorporating innovative technologies at Agency facilities whenever this makes technical and economic sense. There are often more than one pilot studies or demonstrations underway at Agency facilities.

3.3 Positionality

I have worked in the water and wastewater industry for over thirty years, including positions with community colleges, regulatory agencies, consulting engineering companies and, now, as a consultant. For the past four years, I have been a technical documentation consultant to the Agency, and continue in this capacity currently. I am therefore acquainted with many people at the Agency. This includes people at all levels, including management, engineering, operations and maintenance as well as support staff. In addition, I have given various types of presentations to these various levels of staff.

This familiarity with the study setting provided me a significant advantage in knowing both the technical and social structure and processes of the Agency as well as the individuals within that Agency. Such familiarity, however, could potentially also be a disadvantage in that I might be so embedded in the system as not to notice certain aspects of the system. An awareness of this potential, however, helps mitigate against its affect. To the degree possible, I have attempted in this study to 'let the system speak for itself.'

3.4 Participants

In order to study the interactions both within and among groups within a complex workplace as well as to investigate instances of organizational learning, the first criteria for participant selection for this study was that they be drawn from more than one functional group within the Agency. I decided to use three groups from

which to draw participants, since this number of groups would be sufficient to reflect diversity yet not be so large as to cause the study to extend beyond the time constraints of the study.

The next question for consideration was then which three groups of the Agency should be selected for possible participant selection. I decided that the choice of groups should be those groups most directly involved in achieving the overall Agency goals (the "object" of the Agency, in activity theory terminology). The mission statement as published on the Agency website is as follows:

> The mission of the Agency is to supply imported and recycled water, collect, treat, and dispose of wastewater and provide other utility-related (renewable electrical energy, compost) services to the communities it serves. The Agency strives to provide these services in a regionally planned, managed, and cost-effective manner. (Agency, 2006)

The three groups selected that most directly participate in the day-to-day achievement of this Agency 'mission,' and the groups that, combined, represent a significant percentage of the Agency staff, are: operations, engineering, and management. I decided to select three participants from each of these three groups, again, in order to reflect diversity yet keep the study size manageable.

There were therefore nine primary participants in this study—three engineers, three managers, and three operators. All participants of the study were employees of the Agency with a minimum of three years at their current level (managers, engineers, or operators). The participants were selected on the basis of their experience in the field, their longevity in their roles as operators, engineers or managers, and their availability to participate in the study.

In addition to the nine primary participants, three 'key managers' were invited to participate in this study on a single-interview basis. These key managers were included in the study to help provide additional perspectives regarding Agency goals and intent. Since these individuals participate significantly in setting Agency goals and policy, the addition of these participants provided an additional vantage point from which to understand study data.

3.5 Data Collection

The data collection phase of this study consisted of two principal activities: interviews and documents review, with interviews being the predominant instrument for data collection.

3.5.1 Interviews

Interviews conducted as part of this research study included both individual and group interviews. Each of the nine primary study participants was interviewed a total of four times—three times in individual interviews (one background and experience interview and two shadowing interviews) and once within their respective participant research study group (operators, engineers, or managers).

On four occasions, shadowing sessions for a study participant included attendance at a group meeting of some type. I have referred to these shadowing session meetings as 'mixed group meetings,' as they were 'mixed' in two ways: there were participants from various Agency groups (operators, engineers, and managers) in the same meeting, and they included study participants and non-participants. Three of

these ‘mixed group meetings’ were regularly-scheduled meetings and one was a one-time meeting pertaining to a specific project. Attendees of these meetings were notified of the shadowing session in progress and all signed permission letters to allow audiotaping of that single meeting and inclusion as part of the study data.

In addition to the interviews of the nine primary study participants, three key managers were interviewed in a single one- to two-hour session. Each of these interview types is described below.

Background and Experience Interviews (Individuals). One-hour background and experience interviews, that I called ‘grand tour’ interviews (Maso, 1996), were intended to obtain general information about the participants, including their age category (a checklist was provided with 5-year increments), their educational and employment experiences, and their current work activities and responsibilities. The form used to guide this interview is provided in Appendix 1. Each of these interviews was transcribed for analysis.

Shadowing Interviews (Individuals). In addition to the background and experience interview, I scheduled two two-hour ‘shadowing sessions’ in which I followed the participant in routine tasks during his or her typical day-to-day practice. Following these shadowing sessions, I had scheduled a one-hour audiotaped interview to discuss various questions or observations that I noted on the Shadowing Observation/Interview Form (refer to Appendix 2). This data collection element was included in the study to provide a means of contrasting and comparing the routine activities of each of the three study groups (operators, engineers, and managers). In

addition, these interviews would provide triangulation of data obtained from other interviews and by review of documents and records.

The data collection design of two hours shadowing, one hour interview was revised after the second shadowing interview. While it had been my intent not to comment or ask questions during the shadowing session, but to reserve my questions for the interview time, two factors changed my viewpoint of this design. First, often the participant was seated at his or her desk and I could not determine what the participant was doing. In response to this problem, prior to beginning the shadowing sessions, I asked the participants to explain briefly what they were about to do (so that I could have an idea of their activities from their perspective) and to let me know again when they were changing to a different activity.

The first change in procedure triggered the need for the second procedural change. Once participants began telling me what they were doing, they typically also began to explain various aspects about that activity. It became clear that the participants preferred talking about a topic at that moment rather than waiting an hour or so during the 'interview' session. Thus, after the second shadowing interview, the shadowing sessions and interview sessions were 'merged' into a single two-hour audiotaped shadow/interview format. This seemed a more natural process both to the participants and to me. Each of these shadowing interviews was transcribed for analysis.

Scenario Interviews (Intra-Group). As an additional means of understanding similarities and differences among the study groups, I developed a hypothetical scenario (see Appendix 3) to be used as the prompt for a group interview session. After all individual interviews were completed, I met with each study group separately for an hour-and-a-half audiotaped interview. I was interested how each group would respond to the same scenario—what would be the focus and scope of their questions as compared with the other groups' responses. All three study group interviews were scheduled for the same day to help establish a sense of completion of the data collection phase of the research project for the study participants.

Mixed Group Meetings (Inter-Group Observation). On four occasions, as part of shadowing sessions, I attended meetings with the participant being shadowed. The first of these meetings was a 'kickoff meeting' for a technical study to be conducted by a consulting engineering firm (this was the only meeting of the four 'mixed group meetings' that included attendees who were not Agency staff members); the second meeting was an in-house regularly-scheduled bi-weekly technical managers' meeting; the third was a regularly-scheduled bi-weekly operations process optimization meeting, and the fourth was non-routine staff meeting to determine key performance indicators for a new process.

At each of these meetings, I was introduced to the group by the participant, who then told the attendees that a shadowing session was in progress. In most meetings, I knew many, if not all, of the attendees. I requested permission of the attendees to audiotape the meeting and each attendee signed a permission form

agreeing to audiotaping of that single meeting prior to beginning the meeting. The general interest level and supportive stance in allowing audiotaping of the meetings was indicative of the general atmosphere of 'open inquiry' at the Agency.

The audiotapes of these meetings were not transcribed since it was sometimes difficult to hear comments of those not seated close enough to the microphone. Further, even given better audio volume levels, it would still have been difficult to transcribe the multiple, often overlapping, voices of the meeting. The recordings did, however, allow a review of the general meeting discussions. As part of the shadowing sessions, these meetings were intended primarily to provide a window on the typical routines of the participants being shadowed. In fact, they provided an interesting window on 'moments' of organizational learning.

3.5.2 Agency Documents

The two principal documents used for analysis in this study included the Agency website and the two-volume, 400-page, Operating and Program Budget updated annually as part of the budget preparation, review, and approval process.

Agency documents provided another window against which the varying understandings and perspectives of the three groups that comprise this study could be compared and contrasted. Documents were easily accessible from the Agency website. The documents used for analysis in this study included the Agency Vision and Mission Statements and the two-volume, 400-page, Operating and Program Budget (FY 2006/07) updated annually as part of the budget preparation, review, and approval process. These documents were used during the data analysis phase of this project.

3.6 Data Analysis

3.6.1 Selection of an Appropriate Data Analysis Strategy

When considering the data analysis strategies to be used for this study, it was my intent to use data analysis methods that were consistent with the two theoretical frameworks that informed this study: activity theory and theory of action. For the activity theory framework, the unit of analysis was the activity system, taken as a unit. In terms of analysis, this meant that data reflecting one part of the activity system should be considered in light of other parts of the activity system.

While the unit of analysis of an activity system is also consistent with the theory of action framework, the focus of analysis consistent with this framework would be more trained on the interpersonal interactions within the system, particularly the espoused theories of action versus theories-in-use comparisons.

Language plays a prominent role in understanding activity and learning for both activity theory and theory of action theoretical frameworks. For example, Vygotsky (1978) notes the importance of speech in attaining goals:

> Our experiments demonstrate two important facts:
>
> (1) A child's speech is as important as the role of action in attaining the goal. Children not only speak about what they are doing; their speech and action are part of *one and the same complex psychological function*, directed toward the solution of the problem at hand.
>
> (2) The more complex the action demanded by the situation and the less direct its solution, the greater the importance played by speech in the operation as a whole. Sometimes speech becomes of such vital importance that, if not permitted to use it, young children cannot accomplish the given task. (Vygotsky, 1978, p. 25)

Engeström (2005) also notes the importance of 'discursive practices' as one area of analysis in investigating 'innovative organizational learning:'

> In my research projects on work teams in American and Finnish organizations, we have identified and analyzed a number of innovative learning processes…We typically videotape series of meetings and interactions at work and analyze transcripts of these interactions as our prime data. This approach enables us to conduct very detailed data-driven analyses of the discursive processes, practical actions and mediating artifacts that are employed in the step-by-step production of an innovative solution or idea. (Engeström, 2005, p. 307)

The role of language is also seen as an important tool of analysis within the theory of action framework as well. Argyris and Schön (1996) typically use tape recordings of conversations as 'the dominant mode' of capturing observations of actual behavior that are then used to establish the 'theories-in-use' of the participants.

> Observations of actual behavior, especially the tape recording of conversations, is the dominant mode. We may also use questionnaires, projective tests, or structured interviews; but if we use such instruments, we recognize that they are likely to give us insights into espoused theories and not theories-in-use. (Argyris & Schön, 1996, p. 76)

Given the importance of recorded and transcribed dialogue as a data analysis tool for both activity theory and theory of action frameworks, I selected transcribed interviews as the centerpiece of my data analysis strategy as well. Most of the data analysis for this study involved various types of analysis of interview transcripts. All interviews except the shadowing session mixed group meetings (as described in Section 3.5.1) were transcribed in their entirety. I used two policy documents of the Agency to determine the overarching goals of the Agency.

3.6.2 Data Analysis Strategy – First Pass

During the first stages of analysis, I used StudioCode to search for themes and patterns that addressed my research questions. I used a coding structure that reflected categories of activity theory, as shown in Figure 11. This was a powerful tool and has great potential for workplace research. However, given my focus on activity theory categories, this data analysis tool did not lend itself to the type of analysis I required. For one thing, using this tool would have required multiple 'passes' of coding since many of the audiotaped segments could be coded in several ways. For example, a comment about cost efficiency might be coded under "Rules" (Efficiency), or under "Misc," (Operator Perspective), or even under "Object" (Work Group).

As I converted the StudioCode coding instances into a matrix output (Figure 12), I noticed that there were more instances of "Tools" than other categories. Recalling the transcripts, the discussions didn't seem that heavily weighted toward "Tools" talk. Apparently, it was easier to code for "Tools" than to code for other less defined talk categories.

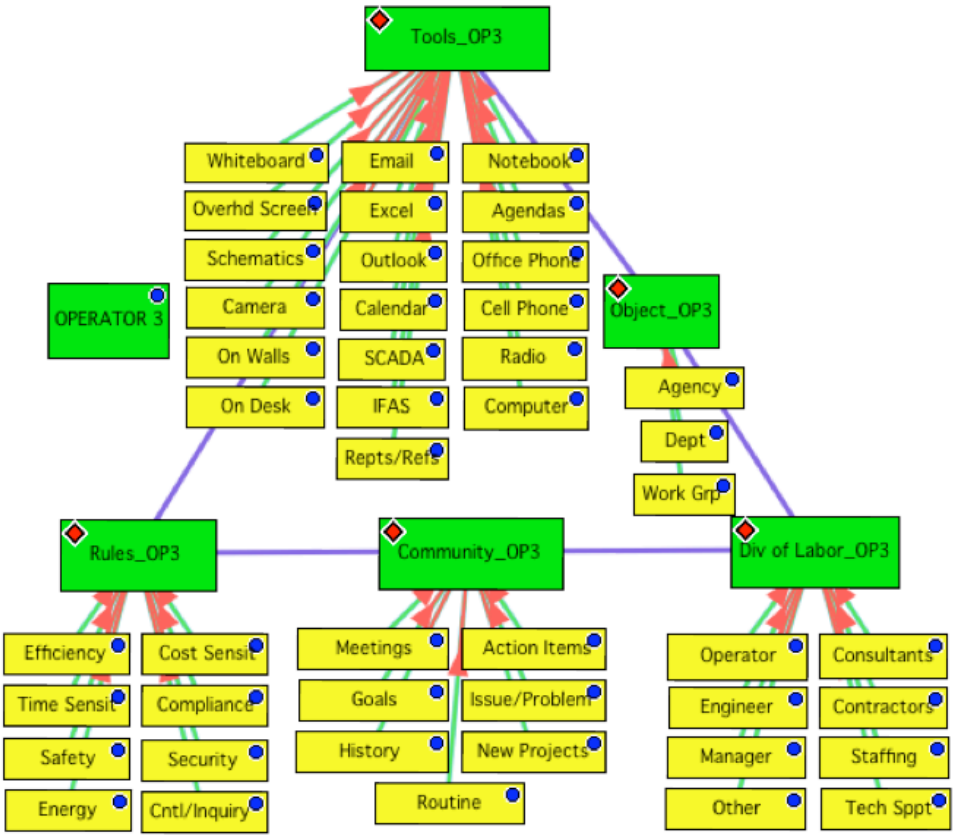


Figure 11. StudioCode Coding Buttons

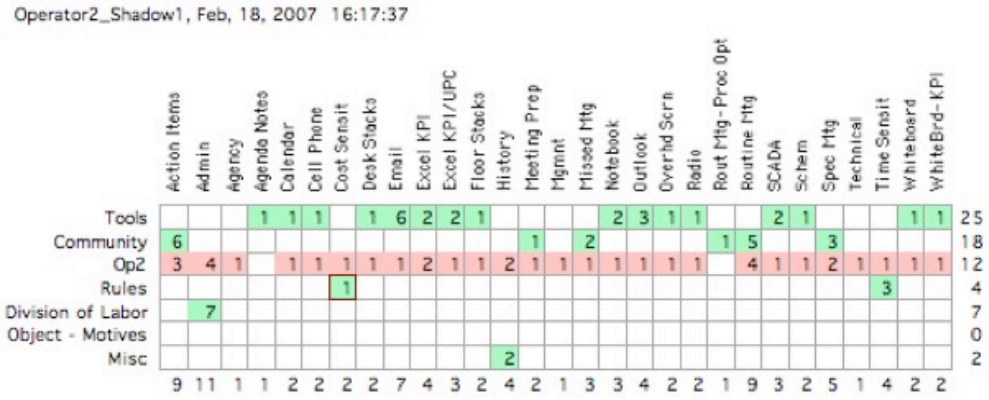


Figure 12. StudioCode Coding Matrix

As I reflected on the information I had obtained from this 'first pass' over the data, I realized that although I was coding the transcripts of individuals in each of the three study groups, the coding categories were too broadly defined as to allow much of a comparison. In addition, the relative subjectivity in assigning categories was of concern to me.

3.6.3 Data Analysis Strategy – Second Pass

I decided that while the 'first pass' data analysis coding strategy was consistent with information categories common to activity theory, the coding was not sufficiently focused on my research questions to allow analyses that would address the research questions. Therefore, for the second pass of the interview transcripts data, I decided to use a simple 'word search' methodology. This allowed me to view instances of a word across a single transcript, a selected group of transcripts, or across the entire collection of transcripts. This seemed to provide a broader window through which to view and compare data than the StudioCode coding analysis provided.

The juxtaposition of word search results, coupled with the speed in which I was able to access and compare surrounding contexts of the comments, enabled me to see nuances in data that would not have been possible were I reviewing the data in discrete, separated files.

CHAPTER 4 – FINDINGS AND DISCUSSION

4.1 Introduction

The broader questions that underlie those posed in this research study are: how are organizations able to move in a coordinated, 'productive' way toward their goals; and what are the factors that promote or interfere with this process. Stated another way, how does an organization change and adapt in a complex, dynamic environment in a way that is consistent with the overarching goals of that organization?

This study investigated three research questions: how do the understandings of overarching organizational goals vary among different groups within an organization, what effect do these understandings have on coordinated action, and what affect do these understandings have on organizational learning. In the following sections, each research question and a bulleted list of findings is followed by a more detailed presentation of the findings and discussion of those findings.

4.2 Understandings of Overarching Goals

4.2.1 Research Question 1 and Summary of Findings

Question 1: How do the understandings of overarching organizational goals vary among different groups within an organization?

Summary of Findings:

- The awareness of the overarching organizational goals in fact varied little among the three groups studied.

  Understandings of individuals are inherently tied to their practical activity (Vygotsky, 1978). Thus, an analysis of 'key words,' or 'goals talk' is not an adequate means of investigating the understandings of the participants, since such an approach uses words decontextualized from practice. An analysis of conversation embedded in routine workplace practice, by someone with a general familiarity with that practice, is a more reliable source of data for making observations about practice.

- While there was less specific mention of organizational goals by operators than by engineers or managers, this fact did not equate to lesser understanding or awareness of these goals, a point described in answer to Research Question 2.

- The organizational goals of the Agency are deeply embedded within the processes, practices, and artifacts used routinely by members of the Agency.

4.2.2 Discussion of the Findings

To answer the first research question, it became apparent that two related questions must be addressed: what are the overarching goals of the organization, and how does each group understand those overall goals.

From those two questions, the question of varying understandings could be then be evaluated.

What are the Overarching Goals of the Agency? In prior years this question might have been a more daunting question. But recently, perhaps in an attempt to help coordinate efforts across the system, many organizations, particularly large ones, have spent considerable time and effort in articulating their overarching goals in Vision and Mission Statements.

The Mission Statement for the Agency that is the setting for the research is comprised of four parts—Mission, Vision, Values, and Responsibilities—as shown in Table 4 below. This information was obtained from the Agency website but is also included in the most recent Operating and Capital Improvement Budget Report for Fiscal year 2006/2007.

Table 4. Agency Mission Statement

Agency Mission
SERVICES: The mission of the Agency is to:
• supply imported and recycled water;
• collect, treat, and dispose of wastewater; and
• provide other utility-related (renewable electrical energy, compost) services to the communities it serves.
VALUES IN PROVIDING SERVICES: The Agency strives to provide these services in a
• regionally planned,
• managed, and
• cost-effective manner.
Agency Vision
The Agency will strive to enhance the quality of life in the surrounding area by providing the
• optimum water resources management for the area's customers while
• promoting conservation and environmental protection.
Agency Values
The success of the Agency depends on:
• teamwork,
• mutual trust and respect, and commitment to the highest standards of quality, responsibility, accountability, and dedication.

Continued

Table 4. Agency Mission Statement (Cont'd)

Agency Responsibilities
The Board of Directors and employees of the Agency are responsible for fulfilling the mission and vision by demonstrating and expecting:
• Loyalty, professionalism and ethical behavior
• Open and courteous communication with each other and with the communities served,
• Prudent and cost-effective resource planning, management, and utilization,
• Innovation in meeting the present and future needs of the Agency.

Source: Agency Website, "Mission Statement," downloaded 5/29/07.

A 'short version' of the Agency mission statement is placed prominently as the Agency website banner graphic: "Clean, inexpensive, plentiful water."

How does each group understand these overall goals? With the overall organizational goals identified, the next step was to investigate the understandings of these goals by each group. In data reduction, I created two means of generating this information: (1) 'Typical Day in the Life" summaries from individual shadowing sessions, and (2) 'Goals Talk" excerpted from the group meeting transcripts.

As a starting point for determining how the understandings of the overarching organizational goals might be characterized from person to person and group to group, I constructed a 'snapshot' of a typical day for each of the nine participants. While there is no such thing as a 'typical day,' particularly when viewed from the perspective of only two three-hour shadowing sessions, I believed that a summary of these 'typical

days' across the three individuals of the group would provide at least a rough approximation of typical activities for that group.

I used Activity Theory as a guideline for establishing topics that I would highlight in these summaries. Each of the shadowing interview transcriptions (two interview transcripts for each participant) was reviewed and a "Typical Day in the Life" summary was prepared. An example of these summaries is provided in Appendix 4.

Constructing these summaries from the transcripts led me to develop a second means of determining the understandings of goals by each group. In preparing the 'Day in the Life' tables, it became apparent that while the specifics of the activity were a common point of discussion, there was less explicit talk about the goals.

I decided to go back to the transcripts and look for specific instances of references to any of the Agency goals (i.e., where there was 'goals talk'), and then compare those instances across the groups. Tables 5-9 summarize the findings of this 'goals talk' analysis. In the remainder of this sub-section, I will describe the 'goals talk' of each group.

Operators' Talk About Goals. Two instances of operators' talk about Agency goals, summarized in Table 5, include one instance of talk about cost effectiveness and one instance referring to innovative technologies. The third instance of talk about goals pertains to a goal not mentioned by the other two groups: 'the valuable customers.' The reason for this distinction may be because operators occasionally receive calls from residential or commercial customers regarding various issues in the system that require troubleshooting and/or correction and therefore are more conscious of this Agency goal.

Table 5. Operators' Talk About Goals

Operators' Comments	Goal
"I think if you step back a little bit, I think the reason they separated out those two projects…There was one called the energy reduction project for Plant 4 and then there was plant expansion. I think the reason they did the energy reduction project first was because that project was grant-driven. So in order for them to get that money, they had to put that in first."	Cost effective
"So as we're getting more and more users online, the stress is more to minimize the impacts to them, the valuable customers."	Value of the customers
"Now, if it's a brand new facility, I would hope that they'd venture out to many areas if they're looking for a certain type because there are many kinds of treatment plants."	Innovative technologies

Engineers' Talk About Goals. Engineers' talk about goals include four specific references to the goal of being cost-effective, and three references to regional planning goal. In addition, there were two references to the goal of being environmentally friendly, two references to the goal of utilizing innovative technologies, and one reference to being environmentally-friendly. The engineers' comments and the goals to which they refer are summarized in Table 6.

Table 6. Engineers' Talk About Goals

Engineers' Comments	Goal
"Obviously the second step is to know in the next ten years is there going to be consistent development, consistent in growth, consistent whatever that's projected by the surrounding agencies."	Regional planning
"And they have, always have a well experienced team and they can do it much faster at a much lower cost. So it's not going to be cost effective for us if you're going to hire all of that, then you're starting from scratch."	Cost effective
"They have the resources. They have the experience as a company and they can do much many things much faster and cheaper than us."	Cost effective
"I would add, the advice for this team, is to look carefully for the location selection because sometimes the location really impacts the process and interconnecting with the other plants." (Lines 44-46)	Regional planning
"And sometimes, if it's within a residential area, that's going to bring a lot of problems that we've have faced this before, if it closer to a residential area. So, location is very important. It has to be technically feasible but also... it has to also be environmentally friendly."	Environment-ally friendly
"Another advice would be to look for new technologies and not to settle for the standard conventional process, which may not be energy efficient. So we have to, during the conceptual phase, explore new technologies and talk to the leading expert in the country and come up with something new. Maybe it's going to, I'm sure it's going to save a lot of money."	Innovative technologies; Cost effective; Energy efficient

Continued

Table 6. Engineers' Talk About Goals (Cont'd)

Engineers' Comments	Goal
"...so taking into consideration what has worked for the agency for that particular service area and treatment compared to what hasn't worked. So you're not going to do the same things that you've done in the past."	Innovative technologies
"You have requirements on what the city would need and where you can actually have a wastewater treatment plant. That's a long CEQA process to get that done, so just looking at all the permitting environmental issues and long term goals is important."	Regional planning: Environment-ally friendly
"There's going to be a lot more of a loophole in there for them to not get a good construction price. The cost is going to be a lot more expensive."	Cost effective

Managers' Talk About Goals. Managers' talk about goals include two references to the cost-effective goal, four references to regional planning, and one reference to innovative technologies. Quotes that pertain to the managers' comments are provided in Table 7.

Table 7. Managers' Talk About Goals

Managers' Comments	Goal
"One of the things that would do is I would immediately set up some sort of system to verify the projection data. You're starting a time line so you're going to have to have something, a reality check, to know whether or not that's real. In other words, the projection is ten years....you know you've got to figure out pretty quickly whether you need to buy property, obtain sites, figure out what you're going to do"..	Regional planning
"So that would be taking a look at whether or not you would be doing a location of satellite plants and things of that nature to optimize and cut cost for the treated products that you're getting from the treatment plant"…	Cost effective

Continued

Table 7. Managers' Talk About Goals (Cont'd)

Managers' Comments	Goal
"What I would do is set up something along those lines because if you're going ten years out, if something comes up and you find out at 8 years, it was really 8 years, you've got a problem. Or, as it's going on if you find out a couple years later that you have an additional 10 or 11 years than that, so I would set up something immediately that's going to do some sort of check if it was on projected data I would do some sort of reality check on that."	Regional planning
"First they need to know which treatment plant the flows are going to be going into? Where the growth is actually occurring in that region."	Regional planning
"And the other one is to look at new technologies to figure out if there is something you could easily retrofit to add additional capacities if you need to. Also just look at do you have enough land at your site to expand when you think you'd like to or need to"...	Innovative technologies
"And one of the things we also do as an agency is we always check with the member agencies on a monthly basis in terms of how many connections they have. And so that's another way because the connections basically are indicating that there is the actually the development that they think is happening is actually happening."	Regional planning
"You know, engineering has $180 million worth of engineering projects and they need to close them up and go on to the next one."	Cost effective

Similar Understandings of Organizational Goals. The evidence of 'goals talk' described above and summarized in Tables 5-7, indicated comments regarding goals consistent with the Agency's Mission Statement (see Table 4) across all participant groups. A summary of the comments made about goals, both by topic and by participant group, is provided in Table 8.

Table 8. Summary of 'Goals Talk' Occurrence, by Group

	Cost Effective	Regional Planning	Environ-mentally Friendly	Innovative Technol-ogies	Energy Efficient	Value of Customer	Totals
Operators	1	0	0	1	0	1	3
Engineers	4	3	2	2	1	0	12
Managers	2	4	0	1	0	0	7
Totals	7	7	2	4	1	1	

Note that the fewest number of comments about goals in the transcribed interviews were by operators, and the most number of comments were by engineers. One should not conclude from this data, however, that either mentioning a goal or not mentioning it, constitutes evidence that the goals are either understood uniformly (or at all), or that they play prominently in the minds or actions of those making such comments. As suggested by Argyris and Schön (1996), comments made during an interview circumstance may simply represent statements of espoused theory, 'the party line,' rather than be a reflection of either an understanding or a use of those goals. Describing their method of data collection for intervention research on organizational learning, Argyris and Schön (1996) note:

> Observations of actual behavior, especially the tape recording of conversations, is the dominant mode. We may also use questionnaires, projective tests, or structured interviews; but if we use such instruments, we recognize that they are likely to give us insights into espoused theories and not theories-in-use. (Argyris & Schön, 1996, p. 76)

An additional consideration about the data summarized in Tables 5-8 is that while participants may use the same words, there may be entirely different meanings

associated with those words. Yet while the assertion of participants' understanding of goals is not supported by using the group interview (hypothetical scenario) interview transcripts, it could be said that the mention of goals would at least indicate an awareness of goals in alignment with the overarching Agency goals.

After using the group scenario interview transcripts to investigate participant understanding of goals, I realized that use of the shadowing interview transcripts would provide a more contextualized view of participants' understanding of overarching Agency goals. The analysis of this data source appeared to address Research Question 2 and is thus included in the discussion in Section 4.3.

Reflections About the Similar Mention of Goals. Given the significant complexity of the Agency and the dynamic conditions that prevail, I was surprised by the similarity in comments about goals, particularly those related to cost effectiveness and planning. The Agency serves eight communities, has 300 staff members, five regional treatment plants, and two regional consortium projects. The area that this Agency serves was listed in the "Top Ten Fastest Growing Areas in the United States." There are upgrading or new construction activities at every one of the five treatment plants. Three years ago the Agency moved its Headquarters Office. The entire communications infrastructure including hardware components and software support is currently being changed. This includes implementation of new project planning software, a new database-driven electronic library, development of database-driven software to integrate all Agency data streams into one common system, as well as upgrades and improvements to the communications hardware. As stated in the most

recent Operating and Capital Program Budget for FY06/07, "Total expenses increased by 55.5%...due to an expanded capital program, which is the largest capital program in the Agency's history." These and many other complicating factors make the awareness of overarching goals across all levels a considerable achievement, and a remarkable finding.

This made me consider why there might be such a common awareness of goals among the three participant groups. One possible explanation might be that the overarching organizational goals are embedded in the routine practices of the Agency at every level.

As outlined in the Agency Mission Statement (Table 4, above), the goals of the Agency are to provide regionally planned and managed services to member communities in a cost-effective manner. The processes and practices of the Agency demonstrate not only an awareness of these goals but ensure an adherence to and alignment with this standard. Each of the nine participants interviewed as part of this study talked about their practice in ways that implied a sensitivity to cost issues, to the importance of planning, and an awareness of the service the Agency provides to the member communities.

How did these sensitivities come about? Examples of Agency processes provide a clue to this. First, recent brainstorming sessions held by the department managers were designed to consider practical, specific ways in which costs could be reduced or revenues generated. These brainstorming sessions are now being followed up with further analysis and evaluation for potential incorporation in the future.

Secondly, annual performance evaluations of staff are tied to goal-oriented expectations and achievements. Process performance management practices such as the use of Key Performance Indicator (KPI) Boards displayed prominently at each treatment plant, and the associated KPI spreadsheets that detail and summarize this information for further analysis, as well as the Unit Production Cost (UPC) spreadsheets, consistently link day-to-day practice with the strategic goals of the Agency.

Thirdly, staff meetings at all levels—from the Executive, to mid-management, to field staff—consistently focus on the Agency strategic goals and are assigned 'Action Items' to be accomplished by specific dates (or revised as needed).

And finally, the annual budgeting process for each department is also significantly linked to the strategic goals of the Agency. The overall strategic goals for the upcoming year are outlined by the Chief Executive Officer and Executive Managers. Following that, each department is asked to develop departmental goals and anticipated schedules for accomplishing those goals that align with the specific Agency goals for that fiscal year. This process is described in an Agency document, as follows:

> Using the Agency's vision and mission statements as a guide, the budget has revised and updated goals for FY 2006/07…
>
> From the policy goals, each department developed measurable goals and objectives along with key performance indicators for the fiscal year. At fiscal year end, policy makers, management and stakeholders can use these indicators as criteria in determining and measuring the degree of goal attainment. (Agency, 2006)

In short, the Agency not only identifies strategic, measurable goals, objectives, and key performance indicators (KPIs) each year, they use these same goals, objectives and KPIs to measure attainment of those goals at the end of that year. In short, staff at all levels 'walk the talk' of the overarching organizational goals: "to provide Agency services that are regionally planned and managed in a cost effective manner; to enhance the quality of life in the surrounding area by providing optimum water resources management for the area's customers while promoting conservation and environmental protection" (Agency, 2006).

4.3 Understandings of Goals and the Effect on Coordinated Efforts

4.3.1 Research Question 2 and Summary of Findings

Question 2: How do the understandings of overaraching organizational goals affect coordinated efforts within the organization?

Summary of Findings:

- While an awareness of Agency goals was generally similar among the three participant groups studied, the way in which these goals were applied varied from group to group according to their role in organizational activities. These differences in application have implications for coordinated efforts within the Agency.
- Collaboration needed to integrate and coordinate these differences in applying organizational goals becomes increasingly difficult as the number of new projects grows.

4.3.2 Discussion of the Findings

Given that each participant group in the study (operators, engineers, managers) has a different function within the overall activities of the Agency, it perhaps comes as little surprise that each group has a different perspective regarding the application of overarching organizational goals, depending on the group's role (division of labor) within the Agency. What is interesting, however, is that the different ways the Agency goals are enacted by these groups results in differing interpretations and expectations about workplace practice.

The first analysis of the understandings of organizational goals by the three groups used transcripts from the three participant group meetings, as described in Section 4.2 above. And since the discussion in these meetings was a reflection about a hypothetical scenario, and was not an observation and interview of day-to-day practice, the meeting transcripts were not an adequate source of data regarding the participants' understanding of overarching Agency goals. The data source needed to be a reflection of participants' everyday activities within the Agency.

Another approach to investigating the participants' understandings of organizational goals, and one that was suggested by the Activity Theory framework, was to choose a single 'object' of the system and then observe the activity, or processes, surrounding that object. This approach seemed promising even for a smaller study such as this one.

In accord with the Theory of Action framework (Argyris & Schön, 1996), selection of an object associated with potential threat or embarrassment, a 'high stakes' object would provide the most important information. This type of 'high stakes' object raises the level of potential threat or embarrassment to the participant, and thereby makes the behavior surrounding it more significant in terms of organizational learning.

> The observations made and the conversations recorded should be connected to objectives and actions to which individuals are highly committed, for example, observations of meetings about non-routine issues that tend to stimulate feelings of embarrassment of threat. Such events are intimately tied to an individual's sense of competence, confidence, and self-esteem. A slightly less powerful set of data may be obtained in classrooms and workshops, as long as those activities raise problems that the participants consider important and persistent

> features of their everyday working lives. (Argyris & Schön, 1996, p. 77)

The 'object' I chose for this approach to investigating participants' understanding of overarching Agency goals was 'cost effectiveness,' since both cost and planning had been the two most commonly cited goals in the participants' group meetings. Rather than look for similarities in understandings surrounding this 'object, however, I decided to look for differences in understandings.

To search for instances of this 'object' in the shadowing interview transcripts, I used the Adobe Acrobat software search feature to find instances of the word 'cost' in all 18 of the transcripts (two shadowing interviews for each of the nine participants). Further, based on my experience in field of water and wastewater treatment generally, and from interviews with study participants, particularly key managers, I knew that both 'chemical' and 'energy' were equivalent to the participants as 'cost,' since these factors are the two greatest sources of daily operation and maintenance costs for the agency. An excerpt from an interview with a 'key manager' participant in this study illustrates this connection between cost, chemical, power, and energy:

> I always like to use bleach...that's a great example. Bleach is very expensive. It's 3.5 million dollars…every year. The O&M cost—which we all understand is a one-shot, life cycle cost—is important. The O&M costs, all the time, are power, energy, labor. (Comment in interview of Key Manager participant of this study)

The four search words (I termed, 'cost talk') selected were therefore: cost, chemical, energy, and power. The results of this search are summarized in Table 9. Transcribed conversations of operators, engineers, and managers represent about four hours of interview time (two two-hour shadowing sessions). The interviews of the key managers, shown at the bottom of the table, represent a single interview of about an hour and a half. I included key manager data, however, to illustrate patterns of word search results.

Table 9. Percent of 'Cost Talk,' by Group

	Search Words Indicative of 'Cost' – 'Cost Talk'				
	Cost	Chemical	Energy	Power	
Operators	17%	52%	17%	14%	100%
Engineers	61%	3%	7%	29%	100%
Managers	55%	16%	20%	9%	100%
Key Mgrs	61%	11%	13%	15%	100%

According to this data, about 17% of the 'cost talk' by operators is from the general term 'cost;' about 52% of the 'cost talk' is from the word 'chemical,' and 17% and 14% of the 'cost talk' are associated with the words 'energy' and 'power,' respectively.

For an additional perspective of the data presented in this table, I graphed the results of the 'cost talk' word search, as shown in Figure 13. One of the most prominent aspects of this data is the contrasting pattern of operators' 'cost talk' compared with that of the other three groups. The difference is striking.

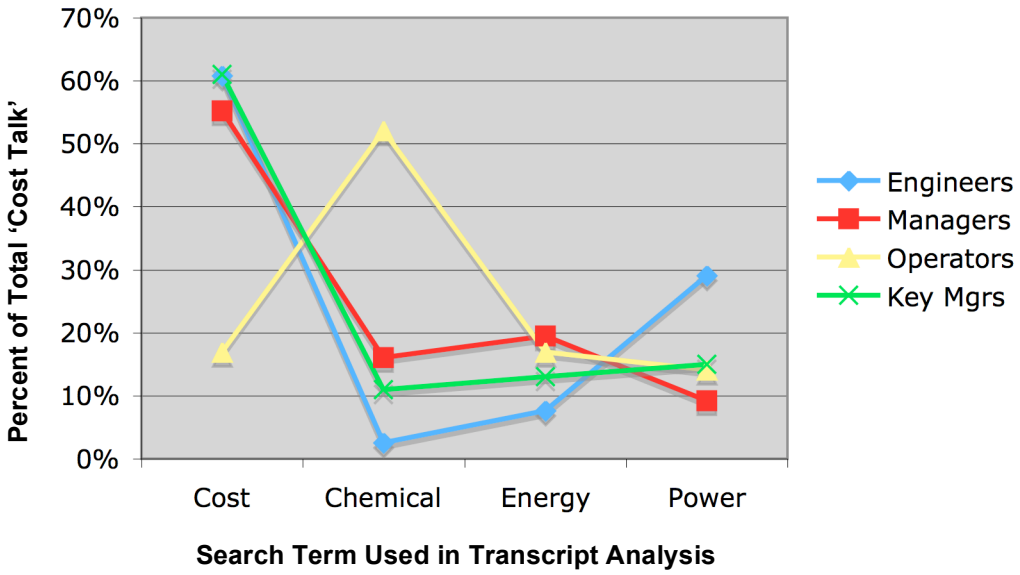


Figure 13. Types of 'Cost Talk,' By Group

The 'cost talk' for engineers, managers, and key managers show a rather similar pattern of 'cost talk' occurrence; whereas, the pattern for operators' 'cost talk' is distinctly different. One reason for this could be that in daily operations, there is a constant monitoring of chemical use. The cost impact of chemical use is well known since chemical costs represent a significant part of the cost data entered into the Unit Production Cost (UPC) tab on the Process Optimization spreadsheet. Data summarized in this spreadsheet is discussed in a routine bi-weekly meeting attended by operators, technical support staff and managers. Therefore, if 'cost' considerations in the everyday practice of operators are focused on chemical use, then this fact may explain the relatively low occurrence of the word 'cost,' yet high occurrence of the word 'chemical' in the 'cost talk' of operators.

This idea—that there is only a difference in *how* cost is talked about by each groups, not *whether* it is talked about—appears to be supported by the data provided in

Table 10. As shown in the column to the right, the total number of 'cost talk' occurrences identified in the shadowing interview transcripts for each group was relatively similar.

Table 10. Occurrences of 'Cost Talk' in Transcripts, by Group

	Cost	Chemical	Energy	Power	
Operators	12	37	12	10	71
Engineers	48	2	6	23	79
Managers	48	14	17	8	87
Total	108	53	35	41	

These differences in perspectives of the same organizational goal, cost, led me to investigate further the context surrounding the 'cost talk.' I singled out 'cost' as the sole focus for this further analysis, as a way to explore the role of context in understanding these different patterns.

Reviewing the nine participants' shadowing interviews transcripts once again, I investigated the context of the 108 occurrences of the term 'cost.' Selected excerpts of the 'cost talk' for each of the three study groups are provided in Tables 11-13.

Operators' Talk About Cost. Surprisingly little of the operators' 'cost talk' involved the actual use of the word 'cost,' as compared with other groups' use of the word (refer to Table 10). However, during shadowing sessions with operators the issue of cost reduction was certainly an underlying theme in various routine practices. For example, an examination of the transcripts indicates that operators are aware of the two largest sources of ongoing operation and maintenance expense: chemicals and

power. The key performance indicator (KPI) boards at each treatment plant include chemical used as part of the analysis, and bi-weekly process optimization meetings include a discussion of unit production costs (UPC) information.

Table 11. Operators' Talk About Cost

Operators' Comments	Cost Topic
"After Item 2 [of the Typical Process Optimization Meeting Agenda], at the bottom of Item 2, typically someone from the tech support group, Janet, will go over the UPC, unit production costs."	Unit Production Costs (UPC) spreadsheet.
"I have the spreadsheet. Here are Plant 4's spreadsheets. And I have Highland's spreadsheets. This is from July. I have it up there daily, so almost daily I look at it, unless there's an issue. So I can look at all the parameters, the influent flow, the effluent flow, conductivity, pH, residual, turbidity average, bleach usage, alum usage, polymer usage, ferric usage, power usage. That's it.…this is called the UPC. I'm sure you've heard of the unit production cost thing…"	Unit Production Costs (UPC) spreadsheets.

Engineers' Talk About Cost. The engineers' talk about cost (see Table 11) centered around three general topics: equipment, agreements, and construction. 'Cost talk' about agreements pertained to agreements with outside entities such as other public utilities or cities or with individuals as would be common during property acquisition negotiations. The 'cost talk' about equipment typically pertained to equipment technical specifications, purchase considerations, and life cycle analysis. 'Cost talk' about construction generally pertains to matters of schedules, change orders, or claims.

Table 12. Engineers' Talk About Cost

Engineers' Comments	Cost Topic
"But for this application…we started talking to Equipment Manufacturing, Inc. They have a division, using these kind of things. And the cost was like $300,000. Until we came across ABC…I can't remember how we ran into them. And when we heard like $50,000 to $60,000, that was a big cost reduction. So immediately we said, that's the one we want to use."	Potential cost savings associated with in-house equipment evaluation.
"When we do it ourselves instead of the contractor that does it, we have control on quality and also we eliminate the markups by the contractor. So these are the things. Schedule-wise for the renewable energy engines, it was not really a big factor but it was for us to save money because if we left it to the contractor, it would have cost maybe $5 million from the markups and whatever."	Potential cost savings in pre-purchase of large pieces of equipment.
"And if you do not have their [power company] approval, you will never be able to start your generation station. When these [power generators] are down, you buy power. When these are generating power, you don't buy power generally. You just save it."	Cost implications of obtaining interconnecting agreements.
"When we determined that exactly that's the best route and best way to go, we start the process of contacting and communicating with the property owner." (Lines 87-89) "When we look at the project, we look at what benefit that project is going to have for citizens and the people who live in that area or that region. That's our main goal, how we can serve these people. Obviously the next step is the feasibility study on the engineering issues and then the cost and so on and so forth."	The role of property cost in the project alternative selection. Property cost is secondary to public benefit.
"And so we are initiating the change request and stating that we want different design modifications to be done and reissued to the contractor saying it's a deviation from what you have in your current specifications. Provide us a quote. We agree on the price and we move on."	Change orders and agreement on price.

Continued

Table 12. Engineers' Talk About Cost (Cont'd)

Engineers' Comments	Cost Topic
"But in a lot of instances, you're going to have cost associated with the capital maintenance, actually just cost of maintenance and ease of constructability and how it's going to operate, which one is going to give more flexibility for operations. So they have to look at that…. the "business case evaluation." In lifecycle cost, you just take it over a period of twenty years. What's your payback going to be?"	Selection of project alternatives using business case analysis and lifecycle analysis.
"if it's something…it's an ongoing problem or something that I see as potentially coming up later on in terms of cost, I do always document it as an email. And I forward it to all parties so that there's not a misunderstanding. A lot of times it's easy to misunderstand sometimes and then you actually see it in writing and then you go, "Oh, well, that's not what I was trying to say." "Well, tell me what it was that you were trying to say." It's a good point to just have and it's come in handy plenty of times."	Importance of accurate documentation for reference in the event of future claims against a project.

Managers' Talk About Cost. The managers' talk about cost (see Table 13) tends to focus on issues pertaining to budgets, project control, or strategies that would either reduce costs or generate revenue.

Table 13. Managers' Talk About Cost

Managers' Comments	Cost Topic
"He likes the program but he doesn't like the cost of hauling. He has the licenses to be able to haul. So we're working on a deal where he will buy a piece of equipment from us, lease a trailer to do the hauling of the manure. So my role in this will be effectuating the sale, negotiating contracts, and then timing the logistics of getting the material in."	Consider cost sensitivities of all project stakeholders.
"...thinking about better ways to do things, ways to either save money or make money, things like that. In our case, in the Organics Department, we do have some opportunities for revenue generating, like collecting tip fees from food waste or ways to generate electricity from the energy, potential of that."	Consider both revenue generation as well as cost reduction.

Continued

Table 13. Managers' Talk About Cost (Cont'd)

Managers' Comments	Cost Topic
"Monitoring Requirements and Deviations [provided in the Project Management book by Lewis]…The Estimates Curve…This is one that, I think that for the most part, you really should know inside, front and back, upsidedown and every which way because this really tells you. Okay, are you on budget and if so...really looking at your cost variances."	Project cost and schedule control is essential.
"… if I bypass a treatment plant that is generating methane from the solids, now obviously they're going to have less solids because I now bypassed that wastewater. What impact does that have on my energy bill? Because either I'm going to be buying natural gas to make up for that methane gas that's not produced, or I'm actually going to be buying Electric Company, Inc. power. During the day, which one is best? Because Energy, Inc. has their peak period rates, maybe it's best that I just buy natural gas. And so all those decisions have an impact on which is the most cost-effective decision."	Cost-effective decisions must consider inter-related issues.
"You're supposed to get something out and you don't know how it's done and the manufacturer doesn't want to divulge what it is and you can't get in there....And if you do, you're going to void your warranty or it's going to disrupt the program. So you have to call them out and that's the problem with it…You bought this piece of equipment. It has failed. It's no good to you at that point and they can charge whatever they want to, to come out and make this repair. So we're trying to avoid that."	The 'black box' approach to equipment control is not a cost effective approach.
"So the KPIs [key performance indicators] are more specific. It's things that we need to monitor to make sure that we are meeting our goal. What's our goal? So, first we establish our goal.…reduce cost and chemicals, 100% compliance. So, from there we break it down. Residuals disposal cost would be another one. We break it down and say, "okay, how can we do this? What is it that we want to monitor?"	KPIs link process performance to strategic goals and result in cost savings.

Reflections About the Talk—Differences That Make a Difference. These differences between what the transcripts indicated using a word search strategy and the actual conversations helped me understand how an analysis of dialog done by someone unfamiliar with a particular practice may miss many of the unstated but

commonly understood connections between words and ‘practice meaning’ and between words and ‘practice implications.’

Contexts suggested by comments in Tables 11-13 have also illustrated a few of the contexts in which decisions must be made that pertain to cost and cost effectiveness. And these specific circumstances vary from group to group. In fact, seemingly ‘stable’ concepts such as ‘cost’ or ‘time’ can be enacted differently or have different frames of reference that have potential adverse affects on coordinated efforts within the organization, To illustrate this, in Sections 4.3.3 and 4.3.4, I have provided two examples drawn from situations encountered during the shadowing interviews that show how two seemingly straightforward practices or concepts are enacted and perceived by different groups within the Agency: grants, and perceptions of time.

4.3.3 Grants—More Than Meet The Eye

The award of a project grant, represents a cost savings to the Agency, sometimes a considerable savings. Thus, applying for and receiving a grant is a benefit to the Agency and is in complete alignment with the overarching goals of the Agency for being cost-effective and environmentally-sensitive. Yet while grants are pursued vigorously by the Agency’s executive managers and by others in the Engineering Department (and wisely so), there are certain system stresses that often arise from the inclusion of such grants-driven projects that play out in the day-to-day activities of the Agency,

Engineers are involved in several aspects of the grant application. And being awarded a grant is both gratifying and technically stimulating. In fact, this positive

side of working on grants-driven projects was mentioned by almost every engineer in this research study. A review of the interview transcripts, however, also indicates that there is another side to grants-driven projects that clearly presents system stresses to the Agency.

Experienced Agency engineers are typically project managers for these type projects, coordinating both internal engineering staff and external consulting engineering staff during the course of the project. Since the grants are often provided to encourage exploration (demonstration grants) of or incorporation (incentive grants) for new technologies, the stresses of the grant-driven projects are often the result of working in lesser known technical areas of practice, in arenas of innovative. This fact translates to more project 'surprises' and the attending challenges of those surprises. And when those inevitable 'surprises' ripple through a project and play havoc on project schedules, the grant-driven deadline remains static. It is the project manager who must figure out how to get the project 'back on track,' in alignment with the original grant schedule. There is also often considerable pressure at the end of a grant-driven project to conclude the project within the allotted schedule, regardless of operational issues at hand.

Besides the scheduling challenges posed by grant-driven projects, another challenge to the engineering staff is the piecemeal nature of work toward an overall larger process or system that accompanies grant-driven projects. Often, grants may be received for work on only certain components of systems while not on others. This

funding of only portions of overall systems presents a coordination challenge, both in technology and in time.

Operators face different, but related, repercussions of grant-driven projects. If the schedule has become a problem for the engineers, it is doubly a problem for the operators. Such time pressures often result in a project startup with more issues that must be resolved than those in which there is less scheduling pressure on the engineers. In addition, new technology generally translates into more 'seat of the pants' figuring things out to establish stable, routine operations. And finally, the sometimes piecemeal nature of grant-funded projects means that operations will have to establish new operating strategies for the overall system operation each time there is an addition of new equipment to the system. Since wastewater treatment includes both physical-chemical and biological processes, finding a new system optimum operating protocol can take considerable time and effort.

4.3.4 Time is Relative—Particularly Within Workplace Practice

The historicity lens of Activity Theory was particularly useful in highlighting this source of differences—difference in 'time'— associated with applying overarching organizational goals within a specific environment. While it may be a commonly accepted notion that time is the same for everyone within an organization, this assumption may be far from an accurate assessment.

I became aware of this aspect of practice as I reviewed the transcripts of each of the groups of this study. I began to see differences in the references to time and the

'disturbances' surrounding those differences. In Tables 15-18, I have provided four examples illustrating time frame differences associated with the term 'temporary.'

In Example 1, Table 1, an engineer is commenting about some piping at one of the treatment plants that was placed there 'temporarily' for testing the potential of a new type of digestion process. These pipes are not 'garden hose' variety. They are perhaps 18-inches to 24-inches in diameter. In other words, they are difficult to maneuver over, and there are many of them, sometimes so concentrated in a particular area that it is would akin to an obstacle course when maintenance is required. Thus, while on the plans, these pipes are only there temporarily, the daily-lived reality of that 'temporary' condition is a lot less theoretical.

Table 14. Perspectives of Time – Example 1

The 'Temporary' Piping	
Participant	**Comment**
Engineer 3	And the gas piping system, it was done as temporary when we moved into this three-phase thermophylic digestion. So **temporary gas piping** is all above ground but it's just laid out on the floor, it's very hard for maintenance. And **it's temporary piping, it wasn't meant to be that way forever.** Now we're moving it out onto a pipe rack.

In Example 2, provided in Table 15, an engineer is discussing a design he was currently working on, a compost storage area (called a 'tent' because of the tarping used). What is particularly interesting is his sense of time associated with 'temporary.' Since the this storage area will ultimately be replaced by a more permanent structure

for compost storage, he considers it a temporary solution to a current need. In this context, 'temporary' means 10-15 years.

Table 15. Perspectives of Time – Example 2

The 'Temporary' Tent	
Participant	**Comment**
Interviewer	Okay. I was wondering about that project. When you were reading the specs, which is one of the first things that you did this morning, that was for the cover for the [composting facility].
Engineer 2	For the tent.
Interviewer	For the tent, yeah. Whose project was that? You were just reading the specs. Was that your project?
Engineer 2	That's my project, yeah.
Interviewer	Okay. Did someone come to you and say, was this always part of the design of that project, that there would be a tent? Why is this happening now as opposed to say, like when it was designed, the building itself? They realized later?
Engineer 2	They didn't know if they were going to use... They are able to use the immediate facility next to the compost facility.
Interviewer	The Plant 4 site, you mean?
Engineer 2	Yes.
Interviewer	So, is this tent going on the Plant 4 site?
Engineer 2	Yeah**, this is a temporary, 10-15 years**, storage facility.

In Example 3 (Table 16), a manager is talking about the 'temporary' location for storing some compost material. Again, note the sense of time associated with the word 'temporary,' about a year and a half.

Table 16. Perspectives of Time – Example 3

The 'Temporary' Location	
Participant	**Comment**
Interviewer	Where is the material going now?
Manager 1	The material is going to composting. It's blended in with manure compost that gets marketed to carrot growers.
Interviewer	So where is the physical location?
Manager 1	The physical location is in Center City and it's a temporary location for about a year and a half.
Interviewer	Okay.
Manager 1	And then ultimately that goes away.

In the fourth and final example of these time frame differences, shown in Table 18, an operator is describing an operations incident that was the result of being asked – by Electric Company, Inc. to come off their grid and move to Agency generators for power. This time, the sense of time associated with the word 'temporary' is dramatically different—twenty minutes.

Table 17. Perspectives of Time – Example 4

The 'Temporary' Loss of Power	
Participant	**Comment**
Operator 1	For…they had a problem that morning. So we had only one co-gen[eration] engine on and we had a diesel running at tertiary plant. So there was some problem with the switchgears not switching to our own power. I don't know the exact details of it, but our backup generation didn't pick up the load. So that's why we dropped off the pumps. We didn't have the power to pump SBS into...
Interviewer	I have a question, technical, about that, when I went here at Plant 5, I found out that when you switch over, only certain things are run by it. Is dechlor[ination] one of those things that is run by it or not?
Operator 1	The dehlor...We have a priority list of things that, when we switch to backup power, these things must run. SBS pumps were one of them. They are on the top of the priority list.
Interviewer	Along with blowers.
Operator 1	Sure. But it didn't pick up.
Interviewer	So therefore, it took a while to realize that they weren't working.
Operator 1	That was one of the first things that Operator 2 told his operators to check. Make sure your SBS is okay. Obviously, we found out it wasn't. So there was another portable generator on site, right next to the SBS building, which sometimes we use as a backup in case...but when we were trying to fire up that generator, the battery was dead. So we had to scramble and get maintenance and an electrician out there**... The whole thing took about twenty minutes for us to get back online**.
Interviewer	That's pretty good.
Operator 1	Yeah. With everybody scrambling everywhere. It was late in the day, it was around four o'clock.

These varying timeframes of practice would appear to be a source of organizational tension, an avenue of frustration and misunderstanding resulting from expectations. In the first example (Table 14), for instance, if an operator or

maintenance staff were told that the new piping being installed was only going to be temporary, there would be certain expectations regarding when that piping would either be removed or made permanent. And if, after some 'reasonable' time, according to the operators' timeframe expectations, the piping remained in place, then frustrations may begin to arise.

The timeframes of practice would seem to be embedded within the cultures of particular jobs and professions, as a consequence of their routine activities and the associated scope of responsibilities. The practice of engineers, managers, and operators vary with respect to the scope and seasons of time-sensitivity—what I will call the 'timescape' of practice.

The Engineer Timescape: Engineers appear to have a generally forward-looking timescape, perhaps 10 to 15 years in the future. Many public utility agencies, including the research site of this study, have about a ten-year window of engineering planning. For example, the Agency has a 10-year capital improvement program (CIP). Each year, in coordination with the budget review process, the CIP is evaluated and revised as necessary to reflect plans for the upcoming ten years.

A closer timescape focus for engineers is a monthly focus surrounding Board of Directors' meetings and Board Committee meetings. Since the Agency engineers often prepare Board Recommendations for proposed projects or change orders for current projects, they must be aware of Board meeting dates and required submittal dates for Board packages.

The interview transcripts for the engineers indicate that there is also a one- to two-year timescape focus toward the past. Engineering designs for some of the larger projects can take up to two years to complete construction. During this time and for a period of time following the completion of construction, until there is a project close-out, there is the potential for contractor claims to the Agency for that project. This then requires review of the claims by the engineers, including associated records that are pertinent to the claim.

The Operator Timescape. The operators' timescape is typically more present-oriented than the engineers' timescape. The practice of operators tends to be more focused on today, this week, this month, and somewhat in the distance, this year.

A monthly focus is associated with monthly water quality reports that must be sent to the Regional Water Quality Control Board, signed by the Chief Operator. These monthly reports are required by law and represent a serious consideration for any operator. There are other reports, such as an annual biosolids report with which the Chief Operator may participate by either preparation or review of the report.

In moments of system upsets or failures, the timescape focus can be decidedly present, like 'the next 10 minutes' present. Violations of National Pollutant Discharge Elimination System (NPDES) permit requirements is a serious issue and can result in rather significant fines to an agency. These compliance matters are a constant consideration of operation and maintenance staff and much of their planning activities occur with an underlying consideration of compliance in the background.

Routine planning for operators certainly extends out for the year but planning is often focused on this month, this season. Since weather conditions impact operations, the attention must be on both the current and upcoming season.

The Manager Timescape: Since managers need to be aware and responsive to the staff, systems, and circumstances under their purview, managers' timescape can be somewhat of a collection of timescapes of those staff and projects they manage. These timescapes can range from 10-15 years and beyond, similar to the engineers; it can be immediate such as during times of equipment or process failures, similar to the operators; or it can even be to the past, tracking with contractor claims, as for the engineers.

One might ask, so what? So what if different groups have different perspectives of time? Why would these differences matter? Or other differences as well? The answer lies in its potential connection to organizational learning. Argyris and Schön (1996) note that an organization's learning system is either facilitated or inhibited by the two factors that comprise it: organizational structures and the behavioral world of the organization. While both are influences on organizational learning, the one most immediately impacted by timescape and other differences is the behavioral world. According to Argyris and Schön (1996), individual hold theories about why things happen they way they do, and about the 'best way' to get things done, to accomplish a desired goal. These ideas are called 'theories of action:'

> Our initial premise is that human beings design their actions and implement their designs. We call these designs theories of action, differentiating…between the theories of actions individuals espouse and the ones they actually use, their theories-in-use.

> Both of these types of theories are learned early in life and supported by features of societal and organizational cultures. Although human beings sense of competence, independence, and self-esteem are based on both types of theories, we consider theories-in-use to be more powerful in explaining and changing behavior, especially in relation to double-loop learning.
>
> Almost all of the individuals we have studied hold theories-in-use that are systematically counterproductive for double-loop learning, especially when the issues are embarrassing or threatening. (Argyris & Schön, 1996, pp. 75-76)

The connection between theories of action and organizational learning lies in moments of threat or embarrassment, and perhaps in moments of frustration as well. Such moments that could result from these differences in practice have the potential of activating the 'self defensive behavior' patterns that are counterproductive to organizational learning.

The effect of various understandings of organizational goals on organizational learning is the third and final research question of this study. Differences in how organizational goals are applied among various groups could either aid or deter organizational learning, depending on whether free inquiry is encouraged and supported or discouraged and suppressed within the organization.

4.4 Understandings of Goals and the Effect on Organizational Learning

4.4.1 Research Question 3 and Summary of Findings

Question 3: How do the understandings of overarching organizational goals affect organizational learning?

Summary of Findings:

- There is evidence that the Agency is nearing the end of a large scale transformation. Whether this transformation is sustainable over time depends on various organizational factors.

  In terms of an Activity Theory analysis of this transformation, it is important that this 'new model of Agency activity' be understood in terms of the contradictions and disturbances of the previous model of Agency activity that led to this potentially-expansive transformation.

  In terms of a Theory of Action analysis, this transformation appears to represent a case of double-loop learning; however, it is not clear as to whether this learning involves both a change in values surrounding instrumental theories-in-use as well as a change in values surrounding inquiry. If both types of change are not part of the transformation, a limited learning environment may be the outcome.

- The Agency 'learning system' appears to be generally supportive of organizational learning. However, the pressures of increasing responsibilities associated with maintaining staffing at 'minimum levels'

> may lead to the emergence of two unintended consequences: (1) 'short-circuiting' of processes important for innovation; and (2) lack of support for individual and organizational inquiry, which could then lead to emergence of Model I behavior. Either consequence would negatively affect the potential for organizational learning at the Agency.

4.4.2 Discussion of the Findings

The answer to the question of the relationship between organizational goals and organizational learning depends largely on the theoretical framework used for analysis of that question as well as the level of aggregation that is the focus of interest (individual, interpersonal, group, intergroup, or whole-organization). Both theoretical frameworks that inform this study (Activity Theory and Theory of Action) underscore the importance of examining organizational learning from a variety of levels of aggregation in order to understand both its emergent forms and its more developed forms.

Engeström (2005) suggests that the expansive learning cycle, used to evaluate organizational development, is appropriate for use in depicting and analyzing both larger-scale and smaller-scale instances of organizational learning:

> The theory of expansive learning has thus far mainly been applied to large-scale transformations in activity systems, often spanning over a period of two to three years (Engeström, 1991a; Engestrom, 1993b). In such a scale, the action phases of the expansive learning cycle are interpreted as lengthy periods of collaborative work dominated by a given action type (e.g., historical analysis, modeling). This corresponds roughly to the scale of events analyzed by Nonaka and Takeuchi.

> In this study, the scale is radically changed. We are looking at phases and cycles that take minutes, perhaps an hour, instead of months and years. Can such miniature cycles be considered expansive?
>
> The answer is yeas and no. Miniature cycles of innovative learning should be regarded as *potentially* [italics in original] expansive. A large-scale expansive cycle of organizational transformation always consists of small cycles of innovative learning. However, appearances of small-scale cycles of innovative learning does not in itself guarantee that there is an expansive cycle going on. Small cycles may remain isolated events, and the overall cycle of organizational development may become stagnant, regressive, or even fall apart. (Engeström, 2005, p. 323)

Argyris and Schön (1996) emphasize not only the scales of aggregation, as described by Engeström (2005), but also the inter-connectedness of those levels of aggregation:

> The meaning of "organizational learning" hinges, as we have seen, on the crucial issue of levels of aggregation at which organizational phenomena are described and explained and at which prescriptions for organizational action are directed. Our analyses of the two groups of studies show that one cannot account for the observed higher-level phenomena of organizational learning, that is, those that seem important to researchers concerned with strategy making or technological innovation, without referring to individual and interpersonal processes of inquiry. The feedback loops contained in our cause-maps and models of O-I learning systems show crucially important causal linkages among three levels of aggregation: interpersonal inquiry, interactions among organizational subunits, and the patterns of action and learning characteristic of whole (Argyris & Schön, 1996, p. 244).

The findings for Question 3 are described in this section first in terms of large-scale organizational learning and then small-scale organizational learning. In each discussion, the findings are stated in terms of the perspectives of organizational learning taken by each of the theoretical frameworks (Activity Theory and Theory of Action).

Large-Scale Organizational Learning. There is evidence of a large-scale transformation at the Agency over the past three to four years, that could be characterized as organizational learning. Within the Activity Theory framework, this type learning, called 'expansive learning' (Engeström, 2005), unfolds developmentally in a cycle with typical stages, as follows:

1. Questioning,
2. Historical analysis and empirical analysis,
3. Modeling the new solution,
4. Examining the new model,
5. Implementing the new model,
6. Reflecting on the process, and
7. Consolidating the new practice.

From the perspective of the Theory of Action framework, large-scale organizational learning is described as 'double-loop learning,' and is characterized by changes in the values and norms of the Agency as well as the strategies and assumptions that accompany those values and norms.

In numerous interviews and across all three groups (operators, engineers, and managers), participants described the current practice and environment of the Agency as markedly different than a just few years ago (perhaps four or five years ago). Some examples of these comments are as follows:

> So in a very short period of time a lot of things have changed… (Operator)

> …based on the meetings that I've been to… the difference between say before and now is that you get a lot more comments at the earlier stage, at the pre-design stage, not just on the design of what you're giving them but more on the intent of the goal of where operations is heading towards, what their long term goal is and to make sure that it fits in. (Engineer)

> We've been using it for almost two years… We've always used spreadsheets and these are spreadsheets. But these are specific to… Well, with spreadsheets, we were just looking at it, kind of blanket…see if you can see trends on what's happening using spreadsheets and stuff….And people are going, "Yeah, it's out of whack, we need to waste more," but how much do you waste? So the KPIs [key performance indicators] are more specific. It's things that we need to monitor to make sure that we are meeting our goal. What's our goal? So, first we establish our goal. (Manager)

> …but we're going through a period, let's say like up until about a year ago for the last maybe three or four years before that… (Key Manager)

The beginning of the large-scale transformation could perhaps be said to have started in 1998, when the Agency changed its name in accord with a change in its mission (governing values):

> The [Agency], originally named [Another Agency], was formed in 1950 to supply supplemental water to the region. Since its formation, the Agency has expanded its areas of responsibility from a supplemental water supplier to a regional wastewater treatment agency with domestic and industrial disposal systems and energy recovery/production facilities.
>
> In addition, the Agency has become a recycled water purveyor, biosolids/fertilizer treatment provider and continues as a leader in water supply salt management, for the purpose of protecting the regions vital groundwater supplies.
>
> On July 1, 1998, the [previous name] officially became the [Agency]. The name change was meant to reflect the changes in the District's mission (Agency website, downloaded May 7, 2007).

Since the name change in 1998, there have been significant changes in the values and processes of Agency practice. These changes have generally reflected a change toward a more strategic-management posture, including the development of strategic goals at all levels within the Agency. Then, over time, those strategic goals were linked to various practices and processes, particularly the annual budgeting process. In addition, performance measurement indicators and targets were identified, making the goals 'actionable' (Argyris & Schön, 1996) at all levels of the Agency, including the General Manager's Office and all Divisions and Departments. Examples of the comprehensive and 'actionable' nature of the strategic management policy is provided in Tables 18 and 19.

Table 18. Performance Measurements Summary – Agency Management

Agency Management			
Division Goals & Objectives	**Department Goals & Objectives**	**Performance Indicators**	**Target**
Hold expenditures within budgeted targets	Office of Chief Executive Officer (CEO) directs the efforts of all Agency staff to ensure prudent fiscal practices, efficient operations and adequate capital planning and implementation	Budgeted expenditures	+/– 10%
Advocate legislation that is consistent with Board policy	Office of CEO provides leadership within the industry on legislative solutions and appropriate regulatory standards for wastewater collection, treatment, and disposal	Board workshops	+/– 10%

Source: Agency Operating and Capital Program Budget, 2006

Table 19. Performance Measurements Summary – Operations

Operations			
Division Goals & Objectives	**Department Goals & Objectives**	**Performance Indicators**	**Target**
Maximize renewable energy production and optimize energy production reliability	Energy Production & Maintenance Department to achieve the most economically advantageous and reliable energy supplies for all treatment facilities	kWh produced from digester gas.	+ 47%
Protect public health and the environment	Laboratory Department configures the Laboratory Information Management System to provide efficient processing of samples and reporting	Number of analyses performed	= or > 100,000
Provide customers with a reliable supply of high quality recycled water	Operations Departments provide customers with an uninterrupted supply of recycled water.	Recycled water used	+28%
Sustain self reliance in organics and biosolids management by beneficially reusing 100% of organic solids generated by Agency facilities	Organics Management sustains self reliance in organics and biosolids management by recycling of 100% of organic solids generated by Agency facilities	Biosolids recycled to compost	+10%
Salinity characterization and management and maximize production from desalter	Pretreatment & Source Control Department continues the efforts in the Agency wide Salinity Reduction Program, which reduces salinity into the Regional Treatment Plants	Regional system pipeline (miles cleaned)	= or > 5 miles
100% regulatory compliance with local, state, and federal requirements	Technical Support Department supports regulatory compliances with State and local agencies	Compliances with Air Quality Management District (AQMD) and Regional Water Quality Control Board	No violation

Source: Agency Operating and Capital Program Budget, 2006

Such sweeping changes are the result of changes in the values and norms of the Agency. Based on several 'in the final stages' type of comments made by some study participants ("But there are still some islands that we need to work on improving communications. But for the most part....," Key Manager), the large-scale transformation of the Agency may be nearing the end of the Engeström (2005) cycle of expansive learning.

The reason stated for instituting these many changes in accord with strategic management principles and practices over the past few years at the Agency is explicitly tied to demonstrating fiscal responsibility. Since the Agency is a public entity, and given the current public concern about fiscal responsibility of public agencies, the issue of fiscal responsibility is of paramount concern to the Agency.

> The budget is the primary performance tool used to measure accountability of public agencies, ensuring the public trust for taxpayer dollars. The budget communicates to all stakeholders (i.e., elected officials, regional agencies, and citizens) how their investment will be used by providing detailed information on specific resource allocations and expenditures. Progress is monitored on a monthly basis, and revisions are made as necessary to meet changing needs or accommodate unplanned requests. This budget document is useful as a benchmark to evaluate the Agency's accomplishments and/or challenges, as well as to assess compliance with fiscal accountability. (Agency, 2006, p. 19)

Small-Scale Organizational Learning. Small-scale instances of organizational learning are more common in workplace practice, although such instances may not be recognized as such since they are intertwined within the daily fabric of workplace practice. Both Engeström (2005) and Argyris and Schön (1996) agree that instances of

small-scale organizational learning provide an important perspective from which larger-scale instances of organizational learning may be traced.

Engeström (2005) suggests that these instances of organizational learning may be just that—instances:

> We are looking at phases and cycles that take minutes, perhaps an hour, instead of months and years. (p. 323)

These small-scale occurrences of organizational learning are 'potentially expansive,' depending on whether they become part of the development of a larger-scale occurrence of organizational learning.

Argyris and Schön (1996) emphasize the essential connection in organizational learning at all levels of aggregation in the organization (e.g., individual, inter-personal, groups, whole-organization). In fact, "one cannot account for the observed higher-level phenomena of organizational learning, that is, those that seem important to researchers concerned with strategy making or technological innovation, without referring to individual and interpersonal processes of inquiry" (Argyris & Schön, 1996, p. 244).

I observed numerous instances of small-scale organizational learning during the course of the research for this study. The following provides two such examples. For each, I have described the small-scale organizational learning first in terms of an Activity Theory perspective and then from a Theory of Action perspective.

Small-Scale Organizational Learning: Example 1 – 'Finding the Balance Point.' This first example examines a one-hour meeting held at the Agency offices. This was a meeting for a new project—An Evaluation Study of the Plant 5 Solids Handling Facility (SHF) Digester Heating System. It was included in this research project as part of a Shadowing Session of one of the study participants.

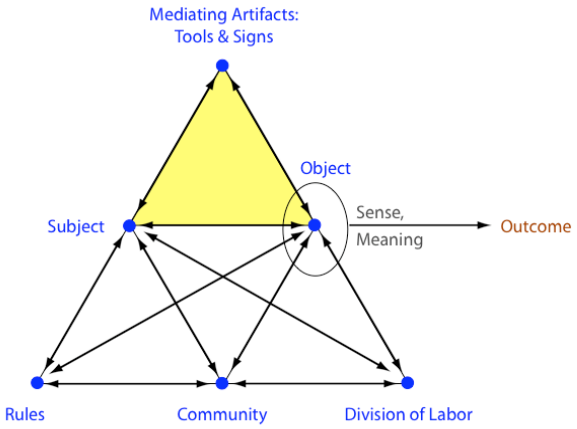
There were 13 attendees of the meeting, including ten Agency staff and 3 staff from a consulting engineering company. Agency staff included the Executive Manager of Engineering, Energy, and Construction, the Deputy Engineering Manager (overseeing construction management activities), three Senior Engineers, an Associate Engineer, the Chief Operator (who is both a Grade 5 operator and a registered engineer) responsible for the facility that was the focus of the study, a Technical Support staff member (who is both an operator-in-training and a Senior Associate Engineer), Manager of Construction Management Department, and a Construction Projects Manager. Staff from the consulting engineering company included a Principal Project Manager, a Senior Mechanical Engineer, and a Senior Electrical Engineer. This meeting thus constituted a 'mixed group' meeting, as it included managers, engineers, and operators from the Agency as well as outside consultants. Some of the attendees were newer to the Agency and less experienced practitioners, while others were seasoned staff members and practitioners.

The purpose of this one-hour meeting, as outlined in the agenda, was to provide an introduction of project members from both the Agency and the consulting engineering company, clarify roles and responsibilities of the two parties, and then to

discuss the project scope of work, schedule, deliverables. In activity theory terms, these represent the 'object' of the study. Drawing of the system and sub-systems were provided to the consultant as part this meeting and were used during discussions of the system.

The title, 'Finding the Balance Point,' points to the rather open-ended discussion in the meeting with respect to two key topics of the meeting: Agenda Item 3 – Scope of Work and Schedule, and Agenda Item 4 – Project Deliverables. The discussion surrounding these items was akin to finding a balance point—a point that addressed technological considerations while maintaining various overarching organizational goals. Both the scope of work and the associated project deliverables were 'negotiated among experts' regarding to the most prudent path, the best design for the project. Implicit in these discussions, although only occasionally made explicit, was a constant background sub-text—the overall organizational goals of the Agency.

Small-Scale Organizational Learning – Example 1 (Activity Theory Perspective). Considered from an Activity Theory framework, this example of small-scale organizational learning might first be depicted using the 'activity system triangle' (Figure 14):



Source: Engestrom, 1987, p. 87

Figure 14. Activity Triangle Revisited

The nodes of the activity system triangle might be represented as follows:

- *Subject* – Project Manager (acting as 'agent' of the organization),
- *Goal* – Obtain expert guidance regarding a key aspect of what has been the problematic operation of a new (and innovative) facility. This is closer range goal than the overarching organizational goals.
- *Mediating Artifacts* – This would include the heating system data and drawings and the signs and symbols embedded therein.
- *Community* – This includes both the organizational communities (the Agency and the Consulting Engineering Company), and the professional communities (Engineers of several types, Managers, Operators, Construction Management, and Maintenance) represented at the meeting.

- *Rules* – The rules pertain to what is expected at the meeting, what 'should' and 'should not' be done, what is 'proper' and what is 'improper' in terms of what is discussed, how it is discussed, who discusses what and when do they do it.

- *Division of Labor* – This is somewhat related to rules but is focused primarily in a meeting such as this as who is seen as the expert in the topic being discussed. As various areas of concern emerge, the 'expert' for that area is implicitly 'given the floor' to provide considered opinion in that area. The task at hand is to come to an agreement regarding the best scope and deliverables that will achieve the goal of solving the currently intractable problem of the gas heating system operation.

The activity system diagram provides a useful heuristic for considering the contributions from the various elements of the activity system to the final outcome. The meeting itself would be represented on the activity system triangle diagram by the oval area surrounding the 'object.' The results of the meeting would be represented by the 'outcome,' shown to the far right of the activity system triangle.

The question arises about the relationship of the overarching organizational goals to organizational learning. As indicated by the meeting transcript excerpts, provided below, one of the overall goals of the agency (cost-efficient operation) is represented in the meeting.

> But you are going to increase the BOD. If you increase the BOD then it's going to ABBS line. We have to pay more money for ABBS (Engineer).

> I have to think about this because, you know, on one hand we do get the benefit of less heating cost. But, on the other hand, I don't want to kill the digester (Operator).
>
> That way we can eliminate that cost all the way (Manager).

In fact, the presence of the Agency overall goals underlies much of the discussion during the meeting. These goals that are often somewhat in tension during the decision-making process, provide a centering point around which a balancing point may be established, a 'best fit' for the circumstance.

Engeström (2005) notes that a traditional understanding of the term 'learning' applies less in meetings such as in this meeting than they might in a classroom setting. In the classroom setting, an individual acquires explicit knowledge or skills and, hopefully as a result, a change may be observed in the individual's behavior. In the classroom setting then, there is the assumption that the knowledge is stable and that there is a competent teacher who has an understanding of what is to be learned. Engeström (2005) points out the problem with such an assumption with respect to learning in the workplace:

> The problem is that much of the most intriguing kinds of learning in work organizations violates this presupposition. People and organizations are all the time learning something that is not stable, not even defined or understood ahead of time. In important transformations of our personal lives and organizational practices, we must learn new forms of activity which are not yet there. They are literally learned as they are being created. There is no competent teacher. Standard learning theories have little to offer is one wants to understand these processes. (p. 66)

From an Activity Theory perspective, then there is organizational learning surrounding these collaborative, negotiated decision-making processes.

Another aspect of the meeting described in this example that is illuminated by the Activity Theory framework is the idea of constructing a 'shared object.' Engeström (2005) describes 'the crucial role of object/problem construction in innovative learning,' as follows:

> The initial existence of a shared problem or task can rarely if ever be taken for granted in work teams. In fact, actions directed toward constructing a shared understanding of the problem took a lion's share of both discussions. The innovative solution itself seemed to emerge as if a final burst after the painstaking period of object construction. (p. 360)

It is interesting that Engeström should use that metaphor to explain the emergence of the solution to the problem, as that image was largely my own impression of how the object was formed and then appeared in tact, as if it had always been there, just not noticed. After more than 30 to 40 minutes of discussion, 'balancing' many technical and organizational goals considerations, there was the following statement, that seemed to emerge, characterizing the 'painstaking period of object construction' was what was now unproblematically clear:

> I guess we all agree that let's focus on the heating and get that system up and running and then get back to filtrate once we know the answer for the heat. (Consultant)

There often seems to be a feeling of relief, of technical resolution of the main object, as if everyone recognizes the solution (consensus on the object) has now appeared. Talk often then fades to more minor, though related, issues. Following that are 'social moments' during which people exchange pleasantries, and the like.

Small-Scale Organizational Learning – Example 1 (Theory of Action Perspective. The focus of the Theory of Action framework is particularly trained on

two matters: the type of learning system that exists in the organization, and the type of organizational learning in play. The type of learning system (whether it is an environment that supports or discourages inquiry) is largely a reflection of various structural (processes, procedures) conditions as well as the characteristics surrounding inter-personal interactions within the organization (Argyris & Schön, 1996):

> An organization's *learning system* is made up of the structures that channel organizational inquiry and the behavioral world of the organization, draped over these structures, that facilitates or inhibits organizational inquiry. Together, structural and behavioral features of an organizational learning system create the conditions under which individuals interact in organizational inquiry, making it more or less likely that crucial issues will be addressed or avoided, that dilemmas will be publicly surfaced, held private, and that sensitive assumptions will be publicly tested or protected. (p. 28)

Organizational structures that can positively or negatively affect organizational inquiry (and thus the learning processes) include the physical facilities, the information and communication systems, various procedures and guidelines that pertain to inquiry processes, and the system of incentives used to influence (positively or negatively) organizational inquiry. The 'behavioral world' that can encourage or discourage inquiry pertains to the feelings and meanings that individuals associate with (infer from) patterns of interactions among groups and sub-groups of the organization.

Organizational environments that are 'win/lose' or 'power play' environments tend to create 'anti-learning' environments. Such environments discourage the inquiry process by activating the 'self-defensive behavior' in individuals; and this, in turn, blocks the inquiry necessary for the emergence of productive organizational learning.

The behavioral environment evidenced in the transcript (and experienced first-hand in the meeting by the researcher) was friendly, respectful, and encouraged inquiry and exploration of multiple perspectives. Such an environment encourages inquiry and productive organizational learning.

The type of learning demonstrated in this example is *single loop* learning. The goal of the meeting was to study the digester heating system so that the operation of the system can be better controlled and remain consistently within the desired operating ranges. This was an instrumental change. The intent was, thus, to 'correct the system.' Since no change in underlying values was at issue, no *double loop* learning was a part of this exchange.

Small-Scale Organizational Learning: Example 2 – 'The Artifact Talks Back.' The second example of small-scale organizational learning is drawn from a story recounted by one of the participants during a shadowing interview. This incident exemplifies the type of small-scale organizational learning that can be stimulated as part of interaction with various types of organizational artifacts.

Various Agency staff had been working together to provide information to a consultant who was then going to develop a software program that would analyze the flow to and from the five regional treatment plant, given various gates being open or closed or various pumps being on or off. One of the foundational pieces of information that needed to be provided to the consultant was information about any current piping that interconnects any of the treatment plants with other. Thus, several members of the Agency provided input to one staff member who then put that information into a

single schematic. That draft schematic was then provided to each member who had supplied information so they could verify an accurate depiction of the information they had provided. The consultant was also part of the review process. Thus, this schematic included, in one diagram, considerable information regarding the treatment plant piping. This process of co-construction and reification that information into a graphic, then, represented the first instance of organizational learning surrounding the artifact. But there was an even more significant organizational learning outcome associated with this graphic.

A meeting was called with all stakeholders to review this 'co-constructed' schematic and to discuss project alternatives for the 'plant balancing software.' The following excerpts from the shadowing interview continue the story:

> PARTICIPANT:
>
> … we thought we had done a good job of working with all these folks in terms of getting the information from everybody and all the [pipeline] bypassing possibilities, all the different pipelines, and all these different things.
>
> And so we had it up there [the schematic was projected up on the screen in the meeting room] and then both [Staff 1] and [Staff 2] started talking about this abandoned sewer that we still could potentially put in. Nobody in the room knew about it.
>
> ….even when we thought we had done a really good job of getting everybody in operations and maintenance [involved] and where are all these pieces [had been assembled in the schematic]…then you find out that when engineering did that construction job way back when, they abandoned this pipeline but they left it in, in case we ever needed to use it for some emergency or something.
>
> INTERVIEWER:
>
> So the operations thought it was gone?

PARTICIPANT:

They didn't know it was there. They didn't know it was something that was even an option, that it was physically in the ground.

INTERVIEWER:

They knew it was there from before. Or was there anybody who knew that?

PARTICIPANT:

No.

This incident exemplifies the type of small-scale organizational learning that is often stimulated as part of interaction with various types of organizational artifacts, in this case a co-constructed system schematic. The discussion surrounding the schematic stirred the memory of two of the most seasoned staff members regarding the existence of a long-forgotten pipeline. Had even one of those two not attended the meeting, it may be that that information would never have surfaced. The cost savings associated with this particular instance of 'small-scale' organizational learning was enormous.

This example illustrates a circumstance that is a current concern of many employers: the loss of significant organizational knowledge with the retirement of the Baby Boomer generation. This example points to steps that can help retain some of that knowledge: collaborative problem solving sessions with staff from a variety of work groups within the organization, working together on some of the complex issues that come up routinely in day-to-day workplace practice.

Small-Scale Organizational Learning – Example 2 (Activity Theory Perspective). Since the schematic was the collaborative effort of several people within the Agency, it would be considered a 'co-constructed' artifact. Such an effort 'stores' individual knowledge in organizational artifacts. The artifact was then the mutually-

constitutive mediating artifact for the discussion that stirred deeper memories of conditions in the field. Both activities would be considered 'knowledge creation' activities of the organization.

Small-Scale Organizational Learning – Example 2 (Theory of Action Perspective). Argyris and Schön (1996) suggest there are several ways in which knowledge becomes 'organizational knowledge.' The organization is a 'holding environment' for knowledge resulting from inquiry. This knowledge may only be held in the minds of the staff members (the 'agents' of the organization) and, in that case, 'walks out the door' when they leave the organization. But some knowledge (though undoubtedly a fraction of what exists in the minds and 'hands' of staff members) can be stored in the organization's records, reports, drawings, graphs, etc., for access by and interaction with other staff. And further, organizational knowledge is stored, and is available, in the organizational process and strategies.

The activity described in this example was collaborative and 'inquiry-friendly.' The result of this inquiry and knowledge-creation activity was a significant addition (with considerable cost benefits) to organizational knowledge. The example was an instance of organizational *single loop* learning since the problem at hand was to develop a model that would allow for better flow-balancing of recycled water among the five regional treatment plants.

4.5 Implications of the Findings for Practice

The focus of this study was the connection between the understandings of overarching organizational goals among different groups and the effect of these understandings on either coordinated activity or organizational learning. Upon reflection on these questions afforded by this study, I believe the concept of coordinated activity may be subsumed by the larger question of organizational learning. Argyris (1996) describes the organization's "task system" as the both the division of labor and a design for the performance of work.

> As Chester Barnard (1938) pointed out, organizations are a species that belong to the genus of systems in which individuals cooperate to perform tasks that arise repetitively (such as making coffee and distributing it to the victims of an earthquake). Every cooperative system embodies a strategy for dividing up, according to one principle or another, the tasks it regularly performs and delegating the components to individual members, thereby establishing organizational roles. The organization's "task system," its pattern of interconnected roles, is at once a division of labor and a design for the performance of work. (Argyris & Schön, 1996, p. 10)

According to this description, there would be little link between organizational learning and coordinated activity. After all, once the members of the organization learn those 'repetitive tasks' there's no learning required. But in fact, the assumption that tasks are primarily repetitive and require little innovation in implementation, points out the very difficulty facing the workplace today: the complex, dynamic conditions create circumstances that are less 'routine,' and thus require more adaptation and innovation than rote performance. Thus, a focus on organizational learning must also address underlying issues that surround coordinated activity.

The connection between the understandings of overarching organizational goals among different groups and organizational learning was considered, in Research Question 3, from the perspective of how these understandings affect organizational learning. However, when considering the implications of this study to practice, a slightly different question might be an important re-framing; that is, how do the understandings of overarching organizational goals arise, and how are they formed in the first place? This question leads directly to a problem that Argyris and Schön (1996) have called the learning paradox. "Our argument can be reformulated in terms of a learning paradox: the actions we take to promote productive organizational learning actually inhibit deeper learning" (Argyris & Schön, 1996, p. 281). Their point is that the very measures that are put in place to ensure productive organizational learning are the same measures that have the potential to derail continued organizational learning. The processes developed to link the overarching organizational goals with day-to-day practice ('strategic management' practices) can potentially lead to other processes or environments that begin to discourage or even block open inquiry, a fundamental building block of organizational learning. Further, strategic management practices can lead to environments that are perceived by some as 'threatening or embarrassing,' environments that Argyris and Schön (1996) suggest activate self-defensive behavior, or "Model I Theory in Use" (refer to Table 2). Model I Theory in Use is characterized by governing variables and action strategies that do not support the open inquiry required for organizational learning.

The remainder of this section describes implications of practice associated specifically with the Agency as examples of the potential onset of the 'learning paradox'. Two areas that could pose a threat to the Agency sustaining improvements in practice resulting from the recent large-scale transformation (organizational learning) include: (1) the top–down establishment of goals; (2) the 'busyness' problem.

During the formative stage of some change initiatives. there may be some action strategies, that in the interests of time and in 'casting the vision' for the model, approach those of Model I behavior. However, in the long run, Model I behavior tends to interfere with or block organizational learning. Table 2 indicates two action Model I action strategies that might align with a top–down establishment of policy: "Design and manage the environment unilaterally (be persuasive and appeal to larger goals," and "Own and control the task (claim ownership of the task, be guardian of the definition and execution of the task)" (Argyris & Schön, 1996, p. 93).

The two primary activities at the Agency that set the pace for all others are the Annual Budget Process and the Mission and Vision Statement Procedure. The wording in some of these excerpts from the Operating and Capital Improvement Program document from the Agency indicates a generally 'top–down' approach to these two processes:

> *Regarding the Annual Budget Process:*
>
> …the Chief Executive Office/General Manager's message, which communicates to all Department Managers and Supervisors the guidelines and the Agency's key objectives for the preparation of the Five Year Business Plan (operation budget) and the Ten Year Capital Improvement Plan (capital budget).

> Each department is tasked to develop accountable and justifiable departmental goals and objectives and performance measurements, staffing plans, capital budget requests, and operation and maintenance (O&M) budget requests that are pertinent to the department and the Agency's goals and objectives. (Agency, 2006, p. 19)

> *Regarding the Mission Statements:*
>
> Each division and department develops individual mission statements in support of the Agency's overall goals…
>
> The cascading effect of this methodology commits all levels of the organization to performance goals that ensure a coordinated effort toward goal accomplishment. Individual staff members can clearly identify what is required within their own performance plans to ensure that departments goals are met. (Agency, 2006, p. 13)

Widespread participation in the formation process, rather than primarily a top down implementation of the strategic goals, may help sustain the organizational learning critical to long-term effective practice by the Agency. Argyris and Schön (1996) cite Kurt Lewin's work regarding the importance of participation in research. This is true of more than research design.

> Finally, as Kurt Lewin pointed out many years ago (Lewin and Grabbe, 1945), people are more likely to accept and act on research findings if they helped design the research and participate in the gathering and analysis of data. (Argyris & Schön, 1996, p. 45)

A second area that may begin to threaten the sustainability of organizational learning is what Argyris and Schön (1996) call the 'busyness' problem: "Their busyness may deter them from engaging in inquiry that would otherwise be useful to them; they are often constrained by the need to leave off thinking and begin to get things done" (Argyris & Schön, 1996, p. 46). This is the circumstance of having 'too

much to do.' Even when staff has the knowledge of what needs to be done, the motivation to do it, and the skill to accomplish it, there are still only so many hours in the day. The warning signs of staff being 'too busy'—not having the time to accomplish tasks, having meetings scheduled upon meetings—should be heeded, as these issues can pose a serious threat to sustaining organizational learning and the cost-effective, productive practice of the organization.

The 'flip side' of having too much to do, is having too few people to do the work. This is obviously the same problem, viewed from a slightly different perspective. But allowing staffing levels to remain static when workloads are rising is an example that may put organizational learning at risk.

Fiscal responsibility is an essential target of the Agency's strategic management policies, and rightly so. Thus, there is particular focus on the three largest sources of Agency operation and maintenance expenses: labor, chemical, and energy. Unlike chemical and energy, however, labor also represents a significant source of both avoided costs and revenue generation as part of their practice at the Agency. The example given above regarding small-scale organizational learning ("The Artifact Talks Back"), indicates how knowledge held by staff can potentially save the Agency significant amounts of money. There is a point at which staffing levels that are low (kept to a minimum as part of the strategic management processes) begin to activate the 'busyness problem,' and possibly result in increased, rather than decreased, expenditures.

The key to sustaining productive organizational learning, then, is to vigilantly support processes and values the lead to open inquiry across all levels of the Agency. This open inquiry will help ensure that Model I behavior does not begin to dominate the Agency learning system. The second key to sustainable organizational learning is to be alert to the 'busyness problem.' Maintaining the balance between fiscal responsibility and staffing workload levels is a critical balance with long-term organizational benefits.

CONCLUSION

Complex systems within the workplace, coupled with changing economic, technical, and regulatory requirements and frequent introduction of new technologies have created the need for and keen interest in organizational learning. There is a desire to understand the processes and environments that best support coordinated activity and organizational learning.

Coordinated activity and organizational learning are particularly critical for agencies that provide public services such water, wastewater, sanitation, gas and electric services, public health services, and protection and emergency services. Thus, it is important to investigate various aspects of organizational activity that promote coordinated activity and organizational learning. Collaboration in this endeavor among researchers from different practices and different disciplines should greatly enhance both the speed and scope of this understanding.

This study investigated how various groups within a public service agency understood their organization's goals, and the effect of these understandings on coordinated activity and organizational learning. The study found that there was a similar awareness of overarching organizational goals among the three groups studied. This may be a result of recent explicit linking of organizational goals and associated performance measures with processes and artifacts of routine practice.

While the awareness of organizational goals was similar among the three groups, differences emerged in the ways the understandings were applied in day-to-

day practice. Such differences may lead to miscommunication among individuals or groups, and thus adversely affect coordination of activities. Further, these differences could potentially result in misunderstandings that could then trigger self-defensive reasoning patterns among these individuals and groups. Such a circumstance may then result in an environment that does not encourage the open inquiry that is foundational to organizational learning.

If Agency staff become aware that there are differences in how the understandings of organizational goals are applied, this awareness may help support an environment that allows for open discussion of competing goals. Open, collaborative inquiry and organizational learning would then likely be the result.

The study found evidence of large-scale transformation of the Agency that began to emerge from 1998, when the name of the Agency was changed in accord with its new mission. This transformation was accompanied by smaller-scale instances organizational learning. But the very processes that have resulted in effective alignment of the Agency processes with the stated strategic goals and efficient operation, are the very same processes that can put organizational learning at risk as well. To avoid this unintended consequence of emerging patterns that may disrupt organizational learning, it is important that the Agency closely monitor and protect the organizational processes, procedures, and values that support open inquiry. Open inquiry is necessary to sustain both large-scale and small-scale organizational learning.

This study was informed by two theoretical frameworks: activity theory and theory of action. This combination of frameworks provided a more robust

understanding of coordinated activity and organizational learning than either framework might have independently, in several ways: (1) in the particular theoretical perspectives that helped shape the creation of tools used to capture, analyze and present results; (2) in the comparative activity (point/counterpoint) stimulated by the juxtaposition of the two theories; and (3) in the research body represented by each theoretical framework and the many ideas stimulated by those 'conversations,' the mediational artifacts that influenced my study.

The framework of activity theory provided a consistent perspective of the activity 'held together.' The framework of theory of action provided a perspective of the uniquely inter-personal aspect of activity and organizational learning. Together, they provided a viewpoint that allowed a simultaneous view of the whole system and the individuals within that system.

APPENDICES

Appendix 1. Grand Tour Interview Form

GRAND TOUR INTERVIEW – _____(Name)_____

Date _____

1. Age Bracket

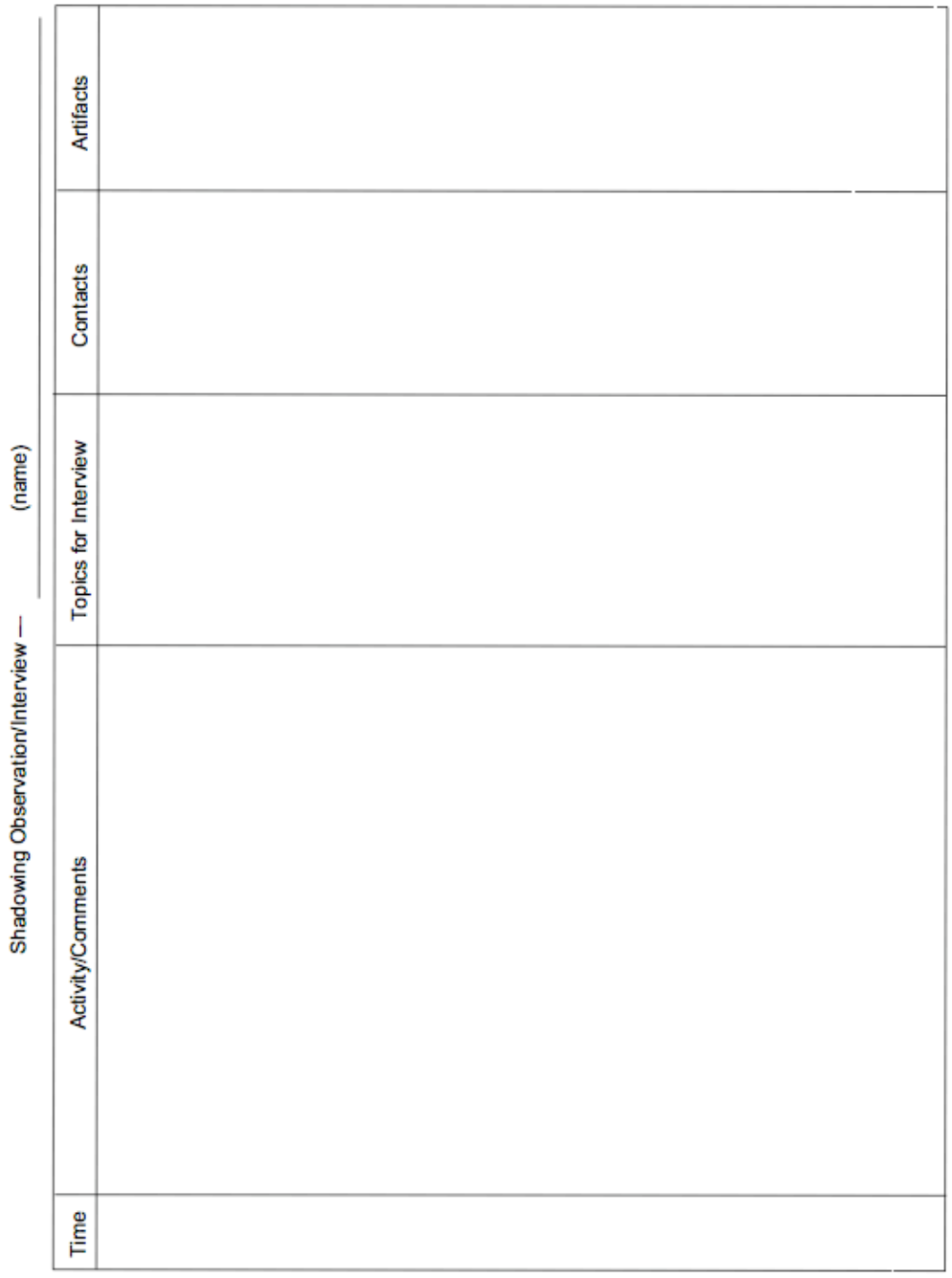
25–29 _____	40–44 _____	55–59 _____
30–34 _____	45–49 _____	60–64 _____
35–39 _____	50–54 _____	65–69 _____

2. Educational History
   - Schools/colleges
   - Professional training
   - Venues of networking

3. Experience History
   - Length; public/private
   - Responsibilities

4. Description of Current Work
   - 'Typical' week
   - Who, what, when, where, how?
   - Internal/external

Appendix 2. Shadowing Observation/Interview Form



Appendix 3. Group Interview Scenario and Reflection Form

Scenario — Group Interview

A regional water reclamation agency is comprised of four interconnected wastewater treatment facilities that handle a combined flow of about 85 MGD from several surrounding communities. Population projections for the service area indicate that within the next 10 years, expansion of existing facilities or construction of a new facility will be required. A team from the Agency has been formed to plan for and manage the expansion of Agency facilities (planning through startup and first year of operation).

1. What advice would you give this team for the task ahead of them?
2. What are some of the challenges they will face?

Reflection — Group Interview

In a complex workplace environment, there are many factors that influence smooth, effective functioning the organization.

1. What are hallmarks of an effective, well-functioning organization? What sets them apart from other organizations that don't seem to function well?
2. What advice can you provide newcomers so that they will be able to grow and function well and thrive within the Agency?
3. What aspects of your work do you find most satisfying or rewarding? What aspects are most challenging, and why?

Appendix 4. 'Typical Day in the Life' Summary – Example

In order to investigate similarities and differences in the daily routines of operators, engineers, and managers, each of the 18 Shadowing Interview transcripts was evaluated according to topical areas suggested by the 'Activity Triangle' categories (subject, object, artifacts, community, division of labor, and rules). This appendix provides one example summary.

TYPICAL 'DAY IN THE LIFE'
INDIVIDUAL PERSPECTIVE — MANAGER 1, DAY 2

Object (Motive)	Goals (Action Plan)	Actions	Instrumental Conditions Mediation by...					Notes
			Community				Artifacts	
			Division of Labor		Rules			
			CoP	Individual	Role	Location		
Conduct business in a cost-effective manner	Consider better ways to do things; ways to either save money or generate revenue.	1. Conduct a brainstorming session with Organics Dept management and administrative staff	Organics Department & Operations Dept	Organics Dept Managemt and admin staff	Facilitator	In-house		Mgr of Operations suggested this brainstorming approach similar to what was done for the Operations Dept
		2. Select promising ideas for further investigation: feasibility then possibly BCE	Consultant training in BCE to Engineering Dept; Engrg Dept give BCE mat'ls to Organics Dept	Organics Dept Staff	Facilitator/Evaluator	In-house	Spread-sheet template	BCE: Business Case Evaluation; Some seem to equate BCE with life cycle analysis. Engrg Dept Deputy Mgr suggests there is a big difference between the two.

TYPICAL 'DAY IN THE LIFE'
INDIVIDUAL PERSPECTIVE — MANAGER 1, DAY 2

Coodinated Activity (Efficient Operation	Plan ways to have Organics Dept staff to interact with other agency depts staff	1. Plan and implement quarterly brown bag sessions for Organics Dept staff	Various depts within the agency	Various	Planning/ Coordina-tion	In-house	Food	Brown Bag sessions like this would be informal presentations and Q&A someone from another dept.
		2. Investigate the feasibility of staff field trips to other locations will similar or complementary operations.	Outside but Associated Commun-ities of Practice	Various	Planning/Coordina-tion	Away from agency	Transpor-tation	Brown Bag sessions are informal sessions in which so

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