

**Gauging Learning in Public Sector Organizations: A Case Study of the  
Penetration Rate Enhancement Program (PREP) of the Virginia Department of  
Social Services**

by

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# **Gauging Learning in Public Sector Organizations: A Case Study of the Penetration Rate Enhancement Program (PREP) of the Virginia Department of Social Services**

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## **Abstract**

*Many public administration scholars and administrators look to the concept of organizational learning as a means of coping with shrinking resources and increasing responsibilities and accountability. At the theoretical level, the notion of organizational learning is appealing, since it emphasizes achieving organizational goals through optimization of internal resources, i.e., assimilation of staff members' fullest potential and organizational visions through the synergistic effects of knowledge creation and continuous learning. There has been a fascination without foundation about organizational learning among scholars of public sector organizations because the validity and utility of organizational learning theory has not been tested in public sector organizations.*

*From the perspective of organizational learning, this dissertation evaluates an intervention program—the penetration rate enhancement project (PREP)—to determine whether and to what extent organization learning has taken place in selected localities. The penetration rate is a foster care funding ratio of federal to state and local dollars. The Commonwealth of Virginia's Department of Social Services through collaborative relationships sought to impart policy knowledge (cooptation) in the local departments of social services (LDSS).*

*This study measured the presence (or absence) of a learning environment that was hypothesized to influence the degree of organizational learning and tested whether it correlates with learning variations as approximated by the penetration rate in LDSSs over a period of more than four years. The main research focus is whether an effective learning environment was related to the extent of learning and thereby may help explain learning variation in public sector organizations. This study uses mixed methods to examine the research questions.*

*The study found evidence of some differential, dispersed, and intermittent learning in various localities. The localities are classified as exhibiting conscious learning, façade learning, unaware learning, and absent learning. Those localities that learned and exhibited evidence of a learning environment are referred to as conscious learners; those localities that saw the presence of learning environment but had not been able to learn are referred to as having experienced façade learning; those localities that have learned but did not see a presence of a leaning environment are referred as to being marked by unaware learning; and those localities that did not learn and did not have a presence of a learning environment are referred to as exhibiting absent learning.*

*The anecdotes of special difficulties experienced by public sector organizations to learn have been reaffirmed by the differential perceptions about learning environments held by the senior and junior level staffers in LDSSs. It is also apparent that problematic organizational structures, an economic (dis)incentive system, and the omission of financial*

*component all contributed to the constraints on organizational learning in LDSSs. Despite the constraints, however, the PREP was largely successful in cultivating organizational learning at the LDSSs, and the organizational learning lens for evaluating intervention programs in public sector organizations at the local level was valid.*

## Personal Statement

This dissertation evolved around the question of whether a statewide intervention program aimed at local departments of social services could be evaluated through the lens of organizational learning theory. The idea emerged both from my intellectual interest in examining the validity and utility of organizational learning theory in public sector organizations and my experience during the last couple of years as a policy analyst and program evaluator at Virginia Tech's Institute of Policy and Governance.

I believe that the environment in which one lives and the communities with which one interacts shape personality and contributes to the development of intellect. This applies both to individuals and organizations. For example, I came to CPAP a decade ago for the study of comparative public administration, but as time passed and as I interacted with CPAP faculty and fellow students, my interest shifted from comparative public administration to organization theories. The driving forces behind this shift were my courses and my interaction with faculty members and students. In particular, Dr. Dudley's policy analysis course,<sup>1</sup> Dr. Rees's organizational behavior,<sup>2</sup> and Dr. Hult's organizational theory capstone courses served as an intellectual intervention resulting in learning, change, and intellectual growth.

I can state with authority that occasional failing grades and incompletes go along with learning and change. Sometimes more learning and humility are gained from failing than from passing. In this sense, the findings of this study present a mirror image of my own learning, change, and missed opportunities. I can even draw a parallel between the penetration rate results and my transcripts and between the survey scores and my false sense of confidence in my own abilities. If evaluated using similar criteria and ratings, I would fall under the façade learning category.

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<sup>1</sup> Although this was a policy analysis course, we spent significant time on understanding the organizational context for policy analysis, which in some way was organization theory.

<sup>2</sup> Since there were only three doctoral students in the class, the level and rigor was raised to the theory level.

## **Dedication**

This dissertation is dedicated to my parents Mr. Hota Nath Pokharel and Mrs. Dhan Kumari Pokharel, who, despite being illiterate, have worked hard their entire life to educate their off-spring. My passion for learning is nothing but a mere reflection of their great souls.

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I must have good Karma to have such a wonderful dissertation committee especially at the time when the Center for Public Administration and Policy was in short supply of faculty members due to a retiring cohort and a lengthy administrative process for hiring professors. Indeed, I could not have asked for any better committee for my dissertation. Dr. Dudley's kind, caring, and gentle push for the better product, Dr. Rees's insistence on opening paragraphs that hit readers and captivate their attention until the end of the chapters,<sup>3</sup> Dr. Hult's superb guidance and insightful suggestions brought this dissertation to this final stage. I must acknowledge that Dr. Hult very kindly allocated a disproportionate share of her time to me during this process. This dissertation would have missed a significant dimension without Dr. Murray's guidance about policy, particularly from a state's perspective. I am profoundly grateful and deeply indebted to these dedicated professors who invested heavily in my intellectual development.

I would like to take this opportunity to thank Dr. Goodsell and Dr. Wamsley for their continued emotional support and encouragement. I also would like to thank Dr. Devi Gnyawali, Professor of Management, for giving his time to discuss with me organization theories in general and organizational learning in particular.

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<sup>3</sup> This vision is still a direction rather than destination for me.

I sincerely thank John Talbott, then Associate Director of the Institute for Policy Outreach, who helped me to refine my ideas by answering all my questions about the PREP project implementation. Raquel Becerra also deserves many thanks for taking notes for me on my prospects defense and discussing with me qualitative research methods and interview techniques. I also thank the CPAP community, which always makes me feel at home in the Thomas Corner building, and the IPG officials who allowed me to use their office space and computers until I completed my dissertation.

I appreciate all directors and staffers of local departments of social services who participated in my survey and took time to express their opinions about the presence of learning environments in their localities. Particularly, I like to thank Mr. Jim Wallis, Director of Pulaski County Social Services, and his staff who pre-tested my survey instrument.

I thank my editors Ms. Shireen Parsons and Dr. John Stubbs who helped me make this dissertation linguistically better.

I have kept the genuine gift of my good Karma until the end. My loving wife Archana and wonderful children Anupam, Aarati, and Susan, give me a joy for life, an inner strength, and a peace of mind. This dissertation would not have been completed without their love and faith.

Mohan P. Pokharel

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# Chapter ONE

## Background and introduction

In this chapter, I provide a brief description of how, by the turn of this century, social service organizations in the US found themselves in a paradoxical situation because of the cyclical nature of their revenues and the countercyclical nature of their service demands. I then explain the specific difficulties of Virginia's Department of Social Services (VDSS) and identify the imperatives of the penetration rate enhancement program (PREP)<sup>4</sup>—the case for this study. After posing the study's major questions, I specify the penetration rate as a proxy for organizational learning. System vision and enhanced penetration rate are considered to be components of organizational learning. This chapter also outlines how each research question is answered and then briefly discusses the general findings. Finally, I present the significance and limitations of this study.

### **The social service paradox**

At the dawn of the 21<sup>st</sup> century, state social service organizations in the US faced two sequential adverse currents that induced them to adopt rapid changes in their business practices. The first was a federal mandate demanding performance measurement and accountability from public sector organizations; the second was the sharp decline in state revenues and consequent budget cuts for social services. Historically, social service organizations were fortunate to have program-based budgets and were much less affected than many other agencies even by the supply-side management movement of early 1980s

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<sup>4</sup> I use PREP as the name of the intervention project instead of FRUTAT, the official name, because of FRUTAT's connotation as referring only to members in the field reading cases and conducting seminars.

(Mullen, 2001). The somewhat privileged position of social services, perhaps due to the sensitivity involved with clientele privacy rights, continued until the promulgation of the Government Performance and Results Act, 1993 (GPRA). The GPRA demanded performance measurement and accountability from all federal agencies including those that provide funding to state and local agencies. Those federal agencies demanded the same from the state and local agencies that sought federal funding. The stringent performance requirements, on the one hand, and the financial and social<sup>5</sup> incentives for meeting the requirements, on the other, brought both challenges and opportunities to state and local social service agencies.

The second adverse current was due to both an economic recession and political preferences. Although economic downturns affect all organizations and businesses, social service agencies, unlike others, are particularly susceptible to the challenging dilemma often called the *social service paradox*. It is a paradox because as the waning economy generates fewer revenues for the states, thus increasing the likelihood of budget cuts for social services, the demand for social services increases significantly. The experience of VDSS was not atypical.

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<sup>5</sup> Those states and local agencies that met these requirements are recognized by the federal agencies, and the rest have been striving to learn from their experience.

## Virginia's response to paradox

The paradox contributed to the need for VDSS to find alternative resources to augment the funds appropriated by the General Assembly so that VDSS could meet the conflicting expectations of doing more with less. While trying to change the foster care<sup>6</sup> funding equation, VDSS looked at a number of federal programs, including the Social Security Act Title IV-E program, as potential sources for procuring more revenue. Under the Title IV-E program, the federal government reimburses the maintenance expense<sup>7</sup> and a portion of administration and training expenses related to foster care for those children who had been found to be eligible. However, “for those children in foster care who have not been found eligible for Title IV-E, the entire costs of their care are borne by the state and local governments in Virginia under the Comprehensive Services Act for At-Risk Families and Children (CSA).”<sup>8</sup> Although the program's eligibility criteria appear to be stringent, the program is the last resort for helping otherwise helpless children. The goal of the Title IV-E program is to:

enable children to live and grow in a safe and stable environment; provide an alternate living environment that is most suitable to the needs of the children if continued residence in their homes is not possible; .... free the children for adoption, emancipation, independent living, or other suitable permanent arrangements.<sup>9</sup>

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<sup>6</sup> The term “foster care” refers to all forms of out-of-home care for minors, including foster care, congregate living arrangements and institutional placements.

<sup>7</sup> Title IV-E covers maintenance expenses for food, shelter, daily supervision, school supplies, clothing, and reasonable travel to the child's home for visitation.

<sup>8</sup> FRU Report Draft—an unpublished document prepared by IPO, VT. January, 2003.

<sup>9</sup> Children's Bureau, <http://www.acf.hhs.gov/>

While there is no cap on the amount that a state can draw from the federal government under the Title IV-E program, failure to secure necessary documentation in a timely manner results in foster care cases being ineligible for the funding. Even more critical are the misplaced cases for federal payments—the false claims for reimbursement invite federal financial penalties if corrective measures are not taken within a given time period (Gruber, 2004). However, if the program is correctly administered, increased federal funding enables Virginia to either widen or deepen the foster care services.

The measure of the federal funding proportion is called the *penetration rate*.<sup>10</sup> The penetration rate is a ratio of federal funding to funding from all sources for foster care; it reflects the amount of funding that the federal government provides<sup>11</sup> to the Commonwealth for the administration of foster care programs. Despite the various incentives and opportunities, Virginia had been unable to reap full benefits from the uncapped Title IV-E program. Virginia's reported penetration rate<sup>12</sup> (about 40%) had been low compared to the national average (around 60%). Thus, increasing the penetration rate became a matter of profound urgency<sup>13</sup> for VDSS.

The other pressing challenge that compelled VDSS to alter some of its old habits was that Virginia had failed in the federal audit conducted during the period under review (October 2000 to March 2001). The federal review had identified both the strengths and weaknesses

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<sup>10</sup> The penetration rate is defined as the ratio of federal funding to the total foster care costs borne by federal, state, local, and other sources. Or, more precisely;  $Penetration\ Rate = \{IV-E / (IV-E + CSA [state + Localities] + Others)\}$ .

<sup>11</sup> The process is commonly termed "cost allocation," and the allocation for Virginia exceeds \$100,000,000 per quarter.

<sup>12</sup> The reported penetration is always higher than the ratio used in this analysis, because VDSS does not count those children in foster care who would not qualify for Title IV-E due to their age.

<sup>13</sup> Each percentage increase in the penetration rate was then projected to generate an additional \$1.5 million in federal funds for the Commonwealth.



of Virginia's foster care system and had assessed the penalty for failing to meet the federal requirements. Following was the stated purpose of this federal review:

The purpose of the title IV-E foster care eligibility review was (1) to determine if Virginia was in compliance with the child and provider eligibility requirements as outlined in CFR 1356.71 and Section 472 of the Act; and (2) to validate the bases of Virginia's financial claims to assure that appropriate payments were made on behalf of eligible children and to eligible homes and institutions. The State was reviewed against the following requirements of the title IV-E section of the Social Security Act:

(a) The eligibility of the children on whose behalf the foster care maintenance payments are made (section 472(a)(1)-(4) of the Act) to include:

1. Judicial determinations regarding reasonable efforts and contrary to the welfare in accordance with 45 CFR 1356.21(b) and (c), respectively;
2. Voluntary placement agreements in accordance with 45 CFR 1356.22;
3. Responsibility for placement and care vested with the State Agency in accordance with section 472(a)(2) and 45 CFR 1356.71(d)(iii);
4. Placement in a licensed foster family home or childcare institution as defined in section 472(b) and (c); and,
5. Eligibility for AFDC under such State plan as was in effect on July 16, 1996 in accordance with section 472(a) (4) and 45 CFR 1356.71(a) (v).

(b) Allowable payments made to foster care providers who comport with sections 471(a) (10), 471(a)(20), 472(b) and (c) of the Act and 45 CFR 1356.30" (Virginia's Title IV-E final report, 2001).<sup>14</sup>

## **Collaboration with Virginia Tech for the PREP**

Against the above backdrop, in September 2001, the VDSS entered into a contract with Virginia Tech's Institute for Policy Outreach (IPO) to create and deploy a Title IV-E Financial Resources Utilization Technical Assistance Team (FRUTAT)<sup>15</sup> with the goal of helping the state boost its federal financial participation or penetration rate. The early assumption regarding Virginia's low penetration rate was improper LDSS assignment of foster care cases to the state funding category under the Comprehensive Service Act for At Risk Youth and Families 1993 (CSA) produced the low penetration rate and thereby the financial distress within VDSS. Similarly, whatever portions of foster care cases were

<sup>14</sup> Excerpt from the federal review final report.

<sup>15</sup> Initially, the current FRUTAT used to be called the Federal Resources Utilization (FRU).

classified as eligible for federal funding did not have proper documentation, resulting in Virginia receiving a failing grade. Thus, the FRUTAT intervention—trainings, seminars, and onsite case reviews—focused on increasing and keeping the penetration rate as high as possible in order to procure maximum federal revenue, while making the foster care cases that were assigned to federal funding error free. During the first phase of the project, FRUTAT reviewed foster care cases at all LDSS across the Commonwealth.

Initially, FRUTAT focused only on the foster care cases then considered to be Title IV-E ineligible and helped LDSS re-determine case eligibility in light of the current legal requirements. Then it began reviewing cases considered to be eligible in order to detect any lack of documentation and also policy and process errors. In other words, FRUTAT intervention helped the LDSS correct both type I and type II errors or false negatives and false positives.<sup>16</sup> At the time of the last penetration rate data collection [March, 2006] and the administration of the survey instrument to measure the presence or absence of organizational learning, FRUTAT was in the last phase of the penetration rate enhancement project. Although FRUTAT had focused on different issues and opportunities for localities, such as Title IV-E, adoption subsidies, quality control (QC) and quality assurance (QA), supplemental security income (SSI) and program improvement plans (PIP), the repeated presence of FRUTAT analysts in the localities and their quality assurance functions appear to have had some positive impacts on the IV-E penetration rate. It must be clarified that these phased programs were progressive in the sense that the second phase was somewhat

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<sup>16</sup> Type I error means rejecting a null hypothesis when it is true, or an alpha error. In this case, type I error was to determine cases to be Title IV-E ineligible when they, in fact, were eligible. Towards the end of the third phase, FRUTAT corrected type II errors—accepting the null hypothesis when it is false or a beta error. In this case, type II errors were the cases determined to be Title IV-E eligible, when in fact they should have been ineligible.

inclusive of the first phase, the third phase was somewhat inclusive of the first and the second phase, and so on. Given the progressive nature of the programs, there were presumably symbolic as well as direct effects of FRUTAT members' revisits in localities on the penetration rate no matter in which phase the project was running. This symbolic effect can be compared with the presence of a blue-and-red-light blinking police car somewhere in given road and the effect of controlling commuters' speed on both sides of the road. FRUTAT's symbolic effect encouraged localities to properly assign cases to appropriate funding sources or deterred localities from misplacing the cases. Although the project focus shifted, the duration of the project was sufficient to make a difference in achieving a higher penetration rate.

The long duration, phase-wise focus shift, and the hundreds of LDSSs involved in the study might make one wonder whether this is one case or instances of various cases. However, this is a single case of state intervention in localities through a collaborative relationship with a university with the single bottom-line objective of enhancing penetration rate to procure more federal revenue by learning the proper rules of the game. Learning the rules of the game also involved detecting and correcting eligibility determination errors making the cases assigned to federal funding sources error free. Hence, this dissertation is a case study of an intervention program that intended to impart certain policy, procedural, and operational knowledge to all LDSS.

## Research questions

The FRUTAT intervention and its impact on the penetration rates can be understood in more theoretical terms. FRUTAT helped LDSSs to boost their penetration rates by detecting and correcting case placement errors, i.e., single loop learning (Argyris and Schon, 1978; 1996; Gruber, 2004), while simultaneously exploring and exploiting revenue maximization opportunities (March, 1991). It did so by engaging LDSSs in different frontiers of their business at different phases of the ongoing project<sup>17</sup> (March and Olsen, 1976; Huber, 1991; Nonaka, 1994). During the project period, organizational learning, as approximated by the penetration rate, both within and among LDSSs occurred differentially. The penetration rate variance among LDSSs throughout the Commonwealth can be understood as an indicator of differential rates of organizational learning. Of further importance to this study, the organizational learning literature suggests that the presence (or absence) of an organizational learning environment determines the degree of learning in organizations (Senge, 1990; Armstrong and Foley, 2003; Watkins and Marsick, 1992; 1996; 2003).

This study begins with framing the exploration of the penetration rates as proxies for degrees of organizational learning, incorporates the dimensions of a learning organization questionnaire (DLOQ) for measuring indicators of the presence of a learning environment, and uses in-depth interviews as a means to dig below the surface. With these measures in

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<sup>17</sup>John Talbott in personal conversation stated that “the focus of the first phase was to increase IV-E penetration rate, the second phase was the adoption subsidy, the third phase was SSI and the fourth phase is the matrix and program improvement plan (PIP) along with QC and QA. We are trying to exhaust all potential federal funding for the state and localities. ”

mind, I posed the following research questions to more fully understand the effects of intervention on learning and to explain the learning variation among LDSSs.

- 1 *Are there variations in penetration rates over time (between September 2001 and March 2006) across five regions of the state and for each LDSS? If so, what is the degree of the variation?*
- 2 *Does an effective organizational learning environment (at the individual, group, and organizational levels with the corresponding dimensions) explain the variation in penetration rate? If so or if not, what insights on organization learning emerge?*
- 3 *What are FRUTAT members'<sup>18</sup> opinions and insights about both the process and the variation in learning and about the residuals not explained by the models?*

## **Dependent variable and hypotheses**

Although, like any other proxy measure in social science, the penetration rate has some weaknesses (Anderson, 2003; King et al., 1994), I chose it as a proxy for organizational learning to have an anchor from which to explore learning in public sector organizations. I contend that the penetration rate is a useful proxy for organization learning because it reflects the detection and correction of eligibility errors (Argyris and Schon, 1996). I hypothesize that organizational learning has taken place in LDSSs, because, first, FRUTAT intervention provided LDSSs with current knowledge of relevant federal and state rules and regulations governing the foster care system. Second, FRUTAT also corrected error cases and taught the LDSSs how to detect and correct eligibility errors. Third, there were

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<sup>18</sup> The federal reimbursement utilization technical assistant team (FRUTAT) members were Virginia Tech employees who worked in the field. Their primary responsibility was to train LDSS staff members through trainings, seminars, and onsite case reviews.

environmental pressures<sup>19</sup> for correctly assigning cases to the appropriate funding sources and making foster care cases error free. A fourth factor was the university's involvement in creating and distributing policy as well as business-process knowledge. Because of the FRUTAT's relentless efforts, the LDSSs at differential rates had been correctly assigning eligible foster care cases to the appropriate funding sources, reducing type I errors<sup>20</sup> to a bare minimum and eliminating Type II errors.<sup>21</sup> Thus, FRUTAT presumably was instrumental in stimulating organizational learning within and among LDSSs in Virginia.

However, additional questions arise. Has the intervention really helped LDSS to permanently correct the Title IV-E eligibility determination errors and kept them from recurring? Has the penetration rate increased and has the increased rate been retained following this intervention? This dissertation examines these questions using the penetration rate panel data.

### **Shared vision as organizational learning**

Organizational learning is more than individual learning (March, 1999), or at least it is individual learning +. The + comes from the group and organizational factors, which are influenced by the organizational environment and culture (Senge, 1990; Watkins and Marsick, 1996; Sessa and London, 2006). A factor that is highly emphasized as the pulse of organizational environment and culture is system vision (Senge, 1990) or shared vision

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<sup>19</sup> For example, the failing grade in the federal audit in 2001, and the realized necessity to pass the second federal review due in 2007.

<sup>20</sup> Unpublished IPO annual report, December 2003.

<sup>21</sup> Although correction of Type II errors under the quality control (QC) program has a countervailing effect on penetration rate, its intermittent effect has been easily absorbed by the long-range time series data without altering the trend.

(Garvin, 2000). Hence, I considered the shared vision as part of organizational learning in addition to quantitatively measurable outcomes, such as the penetration rate.

Social workers and eligibility workers are substantially involved and supervisors and directors minimally involved in eligibility determination for Title IV-E funding and other case management of foster care children. Before the intervention, the differences in perceptions of the eligibility workers and social workers evidently had produced a silo effect that severely hindered LDSSs from accomplishing their penetration rate goals.

Although both social and eligibility workers are employed by the same agency and in the same local jurisdiction, over time the very nature of their work seemed to have created two distinct perceptions about the ground-reality of foster care. The FRUTAT intervention, however, brought the eligibility workers and social workers together in trainings, seminars, and case-readings at LDSS. This provided the local workers with opportunities for coming together to learn, see, feel, interact, and appreciate other dimensions of the same cases.

The intervention presumably had broken the departmental silos and might have broadened the local workers' perspectives. I hypothesize that the interactions between eligibility workers and social workers helped them to develop a shared understanding (Senge, 1990; Nonaka, 1994; Crossan et al., 1999), collective aspirations (Senge, 1990), and mutual appreciation (Argyris and Schon, 1996) across departments. It could have resulted in establishing a culture of experience-sharing (Duncan & Weiss, 1979) and mutual-learning (Garvin, 1993) instead of information-holding and blame-passing (Argyris and Schon, 1978). Indeed, the aforementioned situation should have created a learning environment

within and among LDSSs. To what extent did this happen? I explored this question by administering a survey that sought to tap into the learning environments in LDSSs from individual, group and organizational perspectives.

### **Learning variation and comparison**

Social scientists would be hard pressed to assume that similar stimuli will produce similar responses in any social situation. It is more so when the focus of the study is organizations and the dependent variable (here, the penetration rate) is only an approximation for learning. Therefore, one can safely expect that there would be little to a great deal of statistically detectable learning variations. Here the penetration rate and survey data are compared to see whether and how they are related. The results of this comparison may be consistent with the hypothesis that the presence of a learning environment (as measured by a high mean-score on the survey) will be associated with higher penetration rates.

### **Qualitative and complementary analysis**

Any effort to fully understand the PREP project as a vehicle for engendering learning in the LDSS must go beyond distanced observation and propositional speculation into the minds of FRUTAT analysts by means of in-depth interviews. The inadequacy of quantitative analysis is evident in a case study like this where numbers can tell at best half of the story (King, et al. 1994). Much of the rest must come from human experience. The interviews were designed, first, to interview one-on-one or in pairs and then to use focus-group discussion with all informants at once to better gauge organizational learning in action (Garvin, 1993) from their perspectives. The advantage of using these FRUTAT analysts as



informants is that they could speak both about an evaluation of the intervention and from a knowledge of the localities as they had more than 100 years' combined experience in localities working as social workers, eligibility workers, supervisors, and director. Because of the knowledge of FRUTAT members, the in-depth interviews and focus group discussion presumably capture many of the residual aspects of the case study.

### **Significance of the study**

Since this is a case study of an intervention program to improve the performance of LDSS in Virginia, it is significant in several ways. This study contributes to the public sector organizational learning literature in two ways: first, by testing the validity of organizational learning theories for public sectors organizations in general and social service organizations at the local level in particular, and, second, by examining the empirical evidence of learning (or the lack of learning) in public sector organizations.

This study uses and validates mixed methods in a case study, with findings that are relevant for case studies and for intervention program evaluations in general and for public sector program evaluations in particular. Case studies remain incomplete without utilizing both quantitative and qualitative methods to tap the variation, measure changes and the strength of relationships, and gain insight into reasoning and meaning. Failing to utilize mixed methods in a case study may result in the study's findings suffering from either imprecision or lack of sufficient truth. Hence, this study adds further importance to mixed methods.

The findings of this dissertation may be important to senior level public sector managers in understanding learning dynamics in government organizations in general and in social service organizations in particular; such organizations arguably have at their disposal enormous yet unexploited human capacity on which they can build more competitive, effective, and thriving learning organizations.

From the perspective of state policymakers, the study explores a subject that likely will continue to have significant budgetary implications for Virginia because passing or failing federal audits often means several million state dollars. Degrees of learning as manifested by LDSSs' ability to detect and correct Title IV-E eligibility errors determine whether the state receives a passing or failing grade from the federal audit.

Finally, this study may be significant to federal agencies that suffer from having at best an aerial view of local level organizations as it provides a closer look at the opportunities and challenges facing local level public sector organizations.

### **Limitations of the study**

Since this is a case study of an intervention program implemented at the local level, its narrow focus might compromise its relevance to the vast literature on organizational learning and program evaluation. Moreover, this case study is one of a single state. Other states may have other structures, and therefore may not be replicated without some modification. Similarly, despite the multiple sources of data collection and analysis, triangulation, and a great caution on my part, there is some chance that this study suffered

from an insider's bias. I tried to be consistently aware that I used to be part of the organization that constituted and deployed the FRUTAT team, and I strove to be neutral and objective while interpreting the findings (Yin, 1994). However, I can only control the biases of which I am conscious and some bias may have been subconscious (King et al, 1994). It is necessary to be cautious of potential biases not only in my interpretation of the qualitative survey responses but also while seeking to learn the views and hearing the stories of FTUTAT analysts.

In addition to taking steps to minimize biases, it was crucial for me to identify and narrow the theoretical landscape to have an anchor for the research and to guide interviews and focus group discussions. The primary means used in the PREP project to accomplish the goal of increasing the penetration rate was by creating, transferring, and maintaining policy knowledge and by detecting and correcting errors (Argyris and Schon, 1978). This was accomplished through case-reviews, training of local workers, seminars, and a continuous exchange of experiences that largely fall within the purview of organizational learning. Similarly, whether learning had taken place could not be known until the PREP project was evaluated through the lens of organizational learning theory. Hence, the review of relevant literature on organizational learning and program evaluation will follow in the next chapter after chapter summaries below.

## **Chapter summaries**

**Chapter One** provides brief information about how, by the turn of this century, social service organizations in the USA found themselves in a paradoxical situation due to the cyclical nature of their revenues and the counter cyclical nature of demands for their services. It then explains Virginia's difficult situation and identifies the imperatives of the penetration rate enhancement program, the case for this study. It specifies the penetration rate as a proxy for organizational learning and then poses some intriguing questions that guided this dissertation research. This chapter also argues for the study's significance and cautions about its limitations. The following chapters tell the story of the changes in penetration rates and the relationships among the penetration rate and organizational learning environments.

**Chapter Two** reviews the relevant literature in organizational learning and program evaluation and justifies the selection of literature threads and their relevance to the proposed study. Finally, it builds both the process and the variance-based conceptual models by distilling the essence of the literature and observing the implementation of the PREP project. The penetration rate and the variance-based model are used here to explain the differential learning among localities by region and over time, whereas the process model is used to explain the actual organizational learning processes in local department of social services (LDSSs).

**Chapter Three** outlines the research methodology used for this study. It emphasizes mixed methods for case studies and program evaluations, and then it explains how and how many

penetration rate data were collected and how the data were organized and analyzed. This chapter also explains the survey design, online survey administration, survey data collection, and the methods and techniques used for their analysis. Finally, it shows how one-on-one and in-pair interviews and focus group discussions were conducted and how those data were analyzed.

**Chapter Four** provides the results of the penetration rate data. These data are divided into three different groups. The first is the entire dataset, containing all localities in Virginia. The second dataset includes only those localities that participated in the survey, which was administered to gauge the presence of a learning environment in localities. The third dataset focuses on the localities that did not participate. Each set of data is analyzed and the variations in localities' penetration rates by region and over time are discussed. Moreover, the time trends and the influence of lagged dependent variables on the current penetration rate were examined and the results reported.

**Chapter Five** provides the results of survey data analysis. The survey data indicates the presence (or absence) of a learning environment in participating localities. It finds that the meeting frequencies and the role/title were significant class variable to influence the learning environment at the localities. The analysis also indicates that individual willingness to learn is the strongest factor and the strategic leadership is the most important dimension in creating a learning environment.

**Chapter Six** compares two sets of data—the penetration rate and the survey scores—and concludes that there are four types of learning with several LDSSs in each category. About 61% of localities fall within the hypothesized categories; that is, there will be positive associations between the survey responses (presence/absence of a learning environment) and the penetration rates (extent of learning).

**Chapter Seven** changes gear from statistical analysis to content analysis or from explaining learning variations to outlining the learning process. It presents results from both one-on-one and in-pair interviews and focus group discussions. It maps the PREP and the learning process from the respondents' recollection of the early days of project implementation, full of doubts, skepticism, and suspicions of the current level of trust and respect, to dismay at the project's ending. This chapter also validates (with slight changes) the process model. The content analysis substantiates many results and insights revealed from earlier data analysis, and it also digs beneath the surface in identifying the constraints in increasing the penetration rate or explaining in the anomalies.

**Chapter Eight** concludes that dispersed learning has taken place but that it is on the verge of evaporation. The chapter also offers other observations, such as the state's inappropriate economic incentive system and the resultant moral hazards. The foster care system in Virginia is being burdened with a cumbersome administrative structure in which several governmental jurisdictions overlap due to the mix of local management, state supervision, and partially federal funding. Despite these constraints, the changes made by the PREP over time are clear. Virginia now enjoys an approximate 11 % higher penetration rate and

associated increased federal revenues. The state not only increased the penetration rate but also kept eligibility errors at a minimum and passed the federal audit in 2007, which it had failed in 2001. Finally, this chapter explains the study's contributions to theory, policy, and practice and offers suggestions for future research.

## **Chapter TWO**

### **Literature Review and Derivation of Conceptual Models**

The purposes of this chapter are, first, to review the scholarly literature in organizational learning and program evaluation, and, second, to use this work as the basis for building conceptual models. First, it briefly surveys a broad spectrum of the literature on organizational learning and then identifies several tensions in that scholarship. Second, it focuses more narrowly on the literature that is relevant to this study, provides justification for the selection of literature threads, and explains how they are relevant to the study. Third, it identifies the gaps in the organizational learning literature that relates to public sector organizations in general and the lack of empirical studies focusing on public sector organizations in particular. Fourth, it bridges the link between the empirical study of organizational learning in public sector organizations and program evaluation.

The second part of the chapter builds both a process and a variance-based conceptual model. The process model is built by distilling the essence of the literature and by observing the implementation of PREP project. It is used to map the actual process of how organizational learning took place in local departments of social services (LDSSs).

Although this model was built to capture the learning dynamics of this particular intervention, it has much broader implications for evaluation of intervention programs through the lens of organizational learning. The variance-based model, on the other hand, suggests a possible explanation for the differential learning that took place over time and across regions.



## Part I

### Literature review

The literature on both organizational learning and program evaluation is massive, and an exhaustive review is not attempted here. Instead, the purpose of this review is to identify the threads of literature that are relevant for this dissertation project. The relevant scholarly literature reveals few significant dimensions of organization study that have not been touched by the wave of emphasis on organizational learning. While some scholars in the field propose to consider organizational learning as an “umbrella” term for studies of organizations’ survival strategy and behavior (Argote, 1999; Argyris and Schon, 1996), others find a lack of consensus even at the core, such as the very definition of organization learning (Daft and Huber, 1987; Dodgson, 1993; Popper and Lipshits, 2000; Garvin, 2000), because of the different “takes” and varied parochial disciplinary perspective of the authors contributing to the organizational learning literature (Wang and Ahmed, 2003; Lipshitz, Friedman, and Popper, 2007). The following review demonstrates some of the distinct perspectives on organizational learning, that is, on how learning takes place in organizations.

Some of the towering figures in organizational theory, such as Simon (1976), Cyert & March (1963), March & Olsen (1976), Levitt & March (1988), and March (1991), construct organizational learning as the development of habit, routines, and standard operating procedures to guide behavior. The broad definition of *routine* includes the structure of belief systems, frameworks, paradigms, codes, cultures, and knowledge that buttress an organization’s *modus operandi* (Levitt & March, 1988). The routines reflect rules,

procedures, conventions, strategies, and technologies around which organizations operate. Routines guide individuals' behavior within organizations, and yet they are independent of the individuals who execute them and are capable of surviving considerable personnel turnover.

Levitt and March (1988) further state that the behavior of organizations is determined more by the interpretation of history than by anticipation of the future. The role of history and the notion of routine in organization learning constitute a step forward in the thread of Fiol and Lyles (1985), who maintained that organizations develop and maintain learning systems that not only influence their immediate members but also are subsequently transmitted to others by means of history and norms. Organizational learning is embedded in organizational structures and is manifested through a deliberate balance between exploring new possibilities and exploiting old certainties; through structure, learning stays with the organization despite significant staff turnover and management changes (Levitt and March, 1988; March, 1991).

One impression from the work of these authors is that organizational learning is a linear, monotonically increasing function of deliberate actions, structures, and strategies. However, others view organizational learning as sudden flashes and discontinuous events, and organizational learning happens only during learning moments (Weick and Westley, 1996; Argyris & Schon 1987). Unlike Levitt and March (1988), Daft and Weick (1984) think that organizational learning is not the strict interpretation of history to encode routine; rather it is a cognition of the current staff members or their framework for the interpretation

of history. Indeed, it is their justification of past actions and present activities that determine organizational behavior, be it learning, changing, sense making, or even unlearning (Weick and Westley 1996). This stream of literature focuses on mental models, cognitive maps, and deeply held values and belief systems instead of just behaviors (Daft and Weick, 1984; Weick, 1985; Weick and Roberts 1993; Weick, 1995; Argyris, 1992; Argyris & Schon 1978; Gnyawali and Stewart, 2003).

Still other scholars pay much less attention to behavior and cognition but rather focus on information-based models of organizational learning (Huber, 1991; Pace, 2002). They seem to implicitly assume that valuable information will produce appropriate cognition and behavior of staff members. Huber (1991) identifies four constructs and processes for organizational learning: (a) knowledge acquisition, the process by which knowledge is obtained by at least one part of an organization; (b) information distribution, the process by which information from different sources is disseminated and shared among members of an organization; (c) information interpretation, the process by which distributed information is given one or more commonly understood interpretations; and (d) organizational memory, the means by which knowledge is stored for future use (Huber, 1991; MacDonald, 1995; Pace, 2002).

Similarly, other scholars suggest that the notion of organizational learning has its genesis in systems theory, particularly in open system theory and its ecological, biological, and contingency perspectives of environments and feedback mechanisms (Katz and Kahn 1964; Senge 1990; Gnyawali and Stewart 2003). Peter Senge's *The Fifth Discipline* (1990)

vigorously spread the notion of organizational learning or learning organization as being a function of systemic vision. He is alleged to be utopian (Garvin, 2000) and the spiritual inspirer (Lipshitz et al, 2007) of organizational learning; one can find his famous line frequently quoted in which he defines a learning organization as one where “people continually expand their capacity to create the results they truly desire, where a new and expansive pattern of thinking is nurtured, where collective inspiration is set free, and where people are continually learning how to learn together” (Senge, 1990, p.3). He further explains that the notion of learning together and from each other comes from the system perspective. Hence, system-wide thinking or simply the system thinking has been generally recognized as a necessary but insufficient condition for organizational learning. Systems theory focuses on the identification of systemic patterns, development of systemic thinking, and instillation of holistic visions as part and parcel of organizational learning. Thus, system thinking is both a requirement for and the product of organizational learning (Katz and Kahn, 1964; Senge, 1990; Pedler et al., 1991; Watkins and Marsick, 1999).

Moreover, Nonaka (1994), in the Japanese context, has developed a model for knowledge creation, which has gained wide popularity in the field of strategic management. He has proposed four-stages of knowledge creation and transfer. The stages are: *Socialization*, experiencing tacit knowledge through apprenticeship or training; *Externalization*, converting tacit knowledge to explicit knowledge and articulating the knowledge to other team members; *Combination*, combining different explicit ideas in a process of standardization such as a manual or knowledge management base; and, *Internalization*, the process that converts knowledge from explicit to tacit that involves extracting tacit

knowledge from the newly created knowledge base, putting new knowledge into use, and developing new routines to internalize the changes.

Furthermore, Crossan et al. (1999) have tried to map out organizational learning theory by linking three agents and four processes of learning from an organizational renewal perspective. The agents are the individual, the group, and the organization; and the processes are intuition, interpretation, integration, and institutionalization. In their model, each learning agent intersects with two processes and shares a process with the immediate next agent: that is to say, intuiting and interpreting take place at the individual level; interpreting and integrating take place at the group level; and integrating and institutionalizing take place at the organizational level. The individual is involved in two processes, intuition and interpretation. While the individual is involved exclusively in intuition, this may also overlap in the process of interpretation with a group. The group is involved primarily in interpretation but is also in integration, and the organization is involved in integration. All are involved in institutionalization of organizational learning.

### **Competing perspectives**

Perhaps the aforementioned differing views or competing perspectives within the organizational learning literature are what have kept the debate about learning within organization theory alive and organizational learning theory thriving. Despite disagreements and tensions, including those over the very definition of organizational learning, an agreement seems to be emerging that there are at least two levels of learning. These levels have been variously presented in the literature as lower vs. higher level

learning (Fiol and Lyles, 1985), exploitative vs. exploratory learning (March, 1991), adaptive vs. generative learning (Senge, 1990), technical vs. strategic learning (Dodgson, 1993), behavioral vs. cognitive learning (Yeo, 2002), and single vs. double-loop learning (Argyris & Schon 1987). Single-loop learning occurs when error detection “permits the organization to carry on its present policies or to achieve its present objectives” (Argyris and Schön, 1978, p. 2), and double loop learning occurs when “error is detected and corrected in ways that involve the modification of an organization’s underlying norms, policies and objectives” (Argyris and Schön, 1978, p. 3) Recently other scholars have begun to speculate on more than two levels of learning, referring to them as triple helix, triple-loop learning, which is basically the notion of collective learning about learning or collective mindfulness (Yuthas et al., 2004; Flood and Romm, 1996; Hawkins, 1991; Yoe, 2002; Wang and Ahmed, 2003).

The above review indicates that the organizational learning literature (OL) has experienced continuous growth since at least the late 1970’s. Scholarly interest in and admiration of organizational learning theories have grown across many different disciplines despite the permeable boundaries, contestable assumptions, and questionable domains (Garvin, 1993; Miller, 1996). Given the sheer breadth of OL, one may accept the view of OL being an “umbrella” term for the study of organizations (Wang and Ahmed 2003). OL appears to have consolidated the strengths and elegance of concepts such as organizational change, organizational development, and organizational renewal and seems to have galvanized into an appealing theory for organizational studies (Bapuji and Crossan, 2004, Lipshitz et al., 2007). As a self-conscious, reflexive, and thought-provoking theory, its appeal has gone

beyond the study of organizations to other areas like policy, management, and intervention programs for both public and private sector organizations and for program evaluations (Mara, 2004).

### **The literature gap**

Although scholars of both public and private sector organization theory admire organizational learning theory, the balance of disciplinary popularity becomes quite lopsided when it comes to empirical examination. There have been very few, if any, efforts to test the relevance and validity of OL empirically in public sector organizations or intervention programs. The lack of empirical work raises concern about possible bias in discussions of organizational learning because it is typically viewed as desirable or “positive.”

Worst of all is the absence of systematic evaluation or measurement of organizational learning in public sector organizations (Betts and Holden, 2003). In this regard OL so far has mostly been prescriptive, abstract, and utopian (Garvin, 1993; 2000). This is clearly true when looked at from the perspective of public sector organizations. Using Dewey’s notion of theory-in-practice and theory-in-view, it can be said that OL so far has only been a theory-in-view but not a theory-in-practice for public sector organizations (Argyris and Schon, 1996; Dewey, 1938). The various perspectives and corresponding definitions make one rather confused about the exact nature and forms of organizational learning. There is no unified and universally accepted definition of organizational learning, and most definitions are either contextual or represent their leanings toward a particular school of

thought. A need for a comprehensive and unanimous definition seems desirable to some, while others see the varieties of definitions adding value by bringing multiple perspectives and enriching the field.

In the absence of a comprehensive and agreed-upon definition, a mosaic of definitions mushroom either to add confusion or to represent a particular context. This dissertation does not seek to develop a universal definition but rather adds one more to the crowd of context-specific definitions. My definition is:

*Organizational learning is a continuous process of value/knowledge integration that may take place through informative, interactive, and cooptative modes. It requires an effective learning environment (defined below) and involves acquiring, interpreting, and sharing information and experiences to create meaning through an organizational process. Organizational learning must be reflected in measurable performance improvements by transforming organizational routines, habits, and practices. However, in the case of policy interventions, similar stimuli from a higher level of government cannot be expected to produce similar outcomes in localities, particularly if the information provided has not gone through the group and organizational process to develop shared understanding or is not accepted by localities.*

The organizational learning literature tends to de-contextualize and overemphasize the value of information as if information itself were the end of organizational learning. I do not intend to minimize the value of information but rather suggest that contextualized



information may yield greater value in terms of organizational learning. Other equally important factors, such as cognition, behavior, and experience jointly transform information into usable and useful organizational knowledge. That is to say that information in itself is of little value until it is interpreted, understood, and converted into usable knowledge through some organizational process. This is why this dissertation emphasizes information in relation to other elements of organizational learning. It values cognition, experience and behaviors, process, and measurements as much as information.

This study recognizes the value of information, as a basis of knowledge; cognition, as a frame for shared understanding; lived experience and behavior, as manifestations of cognition; organizational process or intersubjectivity, as shared understanding; and measurement, as a means for recognizing organizational learning. Indeed, the above definition evolves out of Garvin's notion of the 3Ms—meaning, management, and measurement. Meaning cannot be found in a vacuum, however, particularly for the purpose of organizational learning; therefore a piece of information must be acquired or created before giving meaning to it. Once the information is given a meaning, managing and measuring must follow if organizational learning is to take place.

The above points to the other dimension of the problem of organizational learning that this dissertation engages: how do we go about measuring learning in public sector organizations? I think one important way to find out about whether an organization is learning is to conduct a critical evaluation of its past actions and programs. This

dissertation seeks to establish a link between organizational learning and program evaluation.

### **Program evaluation and organizational learning: putting in the missing link**

Very few studies in the organizational learning literature have focused on systematic measurements. This is even more frequently the case in studies of public sector organizations. Although the phrase “systematic measurement” is not anathema to organizational theorists, preaching management without measurement often is accepted pedagogy among public sector organizations/management scholars. Measurement loathing is not only a sure invitation for bureaucracy bashing but also a highly risky game in which failures will not be known until they become fatal. However acute the problem, its solution is at least straightforward. Indeed, program evaluation in many ways solves a measurement problem of organizational learning. It is an irony that the link between measurement (through program evaluation) and meaning (that we give as organizational success through learning) is frequently missing.

Before establishing the link, I wish to briefly introduce the program evaluation literature. The concept of program evaluation has existed for a much longer period than many of the concepts under organizational learning, and it has established its relevancy to public sector organizations and intervention programs. Although the literature on program evaluation appears to be narrower in scope and sharper in focus, several streams of program evaluation address specific yet varying types of programs.

While a theory-driven approach suggests that evaluators identify a program theory to link program activities to outcomes and then use the theory to guide evaluation (Chen and Rossi, 1989; Chen, 1990), a method-driven approach or causal analysis relies on experiments to assess the merit of programs (Campbell, 1987). The utilization analysis approach focuses on the intended user and use of an evaluation and then selects an inquiry method to match those uses (Patton, 1997). The empowerment driven approach encourages both program staffs and clients to take up the task of systematic evaluation (Fetterman et al., 2004), and the betterment driven approach proposes that the merit of evaluation should be based on its potential contribution to the other similar and subsequent project evaluation (Mark et al., 2000).

Another variant of program evaluation taxonomy is based on the purpose of an evaluation instead of its type. Among possible purposes are: an assessment of the program's merit; program and organizational improvement; oversight or compliance; and knowledge development or organizational learning (Mark et al., 2000, Wholey et al. 2004). The interplay between evaluation of organizational learning and organizational learning through evaluation recently has captured the attention of evaluation scholars (Posavac and Carey, 2003; Marra, 2004).

Using selected concepts from the organizational learning literature as the theoretical framework and the institutionalization of gains (i.e., cooptation of local department of social services into the goals of VDSS) as the evaluative goal, this study assesses the

existence of learning environments in LDSSs and the effectiveness of the PREP project in producing learning. The working definition of program evaluation here is:

*Program evaluation is a process of being informed about how one is doing against what one thinks s(he) is doing. Being informed entails retrospection or critical appreciation through triangulation of methods and cross validations of evidence. I concur with Rossi, (1982) that a program is considered to be successful if it has a discounted mean value greater than zero.*

Program evaluation reminds one of an old adage that “it is hard to know where you are headed without first knowing where you have been and where you are standing.” Thus, it is imperative that evaluators be able to precisely map backward from point  $t_1$  to  $t_0$  and forward from point  $t_1$  to  $t_2$  in an ongoing project so that something can be predicted more precisely about point  $t_3$ . Indeed, the difference between what we did in the past and what we should have done is the achievement gap. Hence, the smaller the achievement gap, the better the program’s performance. However, the smaller gap can also mean continuous problems and failures, provided the goals were realistic. In any event, the achievement gap can potentially become a fertile ground in which organizational learning can be cultivated.

## **Part II**

### **Rationale for the literature selection and the conceptual models**

The previous discussion reviewed only some variants from the vast array of literature in both of the fields of organizational learning and program evaluation. This section, first, justifies the selection of a literature thread and clarifies the components of literature that are relevant to the models. Second, it builds both the process and variance-based models. Third, it clarifies assumptions and elements of the models. Finally, this chapter concludes with how these models are expected to better guide the study.

Levitt and March's (1988) momentous work is highlighted because it clearly marks a departure from individual learning to organizational learning. The authors focused on the development of routine to regularize patterns of behavior by individual actors in an organization far beyond the life of a generation specific human beings. Their explanation of routine lays the foundation for both the targeting of learning (change in behavior through intervention) and its institutionalization of learning (development of routine), which also are the issues that this study addresses.

Moreover, March's (1991) explanation of strategic balance between exploration and exploitation mirrors FRUTAT's phase-wise focus on different areas of potential federal revenue for localities. Whatever federal funding that had already been identified and utilized was considered as the exploitation of certainties, and a constant search for new federal revenue sources for LDSS was considered as the exploration of opportunities, which entails some risk. The ideas of single-loop and double-loop learning and the

detection and correction of errors (Argyris and Schon, 1978) are considered to be legitimate lens for viewing organizational learning; they are relevant to this study because the focus of FRUTAT was on detecting and correcting eligibility errors. I analyze organizational learning in LDSSs in terms of their having the ability to detect and correct errors depending on the presence (or absence) of an effective learning environment.

The theme of the fifth discipline (Senge, 1990) is reflected in the three modes of organizational learning that will be discussed in the process model of organizational learning below. System thinking is required for learning to be operational, let alone institutionalized. I hypothesized that through the FRUTAT's effort and implementation of the PREP project the divisional silo separating the eligibility and social workers would be broken. The landmark work of Huber (1991) on articulation of information in the context of organizational learning is vital for understanding how policy information was presented by the members of FRUTAT to the LDSS staffs, how LDSS staffers interpreted it, and how the local staffers received and understood the information; such reactions have important consequences for whether organizational learning takes place.

Nonaka's (1994) model provides the bridge between program evaluation and organizational learning theory. In particular, the *externalization* and *socialization* processes come into play when evaluation of the learning becomes not only the source but also a part of organizational learning (Marra, 2004). Furthermore, there is a close association between Nonaka's four processes of knowledge creation and the proposed three modes of organizational learning [please refer below to the Table 2.1].

The process model also relied on Crossan et al.'s (1999) work. Their excellent mapping of the learning process helped me to shape the proposed modes of learning. I agree with them that learning starts from the intuition of individuals; in this case, from the intuition of experienced FRUTAT analysts, social workers, and eligibility workers in the LDSS. It may become a group process during the seminars, meetings, and training; and then institutionalized in the routines of LDSS modus operandi. The Crossan et al. (1999) model is more conceptual than empirical. While this study may provide conceptual insight, its emphasis is primarily empirical.

The process model was also influenced by David Garvin's work (Garvin, 1993; 2000), because I share the world view that "if you cannot measure, you cannot manage." Finally, this process model has borrowed terms from the work of Gnyawali and Stewart (2003), in which the authors use two modes (informational and interactive) while developing organizational learning theory from a contingency's perspective employing an open system approach.

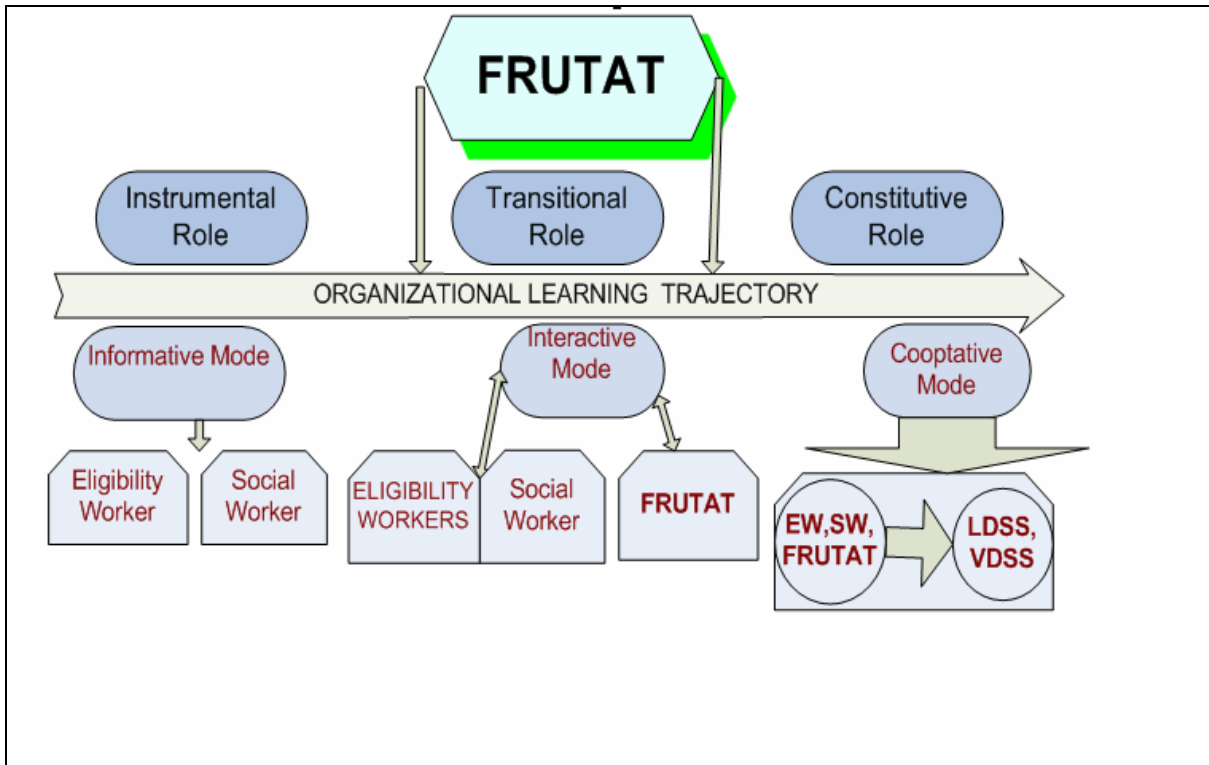
**Table 2.1**

**The Process Model  
Modes of Organizational Learning**

Senge (1990)	Personal Mastery/Mental Model	Team Learning (and System Thinking)	Shared Vision with System Thinking
Nonaka (1994)	Externalization	Socialization/Combination	Internalization
Crossan et al (1999)	Interpretation	Integration	Institutionalization
Gnyawali & Stewart (2003)	Informational Mode	Interactive Mode	N/A
Pokharel (2007)	Informative Mode	Interactive Mode	Cooptative Mode

**Figure 2.1**

**Visualization of the Modes of Organizational Learning**



**Elements and assumptions of the process model**

Building upon the literature review and knowledge of the FRUAT intervention, several modes of organizational learning are proposed for understanding the organizational learning process in LDSSs. As can be seen in the table 2.1 and figure 2.1, there are three modes of organizational learning and three roles that FRUTAT members appear to have played in the process. In what follows, I briefly explain each mode and each role.



*The informative mode* represents the activities that pertain to conveying the information that FRUTAT delivered to the eligibility and social workers at LDSS. Given the nature of that information and its goal, one can infer that FRUTAT analysts played an *instrumental role* with the specific purpose of enhancing penetration rate and thereby maximizing the procurement of federal resources. Notice that under the informative mode, the social and eligibility workers are presented as two separate entities, not integrated together in the process. This reflects the large silo effects within a LDSS and the often disaffected nature of the two groups. Similarly, at this stage, FRUTAT members may not have created an environment in which two-way flows of communication could take place; rather they tried to introduce a set of information. The arrow shows only a one-way flow of information.

*The interactive mode* represents a step forward in the process where there is a two-way flow of communication between FRUTAT analysts and LDSS staff members and among social and eligibility workers. Since the interactive mode requires a two-way flow of information, it can be considered to be a situationally induced mode of learning. Learning at the organizational level crucially depends on participants' willingness to share their insights and experiences while learning the same from others. The FRUTAT analysts presumably played a *transitional role* in the interactive mode of learning. The product/outcome of this mode compared to that of the informative mode is hypothesized to be of higher value/quality in terms of organizational learning. In this mode of learning, the distance between eligibility workers and social workers has almost vanished, and the arrow indicates a two-way communication flow.

*The cooptative*<sup>22</sup> *mode* seeks to reduce, if not eliminate, any variance between the aspirations of VDSS and LDSS. When the learning process transcends the informative and interactive modes and reaches the cooptative mode, a shared understanding is developed, and for the purpose of PREP, learning presumably has taken place. At this stage, FRUTAT is considered to be playing a *constitutive role*. As the diagram suggests, when discrepancies in understanding among the social and eligibility workers and between them and FRUTAT analysts reaches its minimum, the difference in aspiration between VDSS and LDSS approaches zero. Alternatively, when variance is at its minimum, organizational learning (cooptation) reaches its maximum; presumably when variance is minimized, learning has been institutionalized, or cooptation has taken place in the sense that LDSSs are in complete agreement with VDSS regarding the IV-E policy implementation.

There is symmetry between minimum variance among the aforementioned actors and the common understanding between LDSS and VDSS regarding the Title IV-E policy. Since VDSS initiated the program, this dissertation considers that the program's goal has been accomplished (an institutionalization of gain) when organizational learning activities are detected in the cooptative mode.

This model with three modes of learning is a process-based model and cannot explain learning variance among LDSSs. To get a fuller picture of differential learning, I later develop and explain a variance-based organizational learning model. Before going into this,

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<sup>22</sup> VDSS wanted to bring the LDSS directors into the leadership with IV-E policy without changing the current system of revenue distribution structure. This is a similar situation to Selznick (1949), who went on to realize that once others (such as the directors) were brought into the leadership (in his Case, TVA), then the others (eligibility, social workers, and supervisors) have to change the way the organization operated particularly in dealing with IV-E policy.

however, I feel it is important to explain the role of policy knowledge instigators, here the members of FRUTAT.

FRUTAT sought to play a critical catalytic role in promoting learning in LDSS organizations through PREP. This role in its simplest terms is the vertical sum of the instrumental, transitional, and constitutive roles. While the instrumental role focuses on enhancing the penetration rate, the transitional role facilitates the interaction process, and the constitutive role manifests itself in creating distinctive values by matching LDSSs with the aspirations of VDSS. At a glance the value may appear greater when the variance between the views of LDSS and VDSS about the Title IV-E eligibility determination process and its outcome is minimized. However, at a deeper level, the value can be seen as fostering the integrity of the foster care system in the Commonwealth of Virginia by enabling it to serve as many of the most “deserving” clients as possible, according to the intent of the law. Achieving and maintaining these values require VDSS to be on an optimal business trajectory as the deviation can occur by either under or over utilization of the foster care system. VDSS has tried to achieve this goal through collaboration with the university whose team tried to bring LDSS on the same footing through direct corrective actions and symbolic manipulations. Some value may have also been created by the continuous exchange of experience between FRUTAT and LDSS through the process of critical inquiry (Dewey, 1938).

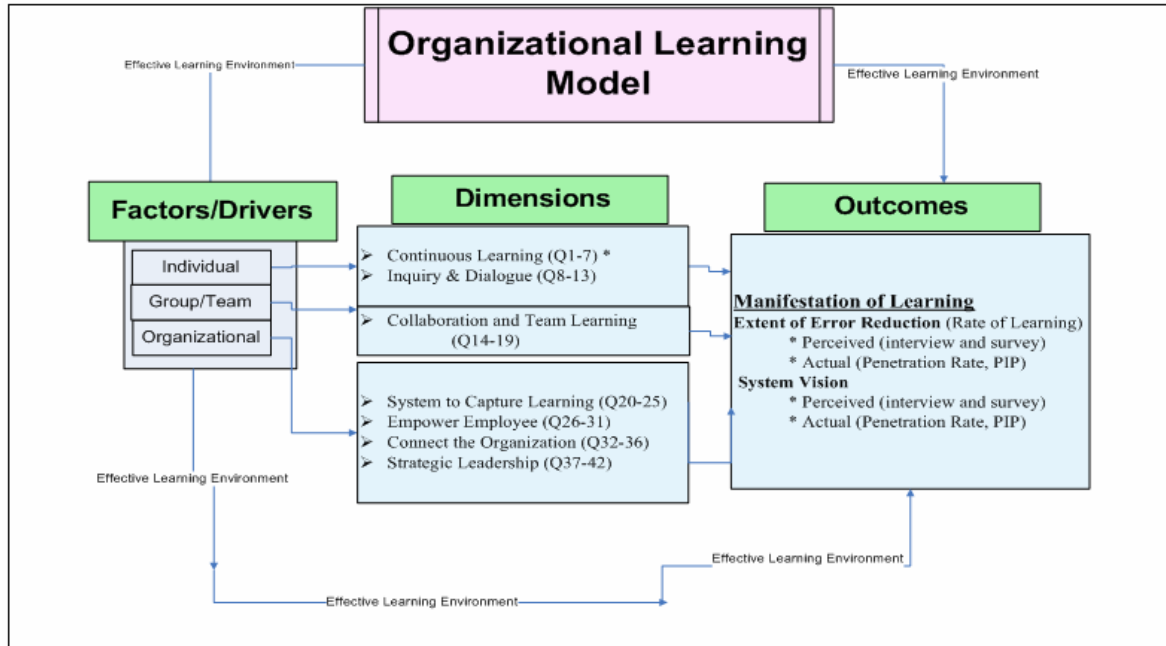
While the former value heightens the probity of socially created public goods (here, foster care), and adds legitimacy to the business of the state agency, the latter value keeps the

university team informed about the grounded reality of policy problems and encourages the external analysts to constantly seek strategies “to put knowledge to work,” and thereby further the social relevance of the university (Bryans, 1999). The primary means of the PREP project for creating values was detecting and correcting errors (Argyris and Schon, 1978) through case-reviews, training, seminars, and continuous exchanges of experiences, which largely fall within the purview of organization learning. Yet the learning in LDSS organizations occurred differentially. So one also needs a way to explain differential learning by assessing the presence (or absence) of effective learning environments.

In addition to the process-based model, I then developed a variance-based model by enhancing the work of Marsick and Watkins (1993) to provide a fuller picture of organizational learning mechanisms and the learning differential. This model (see Figure 2.2) considers the factors (individual, group, organization) and corresponding dimensions (continuous learning, inquiry and dialogue, collaboration and team learning, systems to capture learning, empower people, connect the organization to its environment, and strategic leadership) that constitute an effective learning environment. It provides a basis for measuring the extent to what learning environment is present and may help explain the variations in learning among LDSS organizations as reflected by the analysis of the penetration rate data.

**Figure 2.2**

**Variance-based Model of Organizational Learning**



\* Survey question numbers; see appendix for survey questions.

### The model's dimensions

As Figure 2.2 shows, there are three drivers and seven dimensions or action imperatives of organizational learning (Marsick and Watkins, 1999). These help produce case specific outcomes like the extent of error reduction and the nature of a system vision. The extent of error reduction is captured here by the penetration rate data; the existence of system vision in the post-intervention setting is measured through LDSS staffers' response to a survey and through in-depth interviews with FRUTAT analysts. Since this variance based model is derived from the work of Marsick and Watkins (1993; 1996; 1999; 2003), I am borrowing heavily from them in describing the dimensions and have adopted (with a slight

revision to fit social service organizations) the dimension capturing indicators as indicated in the parentheses next to the dimensions. Learning in organizations goes hand in hand with working in the organization; that is why these authors define learning as a “continuous strategic process integrated with and running parallel to work” (Marsick and Watkin, 1993, p.3). Learning results in changes in knowledge, beliefs, and behaviors and enhances organizational capacity to innovate and grow.

According to the first dimension, organizations must attempt to *create continuous learning opportunities* by effective planning and deliberate action for informal learning, learning how to learn, and just-in-time learning. This can involve continuous learning centers, e-learning, coaching, mentoring, assimilating professional development to organizational goals, offering challenging yet rewarding assignments and providing opportunities to take calculated risks. Creating opportunities refers to better planning, using incentives to support both formal and incidental learning, and providing opportunities to learn from the problems people encounter.

The second dimension is to *promote inquiry and dialogue*, which concerns learning from the experience of others. This is only possible when an organization has a culture of critical inquiry about the subject and of challenging assumptions without attacking individuals. Dialogue calls for trust, open minds, open communication, and an inquiry-supporting organizational environment. Dialogue provides the opportunity for questioning and understanding others’ opinions and being open to new ideas and views; it ultimately helps to build a shared understanding among concerned groups within an organization. Authentic

dialogue and thereby critical inquiry cannot take place in an organization with a culture of doubt, suspicion, uncertainties, defensiveness, and passing blame.

The third dimension is to *encourage collaboration and team learning*. Organization learning thrives when there is an environment that supports collaboration among groups, units, and teams so that information is shared and common understanding is developed. “Team learning is enhanced when teams learn the skill of framing, reframing, experimenting, crossing boundaries, and creating an integrative perspective. Teams can evolve through different levels, from an initially fragmented state to the creation of pooled activities to synergistic effort and finally to an ongoing, continuous capacity to work collectively” (Marsick and Watkins, 1993, p.14). People learn how to work collaboratively through teams, extending an organization’s capacity to achieve unified action on common goals. A genuine collaboration is more likely in decentralized structures where there is collegial feeling and equal status than in centralized structures where there is a hierarchy of authority and lower level staffs are hesitant to speak their minds with higher level officials and vice-versa. In some cases, collaboration and team-learning can extend beyond the boundary of organizations, and staffers also must collaborate with stakeholders. The more the collaboration results in better accumulation of knowledge, the higher will be the level of organization learning. Hence the learning organization must encourage team-learning and collaboration.

The fourth dimension is to *establish a system to capture and share learning*. Marsick and Watkins (1993) state that what is learned must be captured and collected in organizational

memory. Learning organizations find ways to preserve what is learned and utilize that knowledge to sustain them through staff turnover and environmental turbulence.

Organizations may do so by preserving knowledge into the organizational memory and disseminating it to wider and to new staffs. The learning organization is believed to be capable of preserving knowledge without overburdening the system. What this means is that the organization is able to scan valid knowledge and preserve pertinent information while deleting impertinent information that could potentially exhaust the system's capacity.

The fifth dimension is to *empower people toward collective vision*. Again, the structure of the organization becomes a concern, as a rigid structure would not allow people to collaborate and hence develop a collective vision. However, a more flexible structure with employee empowerment will allow developing such vision. A collective vision supports an organizational learning system in several ways. It encourages people to unite themselves with the vision that fosters organizational goals and keeps people committed because they feel ownership of that vision.

The sixth dimension is to *connect the organization to its environment*. Most of the time, an organization suffers from inertia or path dependency and does not keep up with the pace of change in the environment. The longer the organization is not conscious or mindful of this, the farther it can stray from the environment, and long-term survival may be in question.

Therefore, organizations need to be continuously connected with their environment in order to survive and thrive. Connecting with environments may sometimes even require significant changes in structure; moving for example, from command and control to more



of a network-type, flexible, and horizontal structure, permitting it to better connect and respond to important sources of information in the environment.

The final dimension is to *promote strategic leadership*. The significance of strategic leadership for organizational success is the most emphasized aspect of organizational theory in general and organizational learning in particular. The leadership of an organization determines the current action and the future trajectory of organizational life. Thus, strategic leadership becomes a dimension of significant interest to emphasize and measure.

For the purpose of examining theoretical propositions from the viewpoint of public sector organizations, the organizational learning concept needed to be framed in terms of modes of learning and factors that are part of the learning environment. This study later refines the proposed conceptual model based on the results of in-depth interviews and focus group discussion, and then outlines the process on how organizational learning, through collaborative intervention programs, can take place in the local level public sector organizations, that is, LDSSs. Moreover, this study examines factors that may produce an effective organizational learning environment and evaluates its ability to explain learning variations. In this way, both the process and variance of learning are captured in an empirical case study.

## **Summary**

In this chapter, I reviewed a broad range of literature, and then focused on that which is relevant for this study. I identified the dearth of empirical studies in the organizational learning literature in general and in the public sector literature in particular. I also found a gap in organizational learning literature that guides program evaluation. I then derived both process and variance based models, based on both the scholarly literature and speculation about the PREP project's implementation, to bridge the gap between theory and practice and to address the absence of empirical studies of learning in public sector organizations. The process model outlines the learning process and may also explain the anomalies found while comparing the penetration rate and survey data analysis. The variance based model seeks to explain differential learning among LDSSs, by measuring the presence or absence of a learning environment in these organizations. However, the results from any measurements are only as good as a study's research design allows them to be. The next chapter outlines the dissertation's research design.

# Chapter THREE

## Research Methodology

The purpose of this chapter is to outline the study's approach, explain the nature and sources of data it relies upon, and describe the data collection and analytical techniques I used. I describe, first, the penetration rate data and then discuss how they were organized and analyzed. Second, I explain the survey design, online survey administration, survey data collection, and techniques used for their analysis. Third, I describe the interviewees and how the interviews and focus group discussion were conducted. Fourth, the chapter explores how the information gathered from the interviews and focus group discussions supplement the other data analyzed.

This study uses mixed methods—the symbiotic combination of qualitative and quantitative methods—to glean results from the information gathered. While theory-building research may potentially utilize either quantitative or qualitative methods, case studies and evaluation research are, at best, incomplete without simultaneous deployment of both, if they can even be called two different methods (Maxcy, 2003; Green and Caracelli, 1997; Garvin, 1993). Contrary to much conventional methodological wisdom, an emerging stream of methodology emphasizes the middle portion of a quantitative and qualitative continuum and seeks to blend the best of both. A mixed method approach allows bringing together the precision of quantitative methods and the richness of qualitative methods to produce synergetic effects on explanatory powers (Green and Caracelli, 1997; Bartels, 2004; King et al., 1994).

Mixed methods especially appeal to me because of their philosophical linkage to pragmatism (Maxcy, 2003; Datta, 1997). Pragmatism means different things to different people, but here it means an American philosophical tradition that appreciates historical sensitivity, recognizes the localized and contextualized nature of knowledge, allows reasonable doubt as an essential element for organizational study, and emphasizes critical inquiry as a means for gaining an understanding of reality. Hence, in my view pragmatism as a philosophical underpinning provides the best guide for both method and inquiry for organizational learning. Mixed methods also appeal to me because of the very nature of this study where numbers and words together can come closer to telling the full story about the variation in penetration rate (Rossman and Wilson, 1985).

Moreover, this study applies nested analysis as Lieberman (2005) outlined to analyze the penetration rate data. For the nested analysis, the penetration rate data were divided in three groups. The first set is the full data set, which contains the penetration rate data of all localities in the entire state of Virginia. The second data set includes penetration rate data for those localities that participated in the survey (described below), and the third dataset includes the other localities. The third dataset was created and analyzed to check if there were a selection (in this case, non participant) bias.

In addition to employing nested analysis on the penetration rate data, I administered an online survey and conducted interviews and focus group discussions. Before dwelling in detail on each type of data and their analysis, let me reintroduce the research questions that this study seeks to answer.

- 1 *Are there variations in penetration rates over time (between September 2001 and March 2006) across five regions of the state and for each LDSS? If so, what is the degree of the variation?*
- 2 *Does an effective organizational learning environment (at the individual, group, and organizational levels with the corresponding dimensions) explain the variation in penetration rate? If so or if not, what insights on organization learning emerge?*
- 3 *What are FRUTAT members'<sup>23</sup> opinions and insights about both the process and the variation in learning and about the residuals not explained by the models?*

### **The penetration rate data analysis strategy**

The first research question was answered by statistical analysis of penetration rate data. It will be recalled that the penetration rate is the ratio of federal to state and local funding for foster care in Virginia. I collected 50 monthly observations (from September 2001 to March 2006 with four missing observations) of the **penetration rate** for each of the 136 local departments of social services.<sup>24</sup> The dataset captures a time line from the beginning of the project implementation to the effective ending of the penetration rate enhancement program.<sup>25</sup>

I organized the data in an Excel spreadsheet, with region and locality as class variables, and ratio (federal to State and local funding) as the dependent variable. I then used SAS

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<sup>23</sup> The federal reimbursement utilization technical assistant team (FRUTAT) members were Virginia Tech employees who worked in the field. Their primary responsibility was to train LDSS staff members through trainings, seminars, and onsite case reviews.

<sup>24</sup> Currently, there are only 120 LDSS agencies in Virginia, but OASIS still reports 136 agencies in its penetration rate reports.

<sup>25</sup> I use the term “effective end” because the overall contractual relationship between Virginia Tech and VDSS continued until March 2007, but the focus of the project has substantially changed after March 2006.

statistical software to quantitatively analyze the data. There are 6750 observations, with 50 missing data points, ( $50 * 136 = 6800$ ). Primary analysis was done on the full data set, but also nested analysis was conducted by breaking the data into different subsets to compare and contrast the penetration rate results with survey response results. Only 84 localities participated in the survey out of the 136 localities that are reported in the OASIS database for the penetration rate analysis.

VTIPG's<sup>26</sup> FRUTAT team imparted policy and process knowledge to all localities in order to help LDSSs assign cases to correct funding sources, enhancing penetration rates.

Although presumably similar efforts/stimuli were exerted in all localities, the results are mixed. This observation triggered the research question of why similar stimuli resulted in different outcomes. Moreover, it triggered a deeper level investigation into the degree or extent of difference, and whether there were statistically significant variations by region and over time.

Several approaches were applied to understand the variations. First, the analyses of penetration rate data were examined to determine the degrees of variation by region and over time for all localities. Second, a nested analysis (Lieberman, 2005) in a mixed model was undertaken. Nested analysis begins with a large-N analysis (LNA), then drills down to a small-N analysis (SNA), and then triangulates with qualitative analysis. While LNA provides a broader picture of the situation, SNA provides a particular look at subsets of the data, which may be hidden by LNA. Lieberman (2005) proposes using nested analysis to overcome two sets of problems that can be created either by LNA to hide particularity or by the tendency to generalize results from

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<sup>26</sup> VTIPG was established on June 2006 by the merging of IPO, IPPR, and IGA.

one or two case studies. Although discussing it in cross-national comparative politics, he contends that the technique should have much broader applicability in social science. He further explains that the problem in applying nested analysis is the “availability of quantitative datasets with a sufficient number of observations for statistical analysis” (p.438). I have relatively large numbers of observations as well as other reasons to divide the data into smaller subsets, such as comparing localities that participated in the survey with those that did not.

In applying nested analysis, I first checked the distribution of penetration rates and then divided the data into four classes by region. The purpose of this categorization was to better compare performance in the four classes rather than just at a regional level. Thereafter, both multivariate and time-series analysis were undertaken to analyze the penetration rate data. Specifically, I used unstructured analysis of covariance (ANCOVA) to examine variation by region and year without imposing any covariance structure. There are three types of structures of covariance: 1) unstructured, which identifies the covariance among variables without any kind of presumed structures; 2) compound symmetry structure, which assumes that variables are independent from each other; and 3) autoregressive covariance structure, which assumes that previous time period has some kind of effect on subsequent time periods. For all structures the maximum likelihood method and the generalized liner model produces better results than OLS.<sup>27</sup> Although the autoregressive (AR1) structure looks appealing at first glance because of time series nature of the penetration data, I opted for unstructured ANCOVA because the interest here is to explain the variation in penetration rates or the difference rather than to find

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<sup>27</sup> The OLS estimator is still unbiased but it becomes inefficient with a large variance, i.e., the off-diagonal elements in the variance covariance matrix are not zero, which is a violation of one of the assumptions in OLS.

the effect of past penetration rates. Since I was not sure if the prior penetration rate was likely to affect the subsequent rate, I preferred not to force the software on a presumed structure.

### **The survey design and administration**

Examining the second research question relied upon an analysis of survey data using <https://survey.vt.edu>. I conducted an online survey of all social and eligibility workers who had received some forms of intervention (training, seminars, and onsite visitation) as well as of their supervisors and directors. The survey questions were designed to capture what respondents thought about the presence (or absence) of an effective learning environment in their local departments, which may help to explain the differential learning among localities.<sup>28</sup> As stated earlier, one of the goals of this dissertation is to test the utility of the concept of an organizational learning environment for public sector organizations at the local level. In order to achieve that goal, I adapted Marsick's and Watkins's (2003) survey instrument to measure the existence of organizational learning environments, which appears to be well established in the literature.

This study used the revised and tailored (Dillman, 1999) dimensions of a learning organization questionnaire (DLOQ) (Watkins and Marsick, 2003). Every effort was made to get maximum responses out of this online survey as outlined by Dillman (1999). Staffers in 84 localities participated in the survey, yielding a respectable response rate of 45.59% (331 responses out of 726). Potential respondents were calculated from the OASIS

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<sup>28</sup> The survey also contained several open-ended questions that permitted respondents to explain their views and generated some information on class variables, such as their role/title, frequency of meetings, and levels of education.



information for the total number of social workers and eligibility workers in the state and the percentage of their involvement in the foster care cases; the actual respondents are determined by the count of survey returns.

Numerous prominent organizational learning scholars, e. g. (Senge, 1990; March, 1991; Sisakhti, 1999; Garvin, 2000; Marsick and Watkins, (1999, 2003), contend that the degree (and rate) of organizational learning is a function of effective learning environments, which comprise the desire to learn at the individual, group, and organizational levels. Similarly, this study hypothesizes that a public-sector organization learning environment (POLE) is some function of individual willingness (I), group/team supportiveness (G), and organizational readiness (O), which can be written more compactly as:<sup>29</sup>

$POLE = f(I, G, O)$  and seven dimensions [of the variance based model].

The adapted instrument was designed to capture the mean weight that respondents assign to each of the following dimensions of an organizational learning environment: continuous learning, inquiry and dialogue, collaboration and team learning, creating systems, empowering people, connecting the organization, and strategic leadership. These dimensions jointly determine the presence (or absence) of an effective learning environment. The degree of presence of an effective learning environment is hypothesized to explain organizations' differential learning ability. (See figure 2.2.)

Several reasons led me to adapt the aforementioned model and the associated survey instrument. First, the model has three factors that represent the drivers of organizational

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<sup>29</sup> The purpose of this formulation is not to specify a regression equation, but to help organize and communicate my thoughts.

learning, and the instrument has been tested and found to tap into the element of an organizational learning environment. Second, the instrument has been replicated many times in various organizations (Marsick and Watkins, 1996; 1999; 2003) but never in public sector organizations. Third, Marsick and Watkins claim that the instrument avoids upward bias due to self-reporting; yet it can capture individual level motivation to learn. Fourth, it has a very appealing feature of including organizational level questions, which (with some tailoring to fit the LDSSs) seem to capture the organizational dynamics of either helping or hindering organizational learning. In the survey used here, a series of questions asks the respondent to agree or disagree with particular statements.<sup>30</sup> The statements provide information about whether a learning environment exists in a LDSS that could explain the learning variations revealed by the penetration rate analysis. Before proceeding to outline the statistical procedures used to analyze the survey data, I want to briefly describe the pretest of the survey instrument and the subsequent survey administration.

### **Pretest of the survey Instrument**

The instrument was pre-tested in one locality where different role/title holders, including social workers, eligibility workers, a supervisor, and a director participated and gave feedback on the instrument. The survey instrument was then revised accordingly. Before the pretest, the survey contained questions/statements in their original form with seven-point scales. There were not any categorical variables such as role/title, educational level, duration of staff working in that agency, and frequency of meetings. I then included these

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<sup>30</sup> Originally, the survey had seven response categories; however, I reduced it to six categories, in consultation with dissertation committee members, to reduce ambiguous wording and also to standardize the coefficient calculation to a Likert scale.

variables in the instrument. After the pre-test feedback, two questions were deleted, and some were modified to better fit public sector organizations at the local level.

After the revisions (see revised instrument in appendix), the survey instrument was placed in the <http://survey.vt.edu> domain, where questions/statements would pop up in a new window with a click. The email with a clickable link to the survey questionnaire site was sent to all 120 directors of local departments of social services with a request to forward the email and link to all staffers (eligibility workers, social workers and their supervisors) that were involved in handling foster care cases. After the first email, bi-weekly reminder emails were sent three to four times more, followed by telephone calls. As a result of persistent requests through email and by phone, I was able to obtain a respectable response rate of about 45%. However, one limitation of this survey was that I had to rely on directors' cooperation in forwarding this link to their staffers. If a director decided not to participate in the survey and not to forward the email and link to his or her staffers, there was no way for me to reach the end-respondents.

The number of social workers and eligibility workers in the entire state were publicly available, but their involvement with foster care cases was not. So, the numbers of staff involved in foster care cases had to be derived from OASIS (an automated information system of VDSS) to which only staff have access. I was lucky, however, to have had help from a field staffer who had access to OASIS, and she provided the potential respondent numbers and I already had the number of actual respondents from the survey returns.

## **Outline of an analysis strategy for the survey data**

The survey data analysis first examined the mean score for all question/statements and then the mean score for each dimension of a learning environment (continuous learning, inquiry and dialogue, collaboration and team learning, create systems, empower people, connect the organization, strategic leadership) separately. If the mean scores for each dimension were homogeneous, then a single global index could be used in analyzing the survey data and also in comparing these results with the penetration rate data analysis. Since the mean scores were different, the strength of the dimension was examined by using the multiple comparison method. The measure of the presence (or absence) of an effective learning environment in LDSSs was determined from analysis of each dimension's mean score. Moreover, multiple comparisons were performed, using the GLM PROCedure in SAS, to determine the strength of individual, group, and organizational factors. Likewise, multiple comparisons also were used to determine the strength of the dimensions of the learning organization.

Finally, I compared the indications of penetration rates and the survey scores using a 2X2 table. High values for both penetration rate and survey score and low values for both would be consistent with my hypothesis that learning as reflected by the penetration rate would vary with the extent to which a learning environment was present. When findings were not fully consistent, I turned to interviews to help make sense of these anomalies. Rating the penetration rate as "high" was based on three criteria: 1) the tendency or the direction of the penetration rate over time as they appeared on the scatter plots; 2) the stability of the penetration rate that was determined by looking at the oscillation of the penetration rate

scatter plots; and 3) the mean increases in the penetration rate over the 50 month period. This comparison was done at the locality level, while the previously discussed covariance analysis was done by region and over time.

### **Pilot interviews and hypothesized process model revision**

A pilot study was conducted using informal interviews with four people—all part of FRUTAT but with different backgrounds, skill sets, and experiences. These interviews were conducted separately on different dates in an informal and a very friendly setting. They generated the following observations:

- The localities are under severe constraints of both financial and human resources. The low-pay and the consequential high staff turnover make it very difficult for them to keep up with rapidly changing rules, regulations, and broadcasts from VDSS.
- LDSSs understand there are multiple training opportunities to increase the staff's skill levels but again high staff turnover rates and resource constraints divert directors' attention to more urgent issues.
- Achieving a higher penetration rate is also a significant function of exogenous factors like local economic conditions—unemployment, poverty, crime rate, and drug use, in addition to a systematic lack of policy knowledge among LDSS staffers.
- Falling back into old habits or the attitudes of “this is how we do business over here” also was indicated as a cause of a lower penetration rates.

- FRUTAT analysts indicated that there is no direct financial incentive (or, disincentive) for staffers to change their habits as the financial burden of improper case assignment is borne by the state, not by localities.
- The threat of lawsuit due to abuse, neglect, and death of a child is more real than the potential financial consequences, which are yet to come. From the LDSS perspective, being up to date with the rules, regulations, and broadcasts is more cooptation by the state than learning to achieve a competitive edge.

This pilot study made me think that I needed to have both a process and a variance-based model if I wanted to explain the learning variations in LDSSs. As a result, I developed both models to capture the full story. My original concept was that the VDSS was trying to cultivate and institutionalize the policy knowledge that was being created by the professional interaction between FRUTAT and LDSS staffers. I also thought the knowledge was somewhat objective in nature and was designed to help LDSSs become better organizations. However, after the pilot interviews, an alternative explanation became clear. It was the fear that VDSS was trying to co-opt LDSSs. Therefore there was some initial resistance at LDSS to buy into the idea. By co-opting, I mean the state requiring that the localities be conscious of and strive for utilizing the federal resources and following federal rules and guides to the letter. I then changed the construct and interpretation of the process model from institutionalization of learning to the cooptative mode of learning to capture that reality.

The final interview questions (see table 3.1) were designed to capture the assumptions of the process model as outlined and explained in the previous chapter. Although subsequent probe questions and focus group facilitation included somewhat more involved questions than in the following list, major questions that guided the interviews were as follows:

**Table 3.1**

**One-on-one and Focus Group Interview Questions<sup>31</sup>**

1	Do you think the seminars, training, and onsite case review may have helped LDSS to learn Title IV-E policy? Which intervention is more effective?
2	Was there a shared understanding between EW and SW about how localities should operate while dealing with the Title IV-E cases?
3	When you presented the IV-E material, do you think LDSS understood (or agreed with) the content and spirit of it? If yes, how so? If no, why?
4	Do you think the training brought eligibility workers and social workers any closer? If so, how? If not, why?
5	You may have visited the same localities several times in these 5 years; do you think now the LDSS have a broader vision even though it is not reflected in the penetration rate? If yes, how? If no, why?
6	Did you find LDSS staff interacting more comfortably with you and other members of the team now than when you visited the first time? If yes, what might have caused that? If no, why?
7	Did you find LDSS staffs view the problem as an opportunity for interaction and learning? If yes, how? If no, why?
8	Do you think staffs at LDSS give honest feedback to each other? If yes, how? If no, why?
9	You saw a lot of variation in the graphs and Figures I just showed to you. What would you do if you had to minimize variations among LDSS?
10	Do you think learning is a priority in LDSS? If yes, how? If no, why?

<sup>31</sup> These questions were used for the final interview, not the pilot interview. The pilot interview was less structured and more loose.

11	Do think FRUTAT helped them develop shared understanding on this particular policy? If yes, what might have changed that? If no, why?
12	Do you think that LDSSs are now thinking more in line with VDSS than a couple of years?
13	Did you find any change in LDSS staff's attitude towards VDSS over these periods?

## Summary

This chapter outlined the research design and methods that were used to analyze the penetration rate, the survey, and interview data. It focused on mixed methods for this case study because using either quantitative or qualitative methods alone draws only a partial picture of the case. It introduced the concept of nested analysis for mixed models, and highlighted the genesis of the interview questions and the process model and the imperatives for tailoring the survey instrument. Subsequent chapters present the results of each type of data analysis.



## Chapter FOUR

### Results of the Penetration Rate Analysis: The Large Dataset

The purpose of this chapter is to report the results of the penetration rate data analysis.

First, I found statistically significant variation in penetration rates by region and over time.

Second, regression analysis revealed the significant influence of the lagged dependent variable on the penetration rate, suggesting that localities' own histories played a role in explaining the current penetration rates. The regression results also confirmed the positive effect of time for most regions: the longer the PREP efforts were in place, the higher the penetration rates. Third, I concluded that concerted effort can mitigate the regional variation but the time variation will remain intact, as time seems to stand both for random error and for program or policy instability. The analysis is organized to reflect a sort of analytical drilling; it starts from a simple Chi-square test and then goes on to an ANCOVA, and finally moves to regression analysis.

Before analyzing the data in details, I checked its distribution by region to see whether the penetration rate caseloads were uniformly distributed. As the following figure 4.1 shows, there is a great variation in how caseloads are distributed among regions. While the Central and Northern regions cover almost 50% of the cases, the remaining 50% is distributed among the other three regions.

## Figure 4.1

### Distribution of Foster Care Caseloads by Region

<u>Region</u>	<u>Frequency</u>	<u>Percent</u>
Central	1650	24.44
Eastern	800	11.85
Northern	1700	25.19
Piedmont	1550	22.96
Western	1050	15.56

Chi-Square 477.78 P= 0001 N= 6750

Although the caseload numbers provide a good bird's eye view of the distribution, they do not have any other analytical value. For further analysis and better comparison of the penetration rate among regions, I transformed the data (or raw percentages) into quantiles employing the Univariate<sup>32</sup> PROCedure in SAS.

Dividing the data into quantiles allowed me to rank the groups from worst performing to best performing. It permitted me to identify differences not only by region but also by quantiles-based class levels within regions, making richer analyses and comparisons. The quantile values also depict both the penetration rate thresholds between quantiles and the distribution of data. If the data are uniformly distributed, the first quantile falls around 25%, and the median around 50%, the third quantile around 75%, and above this is the fourth quantile. The distribution here, however, is not uniform: 33.33% of the observations fall within the first quantile, the median is 47.37%, and the third quantile is at the 60%.

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<sup>32</sup> The Univariate PROCedure in SAS gives the most useful descriptive statistics, such as the mean, median, mode, standard deviation, variance, skewness, Kurtosis, coefficient of variation, standard error of mean, and quantile

With this information on data location, the data were then further classified into four classes: class 1, between 0 and 33.33%; class 2, between 33.33% and 47.37%; class 3, between 47.37% and 60%; and class 4, anything above 60%.

## Figure 4.2

### Foster Care Case Distribution by Class

<u>Class</u>	<u>Frequency</u>	<u>Percent</u>
1	1577	23.36
2	1831	27.13
3	1562	23.14
4	1780	26.37

Chi-square 33.84 N=6750

Clearly foster care caseloads are not uniformly distributed across the classes. Moreover, as figure 4.3 indicates, the region of the state in which an LDSS is located is associated with the level of its penetration rate. Knowing the region of an LDSS increases one's ability to predict its penetration rate by more than 20% (contingency coefficient = .2088).

**Figure 4.3****Distribution of Foster Care Caseload by Region and by Class**

Region	class				Total
Frequency	1	2	3	4	
Expected					
Cell Chi-Square					
Percent					
Central	441	466	296	447	1650
	385.49	447.58	381.82	435.11	
	7.9937	0.7583	19.29	0.3248	
	6.53	6.90	4.39	6.62	24.44
Eastern	88	145	223	344	800
	186.9	217.01	185.13	210.96	
	52.337	23.894	7.7485	83.896	
	1.30	2.15	3.30	5.10	11.85
Northern	440	489	448	323	1700
	397.17	461.14	393.39	448.3	
	4.6186	1.6831	7.5801	35.02	
	6.52	7.24	6.64	4.79	25.19
Piedmont	425	467	307	351	1550
	362.13	420.45	358.68	408.74	
	10.917	5.1533	7.4467	8.1567	
	6.30	6.92	4.55	5.20	22.96
Western	183	264	288	315	1050
	245.31	284.82	242.98	276.89	
	15.828	1.5222	8.3423	5.2456	
	2.71	3.91	4.27	4.67	15.56
Total	1577	1831	1562	1780	6750
	23.36	27.13	23.14	26.37	100.00

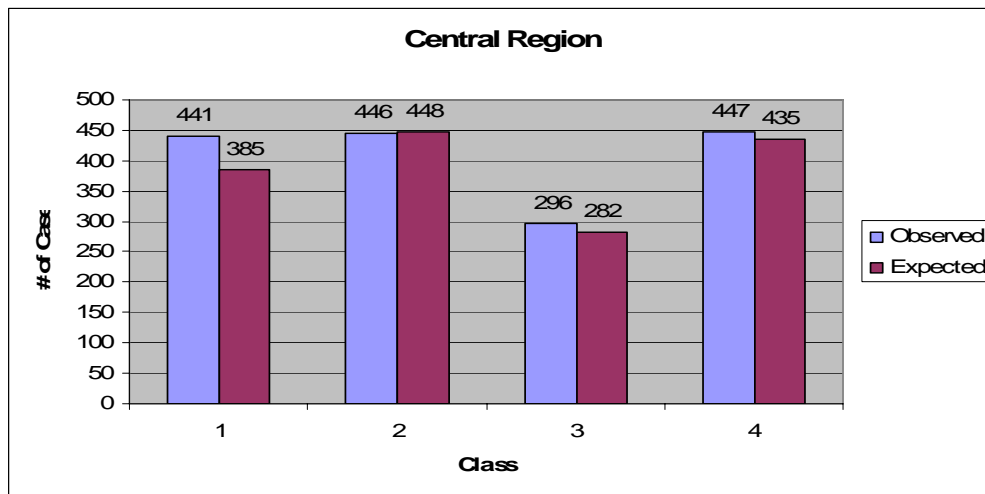
Statistics for Table of Region by class

Statistic	DF	Value	Prob
Chi-Square	12	307.7538	<.0001
Likelihood Ratio Chi-Square	12	315.2753	<.0001
Mantel-Haenszel Chi-Square	1	0.0576	0.8103
Phi Coefficient		0.2135	
Contingency Coefficient		0.2088	
Cramer's V		0.1233	

This regional variation deserves a closer look. First, figure 4.4 focuses on the central region.

**Figure 4.4**

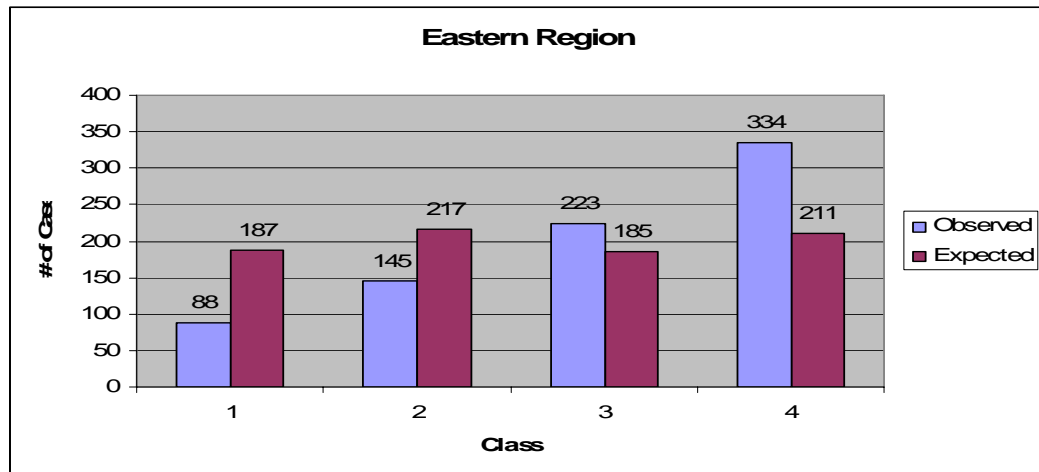
**Foster Care Case Distribution by Class: Central Region**



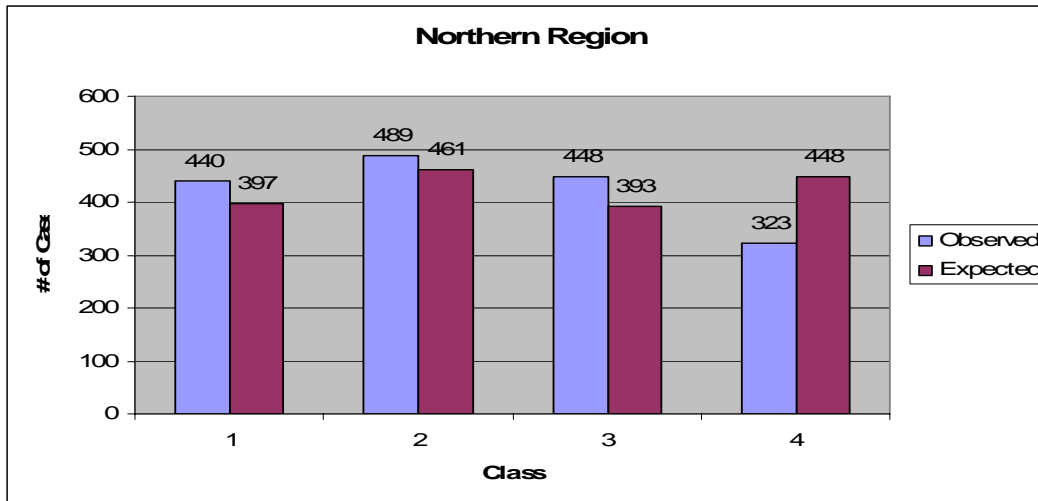
- There is a heavy concentration of cases in class 1, with penetration rates of 33% or lower. This means that the Central region is performing very poorly. If it had an average penetration rate performance, the difference between expected and observed values would not have been statistically significant (Chi-square=7.99). In the median value category, the central region achieved as expected, yet it did worse than expected in the class 3 category. In the class 4, however, the observed penetration frequency is higher than expected, but the difference is not statistically significant (Chi-square = 0.32). Overall, the Central region performed poorly in the 1<sup>st</sup> and the 3<sup>rd</sup> class categories and as expected in the 2<sup>nd</sup> and 4<sup>th</sup> categories. Alternatively, Central region had a few cases that did well, falling into the fourth class category, but it also had a large number that failed to meet expectation (the first and third class categories).

### Figure 4.5

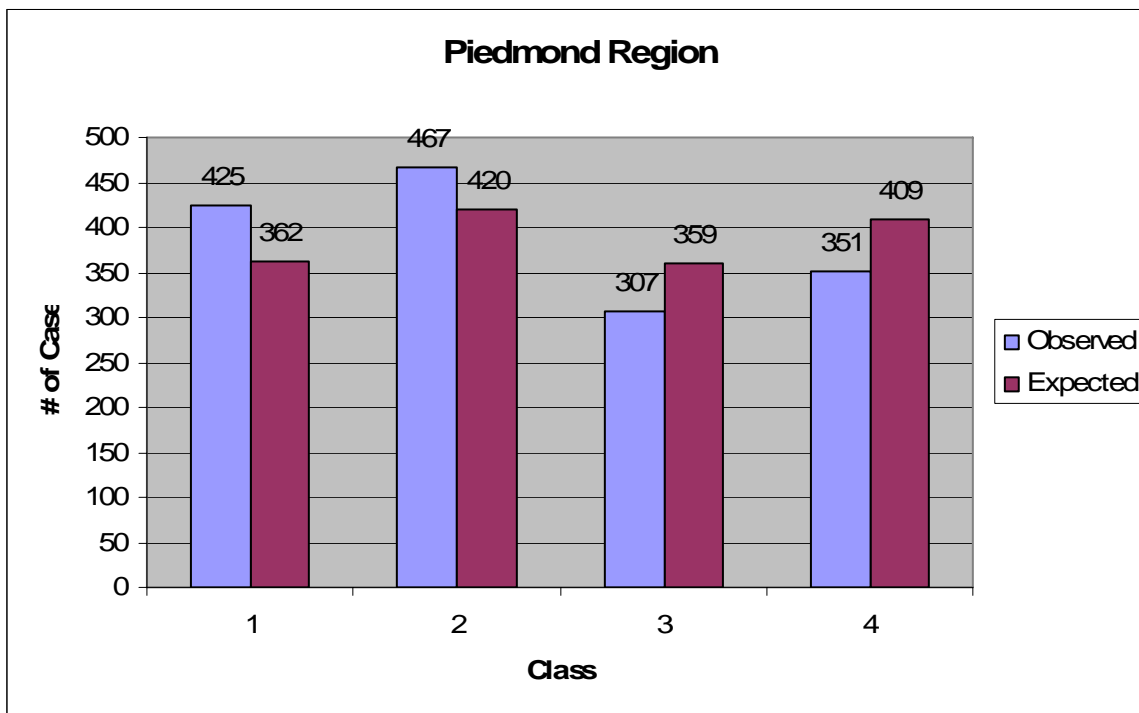
#### Foster Care Case Distribution by Class: Eastern Region



- The Eastern region did very well in terms of having a very few cases in the class 1 categories—observed foster care caseload 88 versus expected foster care caseload 187 (Chi-square = 52.33). This region also has a low observed caseload 145 versus expected caseload of 217 (Chi-square = 23.89) in class level 2. For class level 3, it has 223 observed caseloads versus expected caseloads 185 (Chi-square = 7.75). For class level 4, it has 344 caseload observed versus expected 211 caseloads (Chi-square = 83.9). This region has much lower observed foster care caseloads of cases for the 1<sup>st</sup> and 2<sup>nd</sup> class categories, which are in the lower half of the range and has much higher observed caseloads for the upper half of the range. Hence, the Eastern region did extremely well in achieving higher penetration rates compared to other regions.

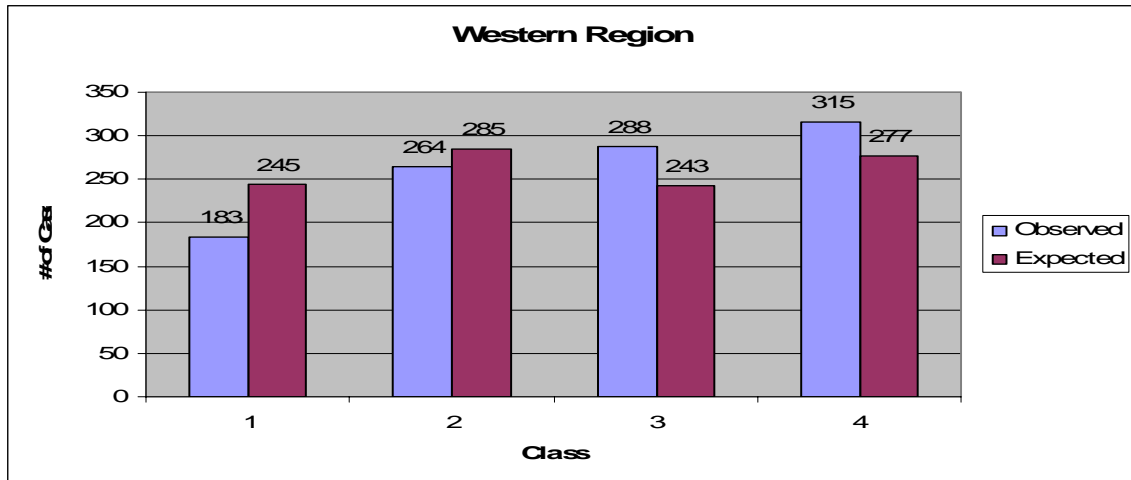
**Figure 4.6****Foster Care Case Distribution by Class: Northern Region**

- The Northern region has 440 observed versus 397 expected caseloads for class 1 categories (Chi-square=4.62). For the class 2, it has 489 observed versus expected 461 caseloads (Chi-square =1.68); this difference is not statistically significant although the raw numbers look somewhat different. This means that for class 2, the Northern region achieved what was expected. This region has 448 observed versus 393 expected caseloads (Chi-square = 7.58) suggesting that the Northern region did well for the class 3 categories. However, it has only 323 observed versus 448 expected caseloads (chi-square = 35.2), suggesting that for the class 4 category, it did not meet the expectation. Overall, the Northern region did well in the vicinities of the median value but failed to do well at the upper and lower ends of caseload distribution.

**Figure 4.7****Foster Care Case Distribution by Class: Piedmont Region**

The Piedmont region has a serious problem compared to the other regions. It has higher observed caseloads for classes 1 and 2, and both differences are statistically significant (Chi-square =10.91 and 5.15, respectively). Likewise, this region has lower observed than expected caseloads for the upper half or for class 3 and 4 categories. The observed caseload for class 3 is 307 versus expected 359 caseloads (Chi-square =7.45), and for class 4 category, the observed caseload is 351 versus expected 448 caseloads (Chi-square = 8.16). Hence, the Piedmont region could not maintain the comparable penetration rate vis-à-vis other regions.



**Figure 4.8****Foster Care Case Distribution by Class: Western Region**

- The Western region had fewer of class 1 cases (Chi-square = 15.83). There is a slightly lower observed caseload in class 2, but the difference is not statistically significant (Chi-square = 1.52). For the classes 3 and 4, this region has 288 observed caseloads versus 243 expected and 315 observed versus 277 expected caseloads respectively. Both are statistically significant (Chi-square = 8.34 for class 3 and it is 5.24 for class 4).

Contrary to widespread belief about its overall performance, the Western region performed well, almost as well as the Eastern region and much better than the Piedmont, Central, and Northern regions. Piedmont performed very poorly, and the Central region remained neutral in terms of how this region might have been expected to perform relative to other regions. The Northern region did not do as well as one would think of this region because the Northern is considered to be the “best” region in Virginia due to socioeconomic factors and its proximity to the nation’s capital.

This analysis is a large sample analysis (or LNA to use Lieberman's term), which covered all localities' penetration rates in the Commonwealth over a 50 month time period. Next, I will concentrate on a small sample analysis (or SNA) so that the data become more comparable to the survey results.

## Results of the penetration rate data analysis: the 2<sup>nd</sup> dataset

A subset of these data included the penetration rates of only those localities that participated in online dimensions of organizational learning questionnaire, the DLOQ. This dataset has only 84 instead of 136 localities, and number of foster care cases is 4100 instead of 6750.

### Figure 4.9

#### Caseloads by Regions

Region	Frequency	Percent
Central	1150	28.05
Eastern	600	14.63
Northern	950	23.17
Piedmont	750	18.29
Western	650	15.85

N = 4100    Chi-square 253.66

Again, caseloads vary by regions (see figure 4.9) and by class (see figure 4.10), and the difference is statistically significant ( $p = .0001$ ).

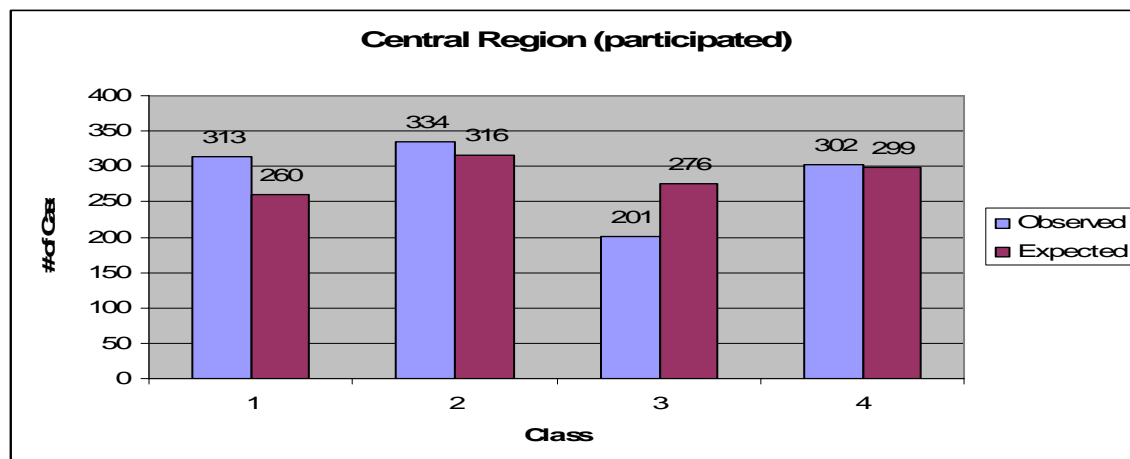
**Figure 4.10****Caseloads by Class**

Class	Frequency	Percent
1	926	22.59
2	1126	27.46
3	983	23.98
4	1065	25.98

N = 4100      Chi-square 22.80

In addition, penetration rate performance levels vary by region in this subset (see appendix). Again, the results are similar when analyzing only participating localities' penetration rates. Although there are slight improvements in some regions and a slight slackness for other regions in penetration rate performance, it is quite reassuring to me that response bias appears to be minimal.

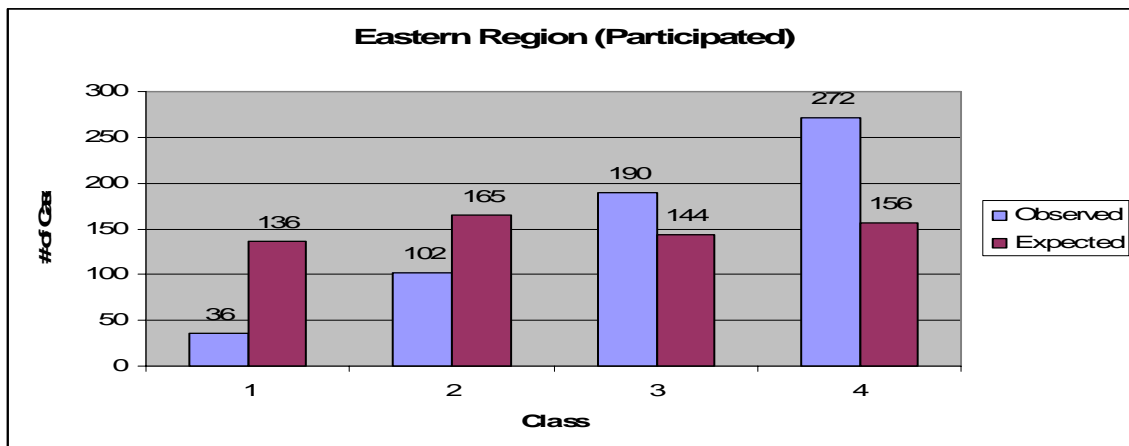
The following figures show the observed versus expected caseload frequencies and the explanation follows.

**Figure 4.11****Foster Care Case Distribution by Class: Central Region**

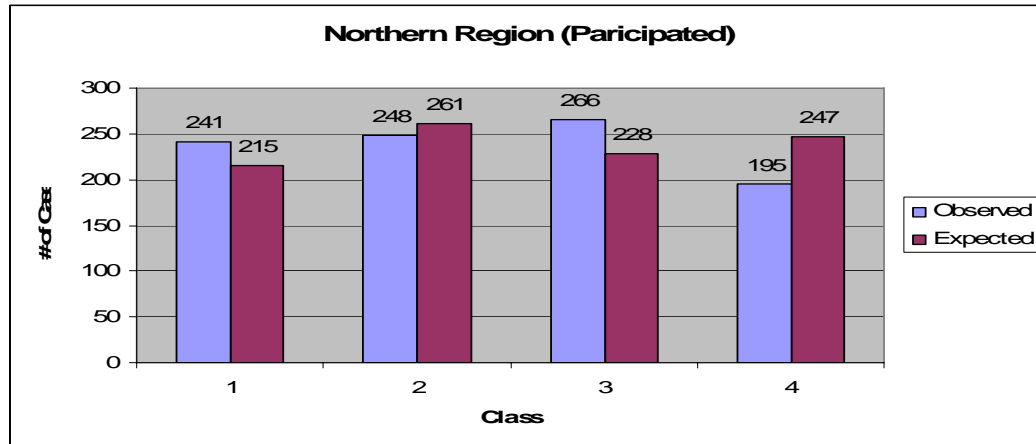
- The Central region again fails to achieve expected penetration rates for all 1, 2, & 3 class categories. As the above chart shows, this region has more observed caseloads for class 1 and 2 and less observed caseload for class 3. It does have somewhat more observed than expected caseloads for the class 4 category; however, the difference is not statistically significant (Chi-square = 0.04).

**Figure 4.12**

**Foster Care Case Distribution by Class: Eastern Region**



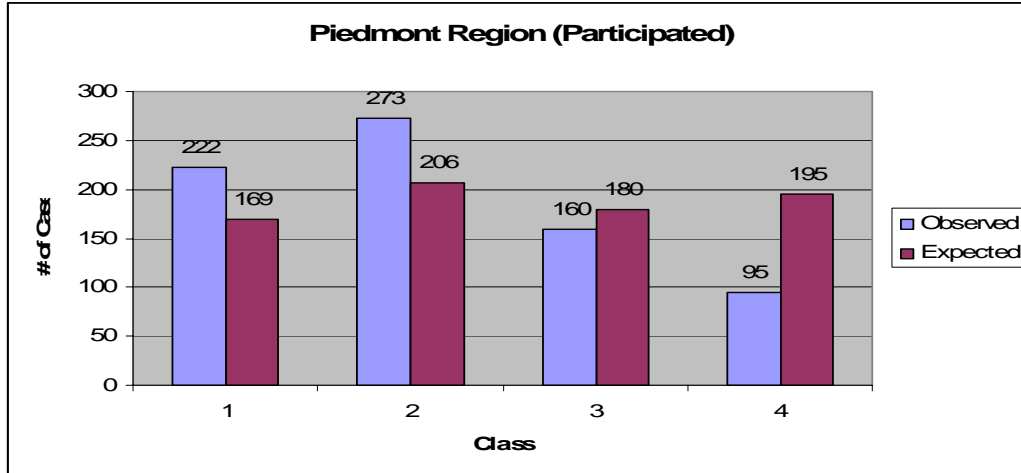
- The Eastern region did very well by having low observed caseloads in class 1 and 2 categories than expected and also having higher observed caseloads in class 3 and 4 caseloads. All class values are statistically significant (Chi-square =73.08; 23.9; 14.80; and 86.56 for classes 1 through 4 respectively).

**Figure 4.13****Foster Care Case Distribution by Class: Northern Region**

- The Northern region once more appears to do poorly as it has higher observed caseloads for the class 1 and low observed caseloads for class 4. For class 2, it did have low observed caseloads compared to expected caseloads but the difference is not statistically significant (Chi-square = 0.64). It, however, achieved better results in class 3 categories in which there is 266 observed versus 228 expected caseloads, and the difference is statistically significant (Chi-square = 6.42).

**Figure 4.14**

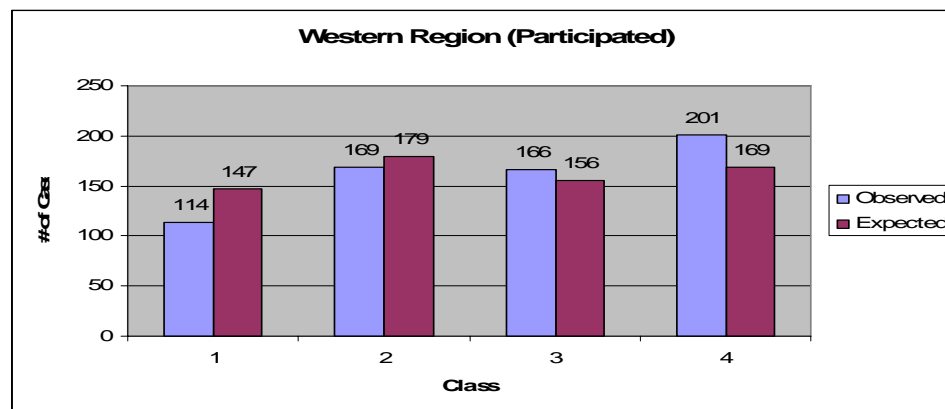
**Foster Care Case Distribution by Class: Piedmont Region**



- The Piedmont region again stands at the lowest position as it has higher observed frequencies for class 1 and 2 and lower observed frequency of class 3 and 4 categories. All values are statistically significant suggesting that this region did very poorly than expected in all four class categories.

**Figure 4.15**

**Foster Care Case Distribution by Class: Western Region**



- The Western region has lower observed frequencies than expected for classes 1 and 2 and higher than expected observed caseloads in classes 3 and 4. This time, however, the differences between observed and expected frequencies for class 2 and 3 cases are not statistically significant. Nevertheless having lower observed caseloads in the lower class cases and higher ones as class increases make this region quite a strong achiever.

In summary, when one considers the only those penetration rates of localities that responded to the DLOQ, the Eastern region performs the best followed by the Western region; the remainder did far less well. The Central and Northern regions evidently are doing somewhat better than the Piedmont, but the difference is not statistically significant; hence nothing can be said with confidence. The analysis shows that the Piedmont region might well learn from the practice and examples of other regions.

### **Results of the penetration rate data analysis: the 3rd dataset**

Finally, the third dataset includes those localities that did not participate on the survey. Again for this subset one can reject the null hypothesis that regions were not associated with variation in penetration rates ( $p = .0001$ ). See figure in the Appendix. In this dataset, the Western region performs the best, followed by the Eastern region; the Piedmont region performed slightly better than the Central with the Northern region remaining in the middle. These findings suggest that at least in terms of regional variation in penetration

rate, the responding localities were not very different from those that failed to complete the survey.

Since this dissertation is a case study of the PREP project, which included the entire state, the remaining analysis in the text focuses on the whole state. Nevertheless, the results of the variance–covariance ANCOVA analysis examining the similarities and difference in penetration rate among regions and over time for the 2<sup>nd</sup> and the 3<sup>rd</sup> data sets may be found in the appendix.

### **Analysis of covariance**

The purpose of the following analysis is to examine the differences in penetration rate, approximating variation in organizational learning, by region and over time. It was prohibitively complex to conduct a locality level analysis on learning difference in all localities using penetration rate data. Moreover, there would not have been any other measures to compare, contrast, and validate the locality level penetration rate for all localities. So, I chose to conduct locality level analysis on the mean value of penetration rates over time and then compare those data with survey scores to see whether and how the two sets of results inform each other (see chapter six).

Using the penetration rate data, I conducted an analysis of covariance (ANCOVA) employing the Mixed PROCedure in SAS. This procedure gives the results of an advanced level analysis of covariance as it combines the least square estimate of regression with analysis of variance/covariance factoring in both fixed and interaction effects. Below I



report results from an unstructured<sup>33</sup> covariance model.<sup>34</sup> Although I examined the results produced using all three covariance structures, the unstructured model seems to fit the data better (SAS codes are in the appendix E).

## Figure 4.16

### Results of the Unstructured Covariance Model

The Mixed Procedure (Model Information)										
Data Set	PRA.PR									
Dependent Variable	ratio									
<b>Covariance Structure</b>	<b>Unstructured</b>									
Subject Effect	Locality									
Estimation Method	ML									
Residual Variance Method	None									
Fixed Effects SE Method	Model-Based									
Degrees of Freedom Method	Between-Within									
Number of Observations										
Number of Observations Read	6750									
Number of Observations Used	6659									
Number of Observations Not Used	91									
Type 3 Tests of Fixed Effects										
Effect	Num	Den	F Value	Pr > F						
	DF	DF								
Region	4	130	7.10	<.0001						
Year	5	130	14.18	<.0001						
Differences of Least Squares Means										
Effect	Region	year	_Region	_year	Estimate	Standard Error	DF	t Value	Pr >  t	Adj P
<b>Region</b>	<b>Central</b>		<b>Eastern</b>		<b>-0.1347</b>	<b>0.02935</b>	<b>130</b>	<b>-4.59</b>	<b>&lt;.0001</b>	<b>0.0001</b>
Region	Central		Northern		-0.04327	0.02363	130	-1.83	0.0694	0.3602
Region	Central		Piedmont		-0.02486	0.02432	130	-1.02	0.3087	0.8449
<b>Region</b>	<b>Central</b>		<b>Western</b>		<b>-0.09700</b>	<b>0.02688</b>	<b>130</b>	<b>-3.61</b>	<b>0.0004</b>	<b>0.0039</b>
<b>Region</b>	<b>Eastern</b>		<b>Northern</b>		<b>0.09140</b>	<b>0.02926</b>	<b>130</b>	<b>3.12</b>	<b>0.0022</b>	<b>0.0184</b>
<b>Region</b>	<b>Eastern</b>		<b>Piedmont</b>		<b>0.1098</b>	<b>0.02983</b>	<b>130</b>	<b>3.68</b>	<b>0.0003</b>	<b>0.0031</b>
Region	Eastern		Western		0.03767	0.03194	130	1.18	0.2405	0.7632
Region	Northern		Piedmont		0.01841	0.02421	130	0.76	0.4484	0.9414
<b>Region</b>	<b>Northern</b>		<b>Western</b>		<b>-0.05373</b>	<b>0.02678</b>	<b>130</b>	<b>-2.01</b>	<b>0.0469</b>	<b>0.2688</b>
Region	Piedmont		Western		-0.07214	0.02739	130	-2.63	0.0095	0.0702
year		2001		2002	-0.00566	0.005822	130	-0.97	0.3331	0.9262
year		2001		2003	-0.02866	0.007704	130	-3.72	0.0003	0.0039
year		2001		2004	-0.01099	0.007716	130	-1.42	0.1567	0.7121

<sup>33</sup> There are three types of structures of covariance: 1) unstructured, 2) compound symmetry structure, and 3) autoregressive covariance structure.

<sup>34</sup> Similar analysis of the second and third dataset results are in the Appendix.

year	2001	2005	-0.00251	0.007589	130	-0.33	0.7418	0.9995
year	2001	2006	0.01299	0.008461	130	1.54	0.1272	0.6423
year	2002	2003	-0.02300	0.004821	130	-4.77	<.0001	<.0001
year	2002	2004	-0.00534	0.005107	130	-1.05	0.2979	0.9017
year	2002	2005	0.003150	0.005397	130	0.58	0.5605	0.9920
year	2002	2006	0.01864	0.007304	130	2.55	0.0118	0.1168
year	2003	2004	0.01767	0.003206	130	5.51	<.0001	<.0001
year	2003	2005	0.02615	0.003763	130	6.95	<.0001	<.0001
year	2003	2006	0.04165	0.006540	130	6.37	<.0001	<.0001
year	2004	2005	0.008487	0.002785	130	3.05	0.0028	0.0326
year	2004	2006	0.02398	0.006463	130	3.71	0.0003	0.0041
year	2005	2006	0.01550	0.005868	130	2.64	0.0093	0.0950

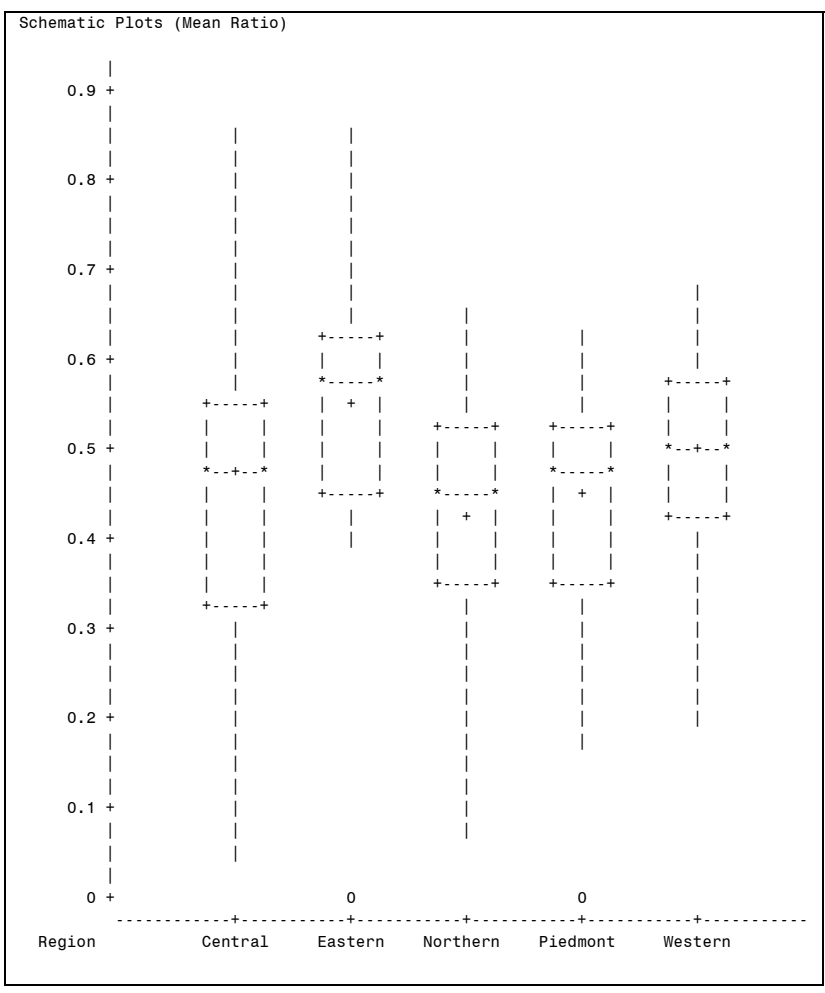
Note: Statistically significant values are highlighted with blue font.

Figure 4.16 shows the learning variations both by regions and over time (in years). The figure also indicates that the learning was not lasting in some cases. The analysis reveals that the Central region's mean penetration rate is significantly different from that of the Eastern and the Western regions ( $p < .004$ ). The mean difference of the Piedmont region's and the Western region's penetration rate is only significant at the lower confidence levels ( $p < .08$ ). The Eastern region differs significantly from the Northern ( $p < .02$ ) and Piedmont regions ( $p < .01$ ). Finally, the mean penetration rate in the Northern region is significantly different from that in the Western region ( $p < .0001$ ).

These results are generally consistent with the earlier Chi-square tests, with the Eastern region differing significantly from the Piedmont, Central, and Northern regions but not the Western region (see also figure 4-17).

**Figure 4.17**

**Box-plot of Mean-Ratio by Region**



This analysis also shows the relationships between time (in year) and the penetration rate. As figure 4.16 indicates, 2001 differs significantly from 2003 ( $P < .01$ ). This was very much expected because the project started in 2001, and if FRUTAT had any impact on penetration rate, the year 2003 had to be different from 2001. Indeed, all years are statistically significantly different from each other except 2001 and 2002, which again is

expected since I have only one observation for the year 2001. The differences between 2002 with 2004, 2005, and 2006 are also statistically insignificant. The differences between these four years also are substantively significant as the PREP project was moving with full force during those years. Although the years 2004, 2005 and 2006 were not statistically different from the year 2002, they do differ significantly when compared with each other. The negative sign means the penetration rate tendency was different from each year. This means that if there was increase in penetration rate in year 2002, then there are decreases in penetration rate in years 2004, 2005, and 2006 relative to the penetration rate of 2002.

What does all of this mean in terms of penetration? What seems to be going on here is that whatever increase in penetration rate was achieved in the first year or in year 2002 it somehow remained intact, or even if there was some movement they regressed toward the mean; hence the years 2004, 2005, and 2006 are not statistically different from year 2002. The difference among those years can mean that the penetration rate did not remain constant at some fixed point; rather it oscillated back and forth, but on average it remained not different from year 2002.

The above differences are interesting also from a theoretical perspective because there are more variations over time than among regions, and time is always an intriguing issue. Hassard (1996) and Weber and Antal (2003) write that the role of time is one of the least understood aspects of studies in many disciplines such as philosophy, natural science, mathematics, economics, social science, and history. It is even less understood in

organization studies. Time is not a clear external “out there,” rather it is a muddle of many kinds of observations. “The concepts of time are developed in a constant process of interaction between humans and their environment and are therefore first and foremost mental constructs.....depending on the worldview and culture that people share, the way time is understood varies tremendously between and within society” (Weber and Antal, 2003, p.351). Weber and Antal, (2003) further explain that considering the ever shorter life cycle of many things in contemporary society, be they products, services, or management concepts, and the resulting pressure on organizations to adapt to change, the time required for organizational learning and unlearning processes is an increasingly important element.

Given the varieties of concepts of time determined by the need of the problem or issue at hand, I aligned the concept of time here with project phases, each of which had the duration of a year. In this conceptualization, time is continuous during the period of a year focusing on a component of the project and an interval and then the same repeats again. When we understand time in this fashion, in examining the variation in penetration rates, time variation more than regional variation is appropriate. Annual shifts of project emphasis arguably make the penetration rate vary more with respect to time than with respect to regions. The finding also can be interpreted as suggesting that through the intervention program regional variance can be mitigated with persistent efforts, but that the differences over time cannot be mitigated when the project focus was a moving entity.

Alternatively, one could contend that the regional variation was mitigated by the project because of its statewide coverage, but time seems to stand both for random error and for

program or policy instability; hence, I found significant time variations in this analysis. The FRUTAT was pursuing different revenue sources in different years and mitigating regional variations were not conscious priority. If the efforts of FRUTAT also had mitigated some regional variation, while pursuing extra revenue opportunities, FRUTAT may deserve extra credit. Exploring new opportunities, such as SSI, adoption subsidies, and food stamps while keeping the Title IV-E money at a reasonable level, meets one of the organizational learning criteria. March (1991) has specified about exploiting certainties and exploring new opportunities as organizational learning.

In any event, this result also made me think whether I should be looking at the penetration rate (ratio) over time or just the difference (change) in the penetration rate. I then converted the data from the penetration rate (ratio) to a change in penetration rates (change), or I took the first difference and then divided the difference by the prior rate to obtain the rate of change. However, once I converted the dependent variable into a measure of change and conducted the same analysis, all differences became statistically insignificant. The reason for that result may be that the penetration rate analysis was able to capture the movement in the penetration rate, and changes over a period of time also were captured on a month-to-month basis. However, the variable CHANGE had to absorb the negative or positive change in the current period by the sum changes up to the last period, and thus the difference disappeared. In another words, the increase in one period was negated by the decrease in another period, so none of a region's change in penetration rate was statistically significant. One way to understand this phenomenon would be to assume similar regional movements. When regional movement is similar,

the relative difference is zero. This can be seen in the figures (scatter plots) in Appendix D.

Since I had created the variable CHANGE using the formula  $(T1-T0)/T0$ , I further refined the variable CHANGE by assigning weight to it. To account for differential caseload differences, I multiplied change by the last observation's caseload: that is, I assigned the proper weight and called the variable WTCHANGE. The figures in Appendix C show the results of regression and time series analyses using both dependent variables—rate (RATIO) and change with weight (WTCHANGE). There are a couple of surprises in the time series analysis. First, the year has positive but the change has negative coefficients, which does not make theoretical sense. Moreover, the R-Square is very small, indicating another problem with the specification.

As stated earlier the ANVOVA results for 2<sup>nd</sup> and the 3<sup>rd</sup> datasets are in Appendix C. Some highlights of these results are as following. For the 2<sup>nd</sup> dataset, localities that participated in the survey, the difference between Eastern and Central region is statistically significant ( $t=2.44$ ), and the Eastern region also is different from the Northern ( $t=2.37$ ) and the Piedmont ( $t=3.19$ ) regions. However, other differences are statistically insignificant. Most years' differences are statistically significant; they are highlighted in bold face. For the 3<sup>rd</sup> dataset, localities that did not participate in the survey, none of the regional differences is statistically significant. However, even in this third dataset all year's differences are significant except for 2003 and 2004. Once again, this affirms the virtual absence of a non-participation bias in detecting the regional difference in the penetration rate.

## The regression analysis

A correlation shows the existence, magnitude, and direction of a relationship, while regression does the same, but with an assumption about causality. The purpose of the regression analysis here was to better understand the influence of time, including a lagged dependent variable, on the penetration rate. The previous ANCOVA analysis revealed statistically significant differences in penetration rate from one year to another. In the following regression analysis, I examined the explanatory power of time, tapped by a lagged dependent variable, and region (as dummy variables) on penetration rate. The lagged dependent variable was the first difference of dependent variable. I used the regression procedure in SAS for the analysis. Figures 4.19 - 4.23) displays the results.

### Figure 4.18

#### Regression Analysis of Penetration Rate by Region: Central

Regression Analysis on Penetration Rate by Region					
Region=Central					
Dependent Variable: Ratio (Penetration Rate)					
Number of Observations Used		1637			
Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	80.80562	40.40281	3513.57	<.0001
Error	1634	18.78948	0.01150		
Corrected Total	1636	99.59510			
Root MSE	0.10723	R-Square	0.8113		
Dependent Mean	0.46502	Adj R-Sq	0.8111		



Coeff Var	23.05986				
Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr >  t
Intercept	1	-0.22899	0.09462	-2.42	0.0156
Day	1	0.00001712	0.00000592	2.89	0.0039
Ratio1 = lag	1	0.89715	0.01102	81.40	<.0001

**Figure 4.19**

**Regression Analysis of Penetration Rate by Region: Eastern**

Regression Analysis on Penetration Rate by Region					
Region=Eastern					
Dependent Variable: Ratio (Penetration Rate)					
Number of Observations Used				795	
Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	35.55750	17.77875	3832.82	<.0001
Error	792	3.67373	0.00464		
Corrected Total	794	39.23123			
Root MSE	0.06811	R-Square	0.9064		
Dependent Mean	0.55207	Adj R-Sq	0.9061		
Coeff Var	12.33662				
Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr >  t
Intercept	1	-0.20265	0.08637	-2.35	0.0192
Day	1	0.00001435	0.00000543	2.64	0.0084
Ratio1 = lag	1	0.95152	0.01125	84.58	<.0001

**Figure 4.20****Regression Analysis of Penetration Rate by Region: Northern**

Regression Analysis on Penetration Rate by Region					
Region=Northern					
Dependent Variable: Ratio (Penetration Rate)					
Number of Observations Used			1675		
Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	46.67512	23.33756	4303.96	<.0001
Error	1672	9.06615	0.00542		
Corrected Total	1674	55.74127			
Root MSE	0.07364	R-Square	0.8374		
Dependent Mean	0.43663	Adj R-Sq	0.8372		
Coeff Var	16.86481				
Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr >  t
Intercept	1	-0.15233	0.06372	-2.39	0.0169
Day	1	0.00001192	0.00000398	2.99	0.0028
Ratio1 = lag	1	0.90770	0.00994	91.31	<.0001

**Figure 4.21****Regression Analysis of Penetration Rate by Region: Piedmont**

Regression Analysis on Penetration Rate by Region					
Region=Piedmont					
Dependent Variable: Ratio (Penetration Rate)					
Number of Observations Used		1483			
Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	46.01338	23.00669	2313.64	<.0001
Error	1480	14.71703	0.00994		
Corrected Total	1482	60.73041			
Root MSE	0.09972	R-Square	0.7577		
Dependent Mean	0.45662	Adj R-Sq	0.7573		
Coeff Var	21.83880				
Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr >  t
Intercept	1	-0.11047	0.09228	-1.20	0.2315
Day	1	0.00001084	0.00000577	1.88	0.0605
Ratio1 = lag	1	0.85832	0.01288	66.66	<.0001

**Figure 4.22****Regression Analysis of Penetration Rate by Region: Western**

Regression Analysis on Penetration Rate by Region					
Region= Western					
Dependent Variable: Ratio (Penetration Rate)					
Number of Observations Used		1050			
Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	25.80748	12.90374	1499.47	<.0001
Error	1047	9.00999	0.00861		
Corrected Total	1049	34.81747			
Root MSE	0.09277	R-Square	0.7412		
Dependent Mean	0.49425	Adj R-Sq	0.7407		
Coeff Var	18.76898				
Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr >  t
Intercept	1	-0.19768	0.10281	-1.92	0.0548
Day	1	0.00001703	0.00000649	2.62	0.0088
Ratio1 = lag	1	0.84562	0.01631	51.85	<.0001

In these figures, the dependent variable is the penetration rate, and the explanatory variables are the time of observation (“day” in months), “ratio1” the lagged dependent variable and region. The time variable is statistically significant for all regions except for Piedmont, at the 95% level of confidence. The time of the observation on average had a positive influence on the penetration rate in all regions except Piedmont. This is consistent with learning taking place in most regions; it is consistent as well with the earlier finding

that Piedmont had more foster care cases in the lower penetration rate and fewer in the upper half.

Penetration rates in the previous month are statistically significant in all regions; the coefficients are substantial. It appears as if the current month's penetration rate is almost entirely driven by the previous month's penetration rate, which is not surprising in the absence of other explanatory variables such as demographic, socio-economic, and a host of other factors that may influence the penetration rate. I will discuss those potentially omitted variables in later chapters. The R-square had been a problem before in the time-series analysis employing (AR1) method, but here the R-squares indicate that the models explain from 74 to 90% of the variations in the penetration rate. Another important point is that the regression analyses used monthly data to explain the penetration rate, and the analysis is based on the localities' penetration rate data. In the previous analysis, ANCOVA looked only at differences by year and not by month and by region, not by localities. Thus, the regression analysis drilled into the data one level below the regional and yearly analyses.<sup>35</sup>

## Summary

This chapter analyzed the penetration rate data using both ANCOVA and time series analysis and found that there were statistically significant variations in penetration rates by region and over time. I concluded that the regional variation can be mitigated with consolidated efforts, but the time dynamics seem to stand both for random error and for program or policy instability or exogenous to the intervention efforts. If this was the case,

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<sup>35</sup> I also generated actual versus predicted penetration rate values by using an autoregressive model that similarly shows learning (see Appendix D)

then the PREP project may deserve additional credit because it was able to explore further opportunities for additional revenues while continuously exploiting the Title IV-E certainties. The regression analysis also showed the positive influence of time on the penetration rate for all regions except Piedmont. I also found additional evidence of learning plus statistical issue—a significant positive influence of the lagged dependent variable on the penetration rate. Differences in the penetration rate, and therefore, in learning by region and over time had been detected from Chi-square tests, ANCOVA, and the regression analysis. Attention turns next to analyzing the survey data and comparing them with the penetration rate data.

# Chapter FIVE

## Analysis and Results of the Survey Data

This chapter analyzes the data collected from the on-line surveys of local social workers. First, I examined the presence (and absence) of a learning environment in participating localities using the survey data and found that different learning environments were present in the localities. Second, I examined the influence of the categorical variables on the mean scores for the presence of a learning environment and the level effect on categorical variables to identify the most contributing response category. I found that role/title and meeting frequency were statistically significant, while region, education level, and tenure were not significant contributors to the learning environment. Third, I examined the strengths of each factor and each dimension and found that individual willingness to learn and strategic leadership were the strongest factor and dimension, respectively, in creating a learning environment. I also noted a contradiction between employee empowerment and strategic leadership.

As stated earlier, Watkins and Marsick's (2003) original questionnaire was augmented and enhanced with categorical variables and several open-ended questions. It included five categorical variables with different response categories. Eighty-four localities participated in the survey, and I obtained a respectable response rate of 45.59%. It will be recalled that the variance based model has seven dimensions and three factors/drivers. A set of questions gathered information on each dimension, and the seven dimensions were distinctly related to three factors, that is, individual, group, and organization.

## Figure 5.1

### Mean Score on the Organizational Learning Dimensions

Dimensions	N	Mean	Std Dev
Continuous Learning	331	4.2443202	0.8601852
Inquiry & Dialogue	331	4.1883082	0.9567952
Collaboration & TL	331	4.0096073	0.9688372
System to Capt L	331	3.8207855	0.9707145
Empower Employee	331	3.6783082	1.0197526
Connect Organization	331	4.2265861	0.9085554
Strategic Leadership	331	4.5985498	1.0122045

### Mean score of the dimensions

Each dimension, which measures the extent to which a learning environment was present in each LDSS is a composite mean score<sup>36</sup> of a group of questions as depicted and explained in the variance-based model presented earlier in chapter two.<sup>37</sup> The staffers' responses to the survey questions that are contained in each dimension are the mean for the dimensions. Figure 5.1 reveals and Figure 5.2 clearly shows an intriguing contradiction explained below.

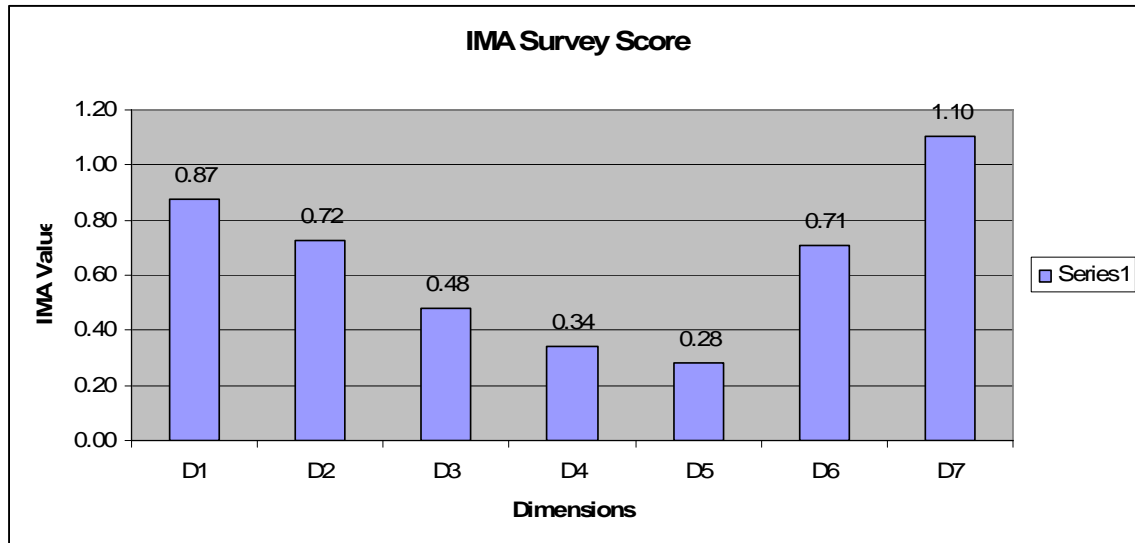
<sup>36</sup> The mean scores are rounded to two decimal points.

<sup>37</sup> The mean score for the continuous learning dimension (questions 1 through 7) is 4.24, whereas mean score for the inquiry and dialogue dimension (questions 8 through 13) is 4.19. The mean score for the collaboration and team learning dimension (questions 14 through 19) is 4.01 and the mean score for the system to capture learning dimension (questions 20 through 25) is 3.82. The mean score for the empowering employee dimension (questions 26 through 31) is 3.68 and the mean score for the connecting organization to its environment dimension (questions 32 through 36) is 4.23, whereas the mean score for the strategic leadership dimension (questions 37 through 42) is 4.60



Figure 5.2

### IMA<sup>38</sup> Survey Score by Dimensions of Organizational Learning



#### Legend:

- D1: Continuous Learning
- D2: Inquiry and Dialogue
- D3: Collaboration and Team Learning
- D4 System to Capture Learning
- D5: Empower Employee
- D6: Connect Organization to its Environment
- D7: Strategic Leadership

### A contradiction

The above figure of the dimensions of organizational learning questionnaire is theoretically interesting because the bar chart for the index mean adjusted survey score is shaped like the letter U. Dimension number five—empowering employees—has the lowest score. It is not surprising to have such a low score for the empowering employee dimension

<sup>38</sup> IMA is the abbreviation of Index Mean Adjusted, which is 3.5 (sum of 1-6)/6. I did this just to increase the visibility of differences. The IMA score is the survey score minus 3.5 for each dimension.

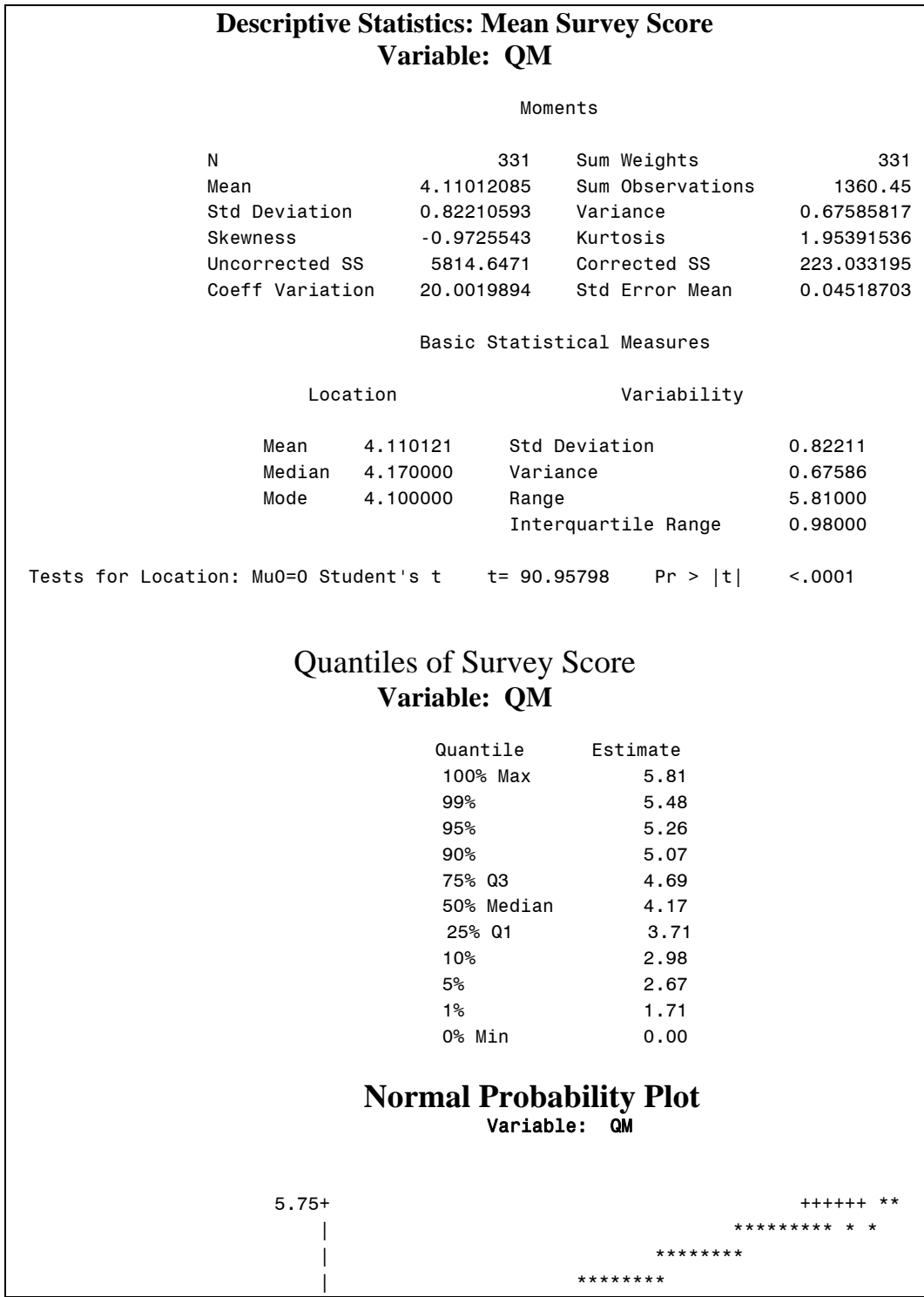
because I learned from the analysts and from others during a project meeting about the constraints in the learning environment in the LDSS. What is very interesting and somewhat surprising is that the dimension of strategic leadership has the highest mean score along with the lowest score for empowering employee dimension.

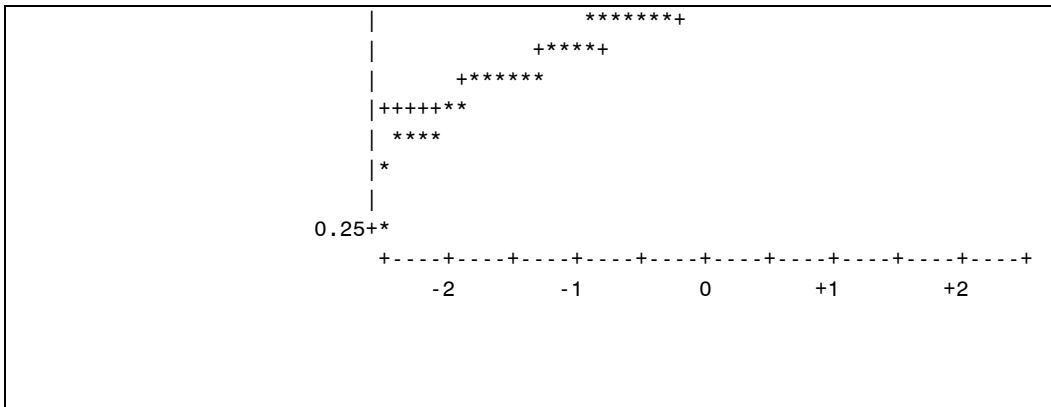
One finds a significant emphasis on employees' empowerment in strategic leadership discussions in the organization studies literature (Westley and Mintzberg, 1989; Russell, 2001). This is often so in the organizational learning literature (Vera and Crossan, 2004). However, here I find a seeming contradiction. The survey respondents very frequently rated weakly the presence of an environment that empowered employees; yet they rated the prevalence of strategic leadership as quite strong. This evident contradiction might warrant alternative interpretations; for example, lower level staffers may have seen the absence of an employees empowering environment, but strategic leadership was something in which only the director and senior level management are involved. When looked at through the eyes of eligibility and social workers, higher level management's environment may look quite rosy. This interpretation emerged from my later discussions with interview respondents about this result.

Figure 5.3 provides more information on the overall mean score across all dimensions. The dependent variable (QM) represents the mean of the overall survey score.

**Figure 5.3**

**The Presence of Organizational Learning Environment**





As can be seen in the Figure 5.3, all three measures of central tendency are fairly close to each other (mean 4.11, median 4.17, and mode 4.10), however, the standard deviation is fairly sizable, close to 1. Although I detected some statistically significant response category-wise differences in categorical variables, which will be discussed later, the density of data is around the mean value, and the curve is bell shaped. That means that despite the relative difference in survey scoring by the higher and lower-level staffers, the absolute difference is not substantial. It indeed points out that, overall, the public sector staffers saw the presence of a learning environment; whether each individual surveyed here saw the learning environment as existing for her/him or just evaluated the learning environment in general at their LDSS is another question. I am making this assertion about the presence of learning environment in LDSSs with caution. The basis for the assertion is that the mean of the overall, survey scores is 4.11 out of six, in which the “average” rating of the presence of a learning environment should have been 3.5. The reason for caution is that the lowest scorers are eligibility workers and their representation is not proportional. The directors, who scored high, were 17%, whereas eligibility workers only 6.5% of the total respondents.

With the above insights from the overall view of respondents, I will now turn to explaining response categories within the categorical variables and analyze them in order. The categorical variables are Region, Title, Meeting frequency (MtnGf), Workers' Education Levels (EducL), and staffers' Experience in years (ExpY) in each LDSSs. Each categorical variable has different response categories,<sup>39</sup> Figures 5.4- 5.8 include information on each of the categorical variables for the survey respondents.

### Figure 5.4

#### Region

Region	Frequency	Percent
Central	51	19.10
Eastern	44	16.48
Northern	56	20.97
Piedmont	69	25.84
Western	46	17.23

Frequency Missing = 65

### Figure 5.5

#### Role/Title

Title	Frequency	Percent
Director	55	17.03
EW	21	6.50
SW	186	57.59
Supervisor	61	18.89

Frequency Missing = 8

<sup>39</sup> The variable *Region* has five categories: central, eastern, northern, Piedmont, and western. The variable *Title* has four categories: director, eligibility worker, social worker, and supervisor. The *Meeting Frequency* variable has 6 categories: twice a week, bimonthly, biweekly, daily, monthly, and weekly. The variable *Education level* has four categories: associates, bachelor, masters, and high school. The variable *Experience in years* has four categories: 1-3 years, 3-5 years, less than 1 year, and more than 5 years.

## Figure 5.6

### Frequency of Staff Meeting

MtngF	Frequency	Percent
2W	1	0.32
BM	33	10.41
BW	70	22.08
DA	4	1.26
M	136	42.90
W	73	23.03

Frequency Missing = 14

## Figure 5.7

### Education Level of Staffers

EducL	Frequency	Percent
Associate	12	3.69
Bachelor	201	61.85
High school	19	5.85
Master	93	28.62

Frequency Missing = 6

## Figure 5.8

### Experience of Staffers (in Years, in Current Job)

ExpY	Frequency	Percent
1-3 years	55	16.62
3-5 years	45	13.60
Less than a year	49	14.80
More than 5 years	182	54.98

The majority of respondents were social workers (about 58%), followed by supervisors (about 19%); those with bachelor degrees (about 62%), followed by those with masters (about 29%); monthly meetings were more frequent (about 41%), followed by weekly (about 23%); and the majority of respondents had more than 5 years' experience (about 55%) in their current jobs. Since the analysis is based on averages, the majority's bias, for example, of social workers may be represented in the results. The next step is to examine whether and how these variables are related to the presence of a learning environment in LDSSs.

The multivariate analysis was done using the generalized linear model (GLM) procedure in SAS to examine the contribution of each independent variable in explaining the extent to which a learning environment was present in the LDSSs (see Figure 5.9 for results).

## Figure 5.9

### The Presence of a Learning Environment

Class Level Information					
Categories	Levels	Values			
MtngF	6	2W BM BW Daily M W			
Region	5	Central Eastern Northern Piedmont Western			
Title	4	Director EW SW Supervisor			
Educl	4	Associate Bachelor High Master			
ExpY	4	1-3 years 3-5 years Less than a year More than 5 years			
Number of Observations Read		332			
Number of Observations Used		272			
<b>Dependent Variable: QM, (the presence of a learning environment)</b>					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F

Model	18	28.6128966	1.5896054	3.09	<.0001
Error	253	130.2425564	0.5147927		
Corrected Total	271	158.8554529			
	R-Square	Coeff Var	Root MSE	QM Mean	
	0.180119	17.33377	0.717491	4.139265	
Source	DF	Type III SS	Mean Square	F Value	Pr > F
MtngF	5	10.30166637	2.06033327	4.00	0.0016
Region	4	0.98517633	0.24629408	0.48	0.7516
Title	3	13.79481640	4.59827213	8.93	<.0001
EducL	3	3.15369289	1.05123096	2.04	0.1085
ExpY	3	1.53328472	0.51109491	0.99	0.3968

The overall model is statistically significant ( $P < .0001$ ). However, only two categorical variables— *meeting frequency* and *title* of respondent are statistically significant to influences on the reported learning environment. I conducted similar analyses for each of the seven dimensions of the learning environment. However, the number of statistically significant influences remained the same, with some minor exceptions for level of a staffer’s education. Since the categorical variables *meeting frequency* and *role* were statistically significant in the overall analysis, I have performed further analysis on these two variables.

### Effect of response categories

I conducted similar analyses for the effect of response categories on each dimension.<sup>40</sup> The same statistical significance held also for the individual dimensions. For example, the categorical variable *role/title* is statistically significant for all of the dimensions at 5%, and *meeting frequency* becomes significant only at the 10% level for the continuous learning dimension. For the inquiry and dialogue dimension, both the *role/title* and *meeting*

<sup>40</sup> Continuous learning (Q1-7), inquiry and dialogue (Q8-13), collaboration and team learning (Q14-19), system to capture learning (Q20-25), empowering employee (Q26-31), connecting the organization (Q32-36), and strategic leadership (Q37-42). The SAS output can be found on Appendix



frequency variables are statistically significant at the 5% level. For collaboration and team learning, both title and meeting frequencies are statistically significant. Interestingly, for the system to capture the learning dimension, staffers' educational level is statistically significant in addition to the regular role/title and meeting frequencies. This means that the higher the level of education in an office, the greater the willingness and ability to capture learning. Only two variables, Meeting frequency and Role/title, are statistically significant for the rest of the dimensions (i.e., empowering employees, connecting the organization, and strategic leadership). After the categorical variable analysis, I will turn to measuring the strengths of factors and dimensions that influence creating of a learning environment.

**Figure 5.10**

**LDSS Staffers' Title and Reported Presence of a Learning Environment**

Least Squares Means			
Adjustment for Multiple Comparisons: Tukey-Kramer			
Title	QM LSMEAN	LSMEAN	Number
Director	4.84014160		1
EW	3.74987333		2
SW	4.28946779		3
Supervisor	4.48799285		4

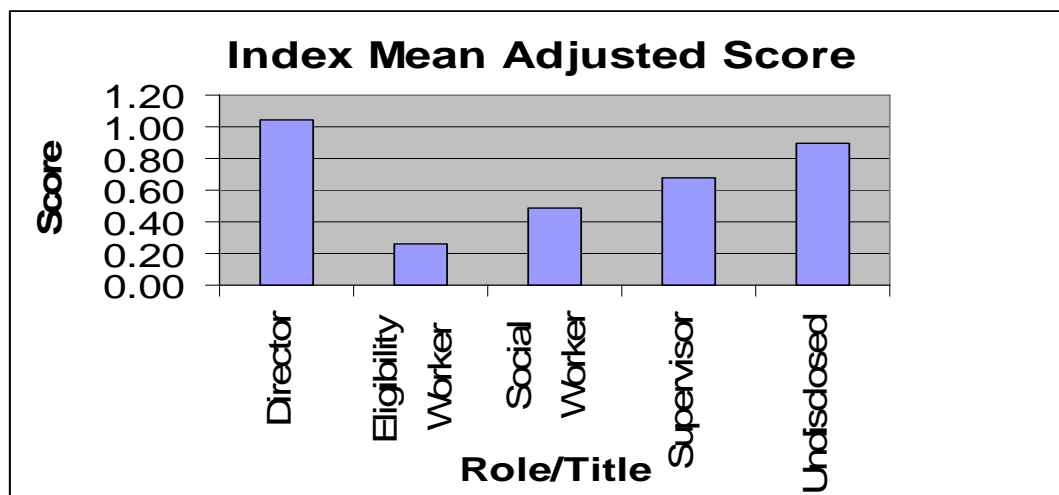
  

Least Squares Means for effect Title				
Pr >  t  for H0: LSMean(i)=LSMean(j)				
Dependent Variable: QM				
i/j	1	2	3	4
1		0.0004	0.0001	0.0861
2	0.0004		0.1509	0.0257
3	0.0001	0.1509		0.3695
4	0.0861	0.0257	0.3695	

A comparing of the mean ratings of the learning environment (Figure 5.10) reveals that the eligibility (EW) and social workers (SW) differ significantly from directors' responses ( $p=0.004$  and  $0.001$  respectively). Directors typically reported seeing more of an organizational learning environment in their LDSSs than did EW and SW. Indeed, the clarity of this is point can be seen in Figure 5.11, which shows the index means adjusted score<sup>41</sup> by title.

**Figure 5.11**

**Score of Survey by Role/Title**



The higher ranking LDSSs staffers who responded to the survey, directors and supervisors, had higher mean scores—4.54 and 4.18 respectively for the presence of learning than the lower-ranking staffers—eligibility workers and social workers— 3.76 and 3.95, respectively.

<sup>41</sup> Once again, the index means adjusted score is the survey mean score, subtracted from the Mean Score of the Survey Index, which is 3.5. The survey uses 6 point Likert scales, so the sum of the index--one through six divided by six gives 3.5 as the index mean.

The above result is intriguing because it apparently reveals some of the organizational inertia of public organizations. Public organizations in general seem to be relatively constrained from learning due to their multiple constituencies and accountability and constitutionality considerations (LaPalombara, 2001). However, some may see inertia as desirable due to its stability and predictability. Moreover, if the higher level officials, who potentially have some authority to cultivate organizational learning, see the greater presence of a learning environment and potentially deny the need to put more effort into nurturing it, then the public organization's learning challenges may be multiplied. At least in the case of local departments of social services in Virginia the problem evidently is profound, a claim that FRUTAT analysts also made in the interviews.

### Meeting frequency

Figure 5.12 compares the mean assessments of the organizational learning by the frequency of LDSS staff meetings.

**Figure 5.12**

### Frequency of Meetings and Presence of Learning Environment

(The GLM Procedure)		
Least Squares Means		
Adjustment for Multiple Comparisons: Tukey-Kramer		
Meeting Frequency	QM LSMEAN	LSMEAN Number
BiMonthly	3.82366106	1
BiWeekly	4.41588207	2
Daily	4.80124485	3
Monthly	4.16279095	4
Weekly	4.50576554	5

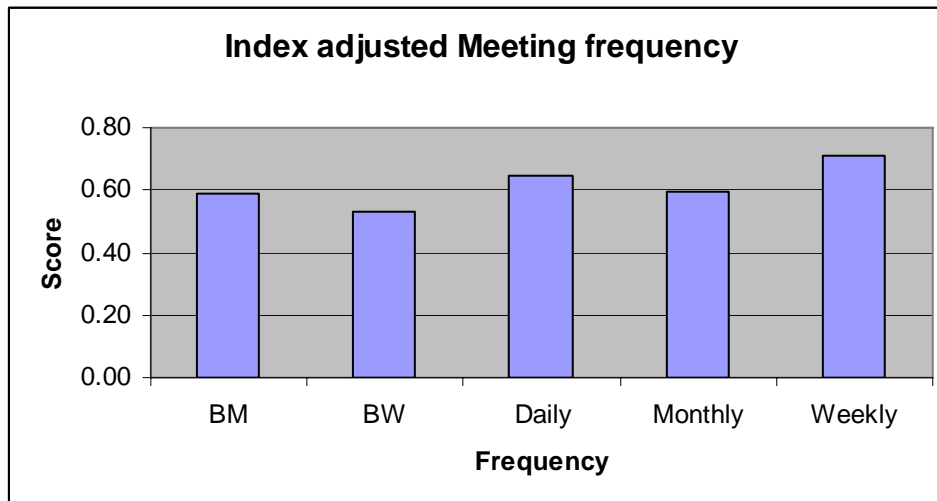
Least Squares Means for effect MtngF  
Pr > |t| for H0: LSMean(i)=LSMean(j)

Dependent Variable: QM					
i/j	1	2	3	4	5
1		<b>0.0070</b>	0.2006	0.2047	<b>0.0011</b>
2	0.0070		0.9047	0.2532	0.9664
3	0.2006	0.9047		0.5750	0.9613
4	0.2047	0.2532	0.5750		<b>0.0452</b>
5	0.0011	0.9664	0.9613	0.0452	

As can be seen from Figure 5.12 only Biweekly, monthly, and Weekly categories are statistically significant ( $p = .007$ ;  $.001$  and  $.045$  respectively) influences on the presence of a learning environment.

**Figure 5.13**

**Frequency of Meeting and Assessment of Learning Environment**



Only weekly, biweekly, and monthly meetings have statistically significant relationships with the reported presence of an organizational learning environment. Meetings that were neither too frequent (daily) nor too infrequent (bi-monthly) appear to be associated with the presence of a learning environment. Since weekly, monthly, and biweekly meetings are

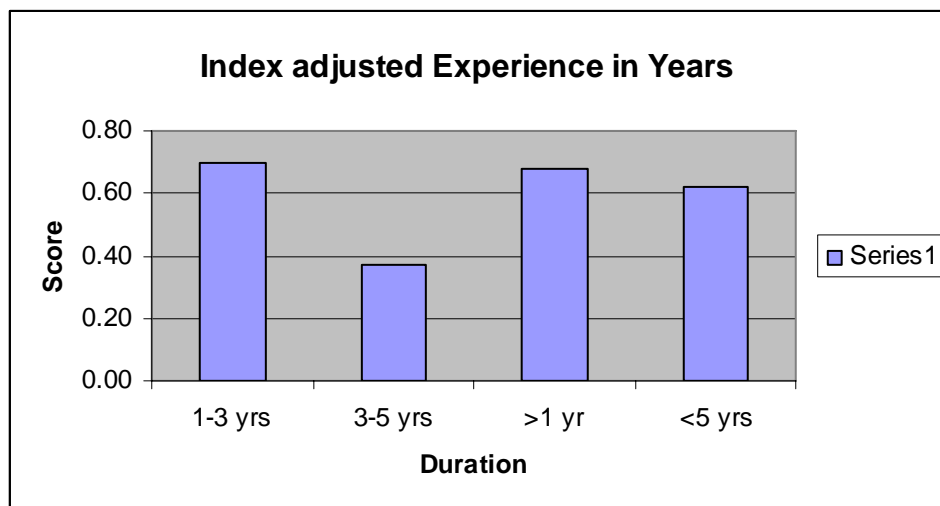
similar in their contributions, biweekly meetings may be better as one can safely assume that some costs are involved (if nothing else, in terms of staff time) in having meetings.

### Statistically insignificant variables

The variables that were not statistically significant influences on the reported presence of a learning environment also may be important to consider. The workers' experience in the LDSSs is insignificant, suggesting that the staff turnover rate, which many believe is a negative factor in contributing to organizational learning, is not an important issue.

**Figure 5.14**

#### Assessment of Learning Environment by Experience



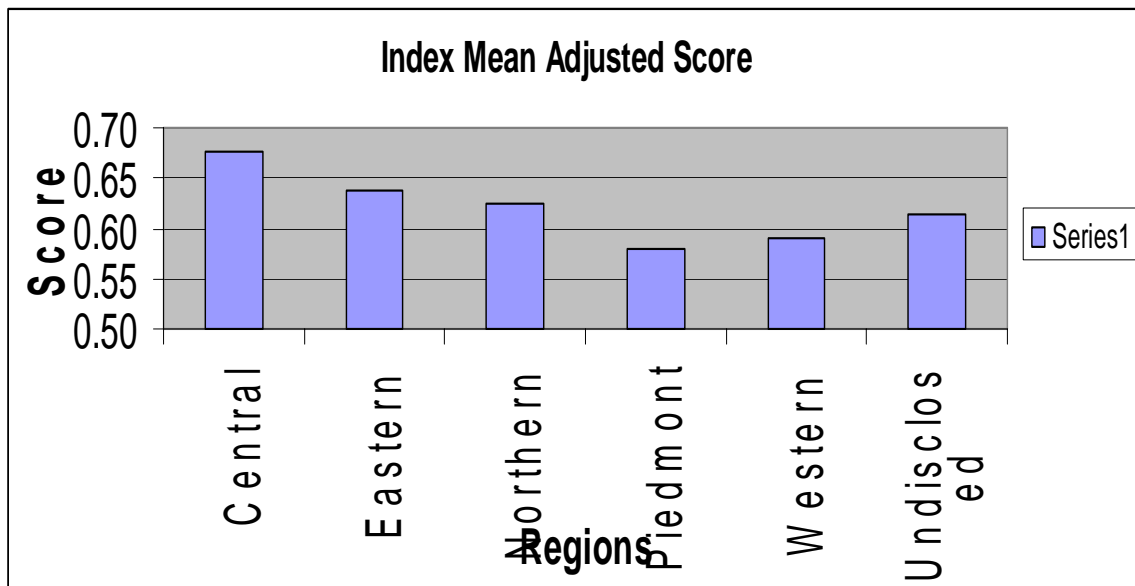
Region is also statistically insignificant in explaining variations in the presence of a learning environment. This is interesting because the penetration rate and a host of other economic and demographic indicators reveal wide regional variations in Virginia. One explanation might be that the region variable used here, localities categorized according to

political boundaries, may or may not be relevant for organizational environment boundaries.

This led me to look at the locality level survey scores and compare them with the local penetration rates, in the next chapter.

**Figure 5.15**

**Presence of Learning Environment by Region**

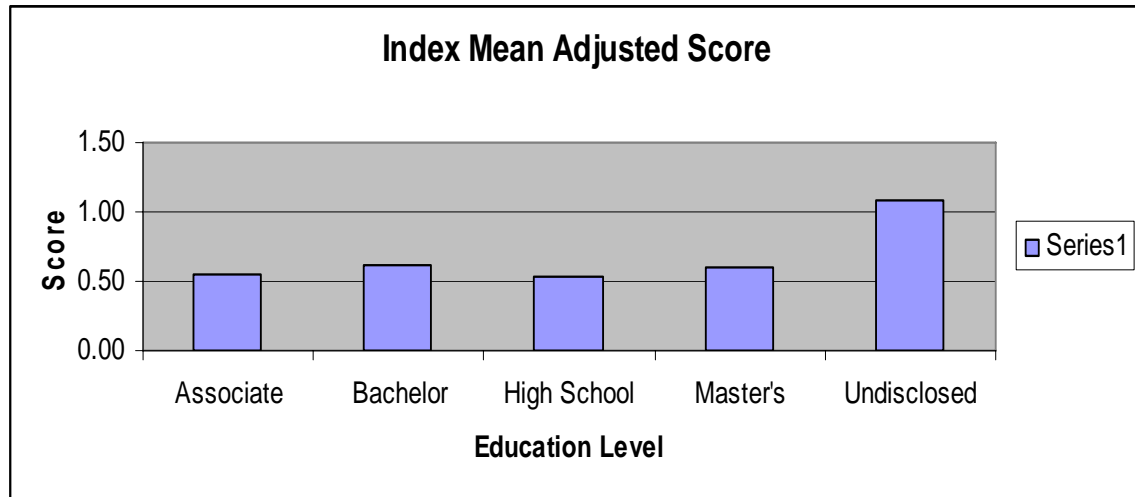


The education level also turned out to be a statistically insignificant influence. This is somewhat surprising because one might expect that higher levels of education may result in a somewhat broader vision in general and in learning desire in particular. This expectation might be true at the individual level but not in the organizational context, at least in this

study. Also finding may reflect general lack of variation in education level as more than 90% respondents have a BA or higher education (see Figure 5.7).

**Figure 5.16**

**Education Level and Reported Presence of Learning Environment**



**Strengths of factors**

The variance-based model includes three factors/drivers and seven dimensions creating an organizational learning environment. The following analysis investigates the strengths of these factors and dimensions by examining multiple comparisons. Multiple comparisons allow one to answer the question: which factors and dimensions stand out in contributing to the reported presence of learning environments in LDSSs. The dependent variable “Qmean” is the mean of each survey’s reported presence of a learning environment. The “group” refers to the role of respondents in the LDSS (directors, supervisors, EW, and SW), the “individual” refers to the particular respondent, and the “organization” refers to the LDSS.

**Figure 5.17****Influence Factors in Presence of the Learning Environment<sup>42</sup>**

Response Category Level Information						
Response Category = factors		Levels = 3 (Group, Individual, and Organization)				
Number of Observations read and Used		990; Dependent Variable: <b>Qmean</b>				
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F	
Model	2	7.5651644	3.7825822	5.06	0.0065	
Error	987	737.1738692	0.7468834			
Corrected Total	989	744.7390336				
R-Square	Coeff Var	Root MSE	Qmean Mean			
0.010158	21.02745	0.864224	4.109980			
Source	DF	Type III SS	Mean Square	F Value	Pr > F	
Factor	2	7.56516444	3.78258222	5.06	0.0065	
-----						
Strength of Factors (Least Squares Means)						
Adjustment for Multiple Comparisons: Tukey						
<b>Factor</b>	<b>Qmean</b>	<b>LSMEAN</b>	<b>LSMEAN Number</b>			
Group		4.02175758	1			
Individual		4.22909091	2			
Organization		4.07909091	3			
Least Squares Means for effect Factor						
Pr >  t  for H0: LSMean(i)=LSMean(j)						
<b>Dependent Variable: Qmean</b>						
i/j	1	2	3			
1		<b>0.0060</b>	0.6706			
2	0.0060		0.0668			
3	0.6706	0.0668				

<sup>42</sup> See Figure 2.2 (page 41) for individual, group, and organizational factors and the questions and dimensions that pertain to each of them.



Among the three factors, the least squared mean for individual respondents is the highest at 4.23. The multiple comparison indicates that the individual contribution in creating an organizational learning environment is significantly different from the group contribution ( $p=0.006$ ) and the contribution of organization is statistically insignificant ( $p=0.6706$ ). But the difference between the group and the organization contribution is not statistically significant ( $p=0.0668$ ). This means that individual willingness to learn contributes more to the presence of a learning environment than group supportiveness and organization readiness in LDSSs. However, an alternative explanation could also be that the individual respondents are where the variation is. The contribution of group and organization is not statistically significantly different from each other. Although methodologists ignore R-square values in cases of multiple comparisons, here the R-square is so small, nothing can be claimed. However, support for result of the individual being a crucial factor of organizational learning can be found everywhere in the literature.

The individual willingness to learn has been emphasized across the organizational learning literature as a necessary but insufficient condition for organizational learning. Individuals are continuous learners (Sessa, 2006), and learning is as natural as any other human activity (Garvin, 2000) or as working (Marsick and Watkins, 2003; Senge 1990). Whether organizations realize and capitalize on this tremendous yet hidden potential that can make organization better is always a question, but many individuals in LDSS are willing to learn. This theme of the willingness for learning of lower ranked staffers in LDSS also was reaffirmed by FRUTAT members' interviews. The Title IV-E foster care caseloads seem to

fall heavily on lower level staffers where there is a thirst for learning; however, in the absence of organizational support, individual efforts at lower levels go only so far.

### Strengths of the dimensions of organizational learning

What follows is a similar analysis of the strengths of the dimensions in contributing to the presence of an organizational learning environment. For the ease of SAS coding, I have abbreviated the dimensions.<sup>43</sup>

**Figure 5.18**

### Relative Influence of Learning Dimensions on Learning Environment

Response category Level Information									
Response category		Levels	Values						
Dimensions		7	CL	CO	CT	EE	ID	SC	SL
Number of Observations Read and used							2310		
<b>Dependent Variable: Qmean</b>									
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F				
Model	6	184.768705	30.794784	35.43	<.0001				
Error	2303	2001.525129	0.869095						
Corrected Total	2309	2186.293834							
R-Square	Coeff Var	Root MSE	Qmean Mean						
0.084512	22.61679	0.932252	4.121948						
Source	DF	Type III SS	Mean Square	F Value	Pr > F				
Dimensions	6	184.7687047	30.7947841	35.43	<.0001				

<sup>43</sup> Continuous learning (CL), connecting organization to environment (CO), collaboration and team learning (CT), empowering employee (EE) is inquiry and dialogue (ID), system to capture learning (SC), and strategic leadership (SL).

Least Squares Means						
Adjustment for Multiple Comparisons: Tukey						
Dimensions	Qmean	LSMEAN	LSMEAN			
			Number			
CL	4.25718182		1			
CO	4.23939394		2			
CT	4.02175758		3			
EE	3.68945455		4			
ID	4.20100000		5			
SC	3.83236364		6			
SL	4.61248485		7			

Least Squares Means for effect Dimensions							
Pr >  t  for H0: LSMean(i)=LSMean(j)							
Dependent Variable: Qmean							
i/j	1	2	3	4	5	6	7
1		1.0000	0.0204	<.0001	0.9874	<.0001	<.0001
2	1.0000		0.0435	<.0001	0.9984	<.0001	<.0001
3	0.0204	0.0435		0.0001	0.1709	0.1234	<.0001
4	<.0001	<.0001	0.0001		<.0001	0.4348	<.0001
5	0.9874	0.9984	0.1709	<.0001		<.0001	<.0001
6	<.0001	<.0001	0.1234	0.4348	<.0001		<.0001
7	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	

As Figure 5.18 shows, the overall test of the model is statistically significant ( $p < .0001$ ). Strategic leadership has the highest least-squared mean 4.61, and empowering employee the lowest least-square mean 3.69 consistent with the paradox noted earlier. The multiple comparison reveals that the strategic leadership dimension is significantly different from the other dimensions of the learning environment (all  $p < 0.0001$ ). In addition, the system to capture learning differs from continuous learning, connecting an organization to its environment, and the inquiry and dialogue dimensions ( $p < 0.0001$ ). This means that the system to capture learning dimension contributes differently to the presence of an organizational learning environment than do the other three dimensions. Empowering

employees is significantly different from inquiry and dialogue, creating learning opportunities, connecting organization to its environment, and collaboration and team learning (all  $p < 0.0001$ ). This means that the empowered employee contributes differently to the presence of an organizational learning environment than the rest, which was apparent in the mean score as well. Collaboration and team learning differ from connecting organizations to the environments and system to capture learning.

Although strategic leadership and the empowering employee dimensions are the most different from each other and from the rest, the other dimensions also differ from each other. This evidently means that the dimensions are measuring different elements of an organizational learning environment; a result that validates the modified survey instrument for studies of public sector organizations. This is a significant result because I was a bit skeptical about this instrument as a way to tap into the presence of a learning environment in public sector organizations since it was designed and had been replicated only in private sector organizations.

## **Summary**

In this chapter, I identified the differences between lower and higher level staffers' perceptions of the existence of a learning environment in LDSSs and provided potential implications for public sector organizational learning. I found strategic leadership as the significant dimension and an individual willingness to learn as a significant driver in the presence of organizational learning environment. One of the unexpected results was that in multivariate analysis, region was not a statistically significant influence on the presence of

an organizational learning environment. I also found a contradiction in the highly scored strategic leadership dimension and the low score of the employee empowerment dimension. With the above insight from the survey data analysis, I turn now to comparing survey results with the penetration rate data analysis results.

## Chapter SIX

### **Learning Categories: Revelation from Comparison**

The purpose of this chapter is to compare the penetration rate data and the survey data to examine how they inform each other and to develop learning categories. First, I compare the two sets of data and then create the learning categories that encompass the varying kinds of learning that different LDSSs manifested. Second, I explain each type of learning and place participating LDSSs in categories based on their penetration rates and survey scores. I find that more than 60% of the responding to the survey localities fell in the hypothesized categories; that is, if localities had better penetration rates they also scored high in the survey and if they did not have good penetration rates they scored low in the survey. I find less than 40% are anomalies, that is, high penetration rates aligned with low survey scores and vice-versa. Finally, the emergence of learning types, I consider, is the realization of latent benefits from the comparison and triangulation.

Various results, presented earlier, from the two sets of data led me to look deeper at the locality level survey scores and compare them with the locality level penetration rate data. Since I was looking at these results from an organizational learning perspective, the cell entries are referred to in learning terms. The cutoff point for the following table, Table 6.1, is the mean of the survey score, which is 4.11, not the mean of the survey index that is 3.5. Similarly, the penetration rate performance is determined by the following three criteria: 1) the average trend (direction of the penetration rate trajectory); 2) system stability, or low

oscillation; and 3) average increases from the beginning to the end of the data collection period.<sup>44</sup>

In Table 6.1, the first cell includes the localities that have done well in achieving and maintaining “high” penetration rates and scored above the mean in the presence of a learning environment survey, and is referred to as *conscious learning*. In the second cell are localities that have lower penetration rates but higher than mean values on the presence of an organizational learning environment, a situation labeled *façade learning*. The third cell includes the localities that have high penetration rates but low survey scores, a condition referred to as *unaware learning*. Finally, the fourth cell is labeled *absent learning* and includes localities with both low penetration rates and low survey scores. The first and fourth cells contain theory-consistent results; the results in other two are considered to be anomalies.

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<sup>44</sup> The two examples of each type of selected localities’ penetration rate scatterplots are in the appendix.

**Figure 6.1****Comparative Learning Types by Locality**

		<b>Penetration Rate</b>	
		High	Low
<b>Survey</b>	High	<b>Conscious Learning</b> 45.94% N=34	<b>Façade Learning</b> 21.62% N=16
	Low	<b>Unaware Learning</b> 17.57% N=13	<b>Absent Learning</b> 14.87% N=11 <sup>45</sup>
		<b>Conscious learning</b> Accomack, Arlington, Buckingham, Caroline, Danville, Botetourt, Buchanan, Dickenson, Fauquier, Fluvanna, Gloucester, Greene, Hampton, Harrison, Lee, King George, Isle of Wight, Louisa, Norfolk, Petersburg, Powhatan, Price Edward, Prince George, Radford, Suffolk, Sussex, Tazewell, Wetmore, Wise, York, Russell, Scott, South Hampton, Shenandoah	<b>Façade learning</b> Amelia, Charlottesville, Culpepper, Floyd, Grayson, Highland, Kings & Queen, Mathew, Nelson, New Kent, Nottoway, Portsmouth, Roanoke Co, Warren, Rockbridge.
		<b>Unaware Learning</b> Alexandria, Dinwiddie, Frederick, Goochland, Henry, Hopewell, Lancaster, Lynchburg, Manassas, Newport News, Northampton, Prince William, Roanoke City.	<b>Absent Learning</b> Appomattox, Bath, Charles City, Bland, Brunswick, Campbell, Essex, Lunenburg, Norton, Rappahannock, Richmond City, Richmond County.

<sup>45</sup> The total number of localities is 74 instead of 84 that participated in the survey, because of the combined FIPS, locality tracking numbers of the merged localities.



## Conscious learning

Conscious learning has been widely discussed in the education and developmental psychology literatures (Dulany et al., 1985, McLaughlin (1990). In education, conscious learning generally is compared with unconscious learning (see Table 6.1).

**Table 6.1**

### Contrasts in Various Uses of the Terms *Conscious* and *Unconscious*

<i>Conscious</i>	<i>Unconscious</i>
Learning with awareness	Learning without awareness
Understanding and insight	No understanding and insight
Intention to Learn	Incidental learning
Intention to use meta-cognitive strategies	No such intentions
Abilities to report what is known	No such abilities
Explicit knowledge	Implicit knowledge
Focal attention	Peripheral attention
Short-term memory	Long-term memory
Controlled processing	Automatic processing
Serial processing	Parallel processing

Source: McLaughlin, 1990. p. 628

One can see from the Table 6.1 that conscious learning takes place with awareness; it is about noticing, understanding, and gaining insight with the intention to learn. For my purposes, however, it simply means both that organizational learning has taken place in an organization as measured by changes in the penetration rate (more than 10% increase on average) and that the staffers are aware that their organization is learning as measured by

the organizational learning dimension questionnaire (where the particular LDSS has scored higher than the mean survey score of 4.11 out of 6). I did not do any attitudinal measurement of or interviews with local staffers, and so my categorization is based on two sets of data, the survey scores and the penetration rates. The conscious learning is the highly accentuated form of organizational learning in the literature (Senge, 1990; Watkins and Marsick, 1996).

I hypothesized that if the local departments of social service were learning (as measured by the penetration rate) and if the DLOQ survey had the capacity to capture that learning environment, more localities would fall in the categories of conscious learning or absent learning. I found evidence that more than 60% of the cases supported this hypothesis. In the following section, I explain remaining learning categories and then focus on the two learning categories that are consistent with the hypothesis.

### **Façade learning**

The term façade is used here to reflect the gap between the reported presence of a learning environment as reflected in the survey scores and a lack of actual organizational learning tapped by the penetration rate. Development economists use the term façade to describe development in the third world, where one frequently finds several aspects of modernity in capital cities, giving the impression that the countries have “developed”; however, if one walks a few miles out of these cities, one often finds that life resembles existence closer to the 16<sup>th</sup> century. The term also refers to a gap between planning documents and what actually takes place (McGuire, 2000). In architecture, of course, façade refers to a

deceptive design, particularly on the front of a building. Psychologists use this terminology to refer to a state of hallucination in which one has the false consciousness that something exists. Finally, since organization science scholars use the term to refer to certain characteristics of organizational subculture (Jermier et al., 1991), I used it here to refer to both the learning gap and a false impression about the presence of a learning environment. Once again, the use of terminology is not in any way meant to be derogatory to those localities that fall in this category, but to describe the gap between the penetration rate performance and the survey scores. This type of learning is variously mentioned by organizational learning scholars, some times as competency trap (March, 1999), learning disabilities (Senge, 1990).

Although this analysis focuses on the LDSSs, a corollary to this situation is visible in the VDSS. In the case of the state agency, strategic planning item 7 in the learning organization suggests that VDSS aspires to be a learning organization. It has formed a committee with local representatives to transform the existing organization into a learning organization. Reality, however, appears to be very different.

### **Unaware learning<sup>46</sup>**

An English aphorism<sup>47</sup> refers to four categories of knowing and responses of the knower that goes something like following:

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<sup>46</sup> Generally, opposite of conscious learning is unconscious (Mc Laughlin, 1990, for example) but I chose the term “unaware,” here, because the situation that I wanted to refer to is not the exact opposite of the conscious learning.

<sup>47</sup> I remember reading the following lines, but cannot recall the source. I tried all internet search engines and found a couple of consulting firms have been using the exact language but without referring to the source. It might already have been public knowledge without the source; I now call it an English aphorism.

1) Who knows and knows that he knows is “wise” follow him; 2) who knows but knows not that he knows is “asleep” awake him; 3) who knows not but knows that he knows not is “simple” teach him; and 4) who knows not and knows not that he knows not is a “fool” shun him.

Although these four types of learning neatly fit the learning category table inside Figure 6.1, I am using the adage only to draw a parallel to the unaware learning of the second category. Here, organization learning is taking place and staffers are learning, but they are not aware that they have learned or are learning. These are the organizations that are “asleep,” and something needs to be done to wake them up so that they become conscious learners.

### **Absent learning**

This refers to the situation in which learning is at least momentarily absent. The organization is not currently learning, and the staffers know that neither they nor their organizations are learning. This is a situation akin to the third category above. The absence of learning does not mean the absence of learning potential. It simply means the penetration rate analysis did not detect any evidence of learning; nor did the survey results reveal the presence of a learning environment. Furthermore, it is possible that organizations are learning but not scoring high enough on the survey to reflect the presence of a learning environment, and the penetration rate analysis is not capturing the learning because some external factors, such as parental incomes being above 185% of the federal poverty line, which makes children ineligible for federal funding and thus dampens the penetration rate.

However, this category does support my hypothesis of consistency (that is, a positive correlation) between higher penetration rates and higher survey score and vice-versa.

Overall, the comparison of two sets of data largely supports the hypothesis that I wanted to test in the context of public sector organizations. I would like to reemphasize that studies of public sector organizations have been lagging behind in empirically testing organization theories. This study is the first, as far I know, effort to test the validity and utility of organizational learning theories to explain situations in public sector organizations at the local level. The instrument that this study uses with some changes and enhancements, has been used hundreds of times to measure organizational learning environment in organizations (Watkins and Marsick, 2003), but never in public sector organizations. Despite the inherent weakness of the penetration rate as proxy of organizational learning, this study considers it as dependent variable and then aligns it with the results of the revised survey, which results in the revelation of the learning categories.

A note of caution is warranted that the results from this case study may not be generalized without qualification. Nonetheless, some insights into the possible problems of public organizations must be taken seriously. The make up (learning organizations' "costumes") of public organizations often seems to come from external consultants, and therefore agencies appear to be doing well. Lifting the consulting veil may reveal another picture of the learning capacity or knowledge endowment of state and local agencies. I am in no way arguing against government agencies hiring short-term consultants to accomplish certain goals. However, unless there is a system to institutionalize the gain by creating a

continuous learning opportunity, the agency may suffer serious consequences. Otherwise, the glow of façade learning at government agencies is bound to fade away or even vanish with the passage of time like morning dew with sunshine.

One clear message from this study for the broader literature is that organizational learning studies in general and public sector organizational learning in particular must find multiple sources of data and measurements and compare the results from different sources. For example, if this study had relied on only one set of data, either the penetration rate or the survey, the analysis and insights would have been completely different as neither the penetration rate data nor the survey data alone had the capacity to generate the learning categories. Although comparing and contrasting the extreme observations or comparing two different streams of literature is common in the organizational learning literature (Lipshitz et al, 2007), parametric measurement and their comparison are very rare in the organizational learning literature.

## **Summary**

In this chapter, I presented the results of the comparison of two sets of data and revelation of learning categories. Four different learning categories, such as conscious, façade, unaware, and absent learning are explained and localities meeting certain criteria are assigned to certain learning categories. Moreover, this chapter sends a message to the broader literature that relying on one parameter to measure the learning may be deceptive. The triangulation of data is suggested for future empirical studies of organizational learning.

Further, I found reasonable support (about 61%) for the hypothesis that higher penetration rates would correlate with higher survey scores in the presence of learning environments in LDSSs. The next chapter more fully explores the apparent anomalies in the 39% of the cases that were inconsistent with the hypothesis, relying on interviews with FTUTAT members and the focus group discussions.

## **Chapter SEVEN**

### **The Process of Organizational Learning (Interview Results)**

The purposes of this chapter are twofold: first, to explain the anomalies that the previous chapter identified; and second, to map the learning process and the changing attitude of localities toward the PREP project and the Title IV-E policy and procedures. The second purpose entails checking the validity of the process model (presented in Chapter Two) by presenting the model to the analysts, explaining the model's assumptions, and then obtaining their reactions. Through the qualitative method discussed here, I also seek to explain the "residuals" of this case study. I use the term "residual" to refer to the aspects of the case and the learning that were not captured by the penetration rate and survey data analysis. The chapter is organized first, to provide a general overview of the respondents' early experience with the PREP intervention, and, second, a thematic presentation of the informants' responses to the interview questions (see Table 3.1). Third, the chapter reports the themes of a focus group discussion. Finally, it discusses how this chapter fits in the overall dissertation.

Before reporting the interview results, I want to clarify the reasons why I believe that I need this chapter. First, my interest in knowing about the actual process of how learning took (or failed to take) place and what role the FRUTAT members played in cultivating organizational learning in the localities led me to conduct in-depth interviews with FRUTAT members. Second, the interviews were conducted to supplement and complement the statistical analysis presented in previous chapters. Third, I wanted to gain a



fuller sense of the learning process and also test to what extent the process the model built from a distanced speculation about the project's implementation and a thorough review of literature had captured reality.

In this chapter, I shift gears from statistical analysis to content analysis and from explaining learning variations to outlining the learning process. As Chapter Three noted, the participants in the focus group were two senior management level staffers in addition to the seven FRUTAT analysts. I mapped the PREP project and the learning process from the respondents' recollections of the very early days of the project implementation, which they experienced as moving from situations full of doubts, skepticism, and suspicion to the current trust, respect, and appreciation of the FRUTAT team, and then to dismay due to the project ending.<sup>48</sup> In general, I found that the anomalies likely were due to miscommunication between information technology systems, missing financial components, and a host of other socio-economic factors.

## **Prelude**

The pilot study described earlier had indicated that there would be some situations in which learning may not be reflected in the penetration rates or even by the survey. The Title IV-E eligibility criteria are such, for example, that if parental income exceeds a certain threshold, the penetration rate cannot improve in particular localities even if the LDSS has learned all it could about the policy and had conducted its business accordingly. Likewise, sometimes LDSS directors may have sent the survey links only to those whom they expected would respond

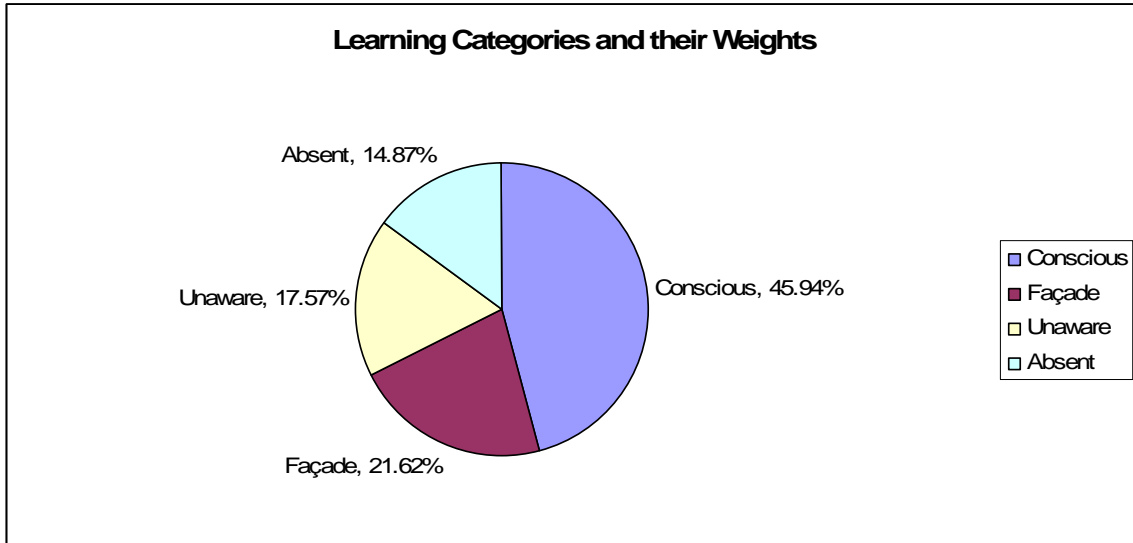
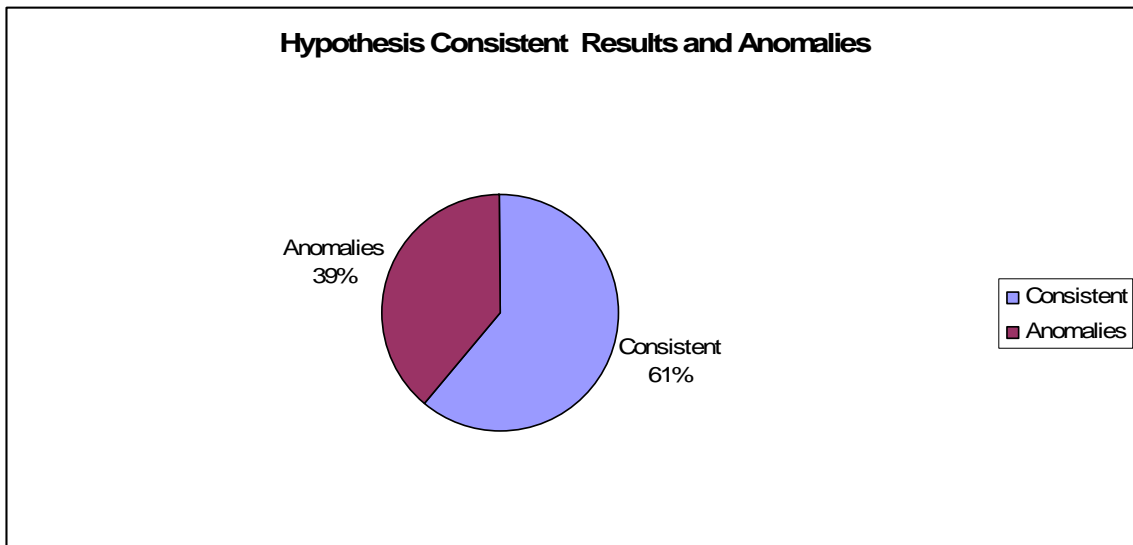
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<sup>48</sup> In addition to the list of questions (in Table 3.1), I also had asked questions to clarify their statements. In order to maintain confidentiality and protect identity, I have referred to FRUTAT members by letters A B C D E F G and the two senior management staff by X and Y.

according to the directors' wishes and report a better picture than that supported by the front line reality, a situation of façade learning. If there had been situations like that, interviews with the FRUTAT members should help me to spot them, because these members had been involved in the project from its first day and had seen LDSSs' attitudes change from resistance to acceptance and even welcome. FRUTAT members could indeed explain how the project began, proceeded, and concluded, and also how learning took place and how it might diminish over time.

### **Explaining residual and anomalies**

It is important for any study to capture as many residuals as possible and bring them out within the purview of the models or in complement to models. The penetration rate could have been an excellent thermometer for taking the learning temperature of LDSSs, if all localities' socio-economic conditions were similar. In the face of considerable socio-economic diversity, the penetration rate has only a limited ability to capture the learning that may have taken place in a particular LDSS. Here, I explain the residuals left by the variance-based model particularly in terms of cause of variation, role of organizational structures, and learning processes through qualitative methods. I hoped the following complementary interviews and focus group discussions would help to tell a fuller story. However, I can report the degrees of hypothesis consistent results and anomalies. Figures, 7.1 and 7.2 show the source and extent of consistency with and anomalies to the hypothesis.

**Figure 7.1****The Learning Categories****Figure 7.2****Conformities and Anomalies**

The above figures depict the hypothesis consistent results and anomalies. These are the findings and revelation from comparison of two sets of data, which were not apparent at the time of the interviews so I could not obtain respondents' reactions to them. However, these learning categories and anomalies are derived from the learning variations that themselves are functions of differential learning processes, varied organizational structures, and management systems. What follows are the responses that I was able to obtain regarding learning variation and mitigation, management structure and system and organizational practices.

## **Themes from the Interviews**

### **Socioeconomic variety**

Responding to the question of how they would reduce the regional variations in penetration rates, many of those interviewed commented that as long as other socio-economic variation exists among regions, so will the penetration rate. In their view, however, variation can be minimized with agency-specific identification of the problem and statewide efforts to help LDSSs, and monitoring.

### **Organizational structure**

Regarding the structure of the foster care management system in Virginia, opinions of the interview respondents were divided; the majority opined that the current organizational and management system, which is state supervised, locally administered, and partially federally funded, is cumbersome and inefficient. But *G* stated that “the state supervised, and locally managed system has given space for the local inputs. Each foster care case is so very

different and local management is the only way to accommodate that child-wise difference. If everything was determined at Richmond, then it would be hard to provide child specific services; therefore the current system produces the better child outcome.” Yet, *E* observed that “the local authority wants to have control over their own affairs so it is more a political outcome than child outcome-driven, so no matter how inefficient the system may be, it would not change. If the General Assembly tries to take control out of localities, we will have a bigger war than the war in Iraq.” From another critical perspective, *A* stated that “I have witnessed financial people cheating the system by misplacing the case because there was no accountability for localities using and manipulating federal money before IV-E audits.” Finally, *X* observed “all localities have the same federal and state guidelines but every locality does business very differently. This is because there is no long term planning, so localities had to act on the basis of the urgency of the day; they are always in the crisis management mode.”

### **Changing attitudes of LDSSs staffers**

Almost all of the FRUTAT analysts told a similar story that initially there was doubt, suspicion, and skepticism about FRUTAT members and a concern that they might be there to find fault. Of the interviewees, person *A* articulated the point very well: “The terminology ‘error’ was problematic because it was causing LDSS staffers discomfort as they thought if there is an ‘error’ somebody needed to be blamed for that ‘error’.” Person *B* agreed, adding that “there were agencies and staffers who never had any training before on Title IV-E policy, and they began to appreciate our work as we trained them on policy and

corrected the errors for them instead of blaming them for having an error. It did not take a very long time for them to realize that we were there to help them.”

Person *D* stated that people cannot help forgetting their own history and experiences.

“LDSSs had been ‘zinged’ before by the state. And our title being Analyst, and our job having to audit case eligibility, they thought we were auditors and we were there to ‘zing’ them. It was partly so because we started training them with a prior contractor’s policy material which had a regional focus and was more liberal than it should have been. That is why it took some time for us to establish credibility and win their trust.” Person *C* recalled her early days, agreed with person *D*’s statement, and added that “FRUTAT a bit later customized training, focusing on the need of the specific agencies, and adjusting our training’s focus to a particular agency helped us win their trust and then the relationships become more collegial.” Respondents *E* and *F* both stated that there was great skepticism about the policy itself and about the real intentions of the state in addition to general skepticism about us being there to help localities”.

Person *G* added a different perspective:

There had not been any change in IV-E policy for a very long time and suddenly there were several changes, making everybody confused. The IV-E used to be one of the neglected policy areas at the LDSSs, and therefore some people did not want to pay any attention to it. For them we were yet another headache and they wanted to avoid us as much as they could. However, there were some people with keen interests in learning

about the changes in the Title IV-E policy through us. They liked us from day one and their liking increased over time.

Respondents categorically rejected the possibility that the trust between VDSS and LDSS had increased. The relationship between LDSSs and FRUTAT was very friendly and trusting, but the former's perception of VDSS was not. The FRUTAT analysts stated that they had gained the trust and respect of the local officials through hard work and their availability to localities. They saw their ability to cultivate learning as being due to their availability and flexibility. They claimed that LDSSs could call them with any kind of question at any time and that FRUTAT members would get back to them with answers and help. At least in the view of interview respondents, FRUTAT members' willingness and availability to assist LDSSs had moved the learning process from an informative mode to an interactive mode as Chapter Three outlined.

After gathering the recollections of FRUTAT members about the project's initial days, I wanted to capture their perspective on the organizational learning process. So I began asking questions from the list (Table 3.1).<sup>49</sup> The following section presents their responses to my predetermined questions.

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<sup>49</sup> I noticed that they answered several questions from the table while trying to answer the one that I was asking. In such situations, either I clarified that they had already partially answered a subsequent question or I skipped the question if I already had the full answer.

## **The organizational learning process**

Virtually everyone agreed that the training, seminars, and onsite case reviews helped LDSSs. Although all of the interventions were seen as complementary, onsite case reviews were perceived as being more effective since LDSS workers could see the problem and learn how to fix it. According to person A, “If we had not provided training, or brought eligibility workers and social workers together in seminars, they might not have understood or appreciated the learning during the onsite case reviews. However, if I have to choose one, I must say onsite case review was the most effective.” The rest of the analyst repeated this almost using the same words and emphasizing the complementary nature of the three interventions. They saw the onsite case reviews as being the most effective to convince LDSS staffers that FRUTAT members were there to help solve eligibility determination and documentation problems in the localities’ foster care cases.

In the majority of LDSSs, the analysts reported few initial shared understandings between eligibility workers (EW) and social workers (SW) about the Title IV-E policy. Person *F* thought that “the larger the agency, the bigger the divide between eligibility and social workers, and the smaller agencies had much less problem because of the small caseloads that require the two groups to work together.” Person *A* noted, “EWs are always more eager to learn and conscious about the financial implications, but SWs did not care who pays for the costs and how it affects the state; so, the silo were mostly created by the social workers.” Person *G* thought “inter-departmental communication systems need to be improved before a better understanding ever takes place fully.”



The interviewees differed on whether they thought LDSS staffers understood and agreed with the IV-E policy materials that FRUTAT presented in the training and seminars. Persons *D* and *E* thought that “LDSS staffers understood the material but did not agree with it.” Yet *A* reported, “LDSS understood and agreed with it because they did not argue against it,” and *B* believed that because the EWs never had had any training before, they were delighted to be part of the training and were eager to learn.” Person *G* observed: “It was hard for eligibility and social workers to understand why they had to do so much extra work suddenly. Directors understood from the beginning, but for EWs and SWs it took some time and effort in our part to make them understand.”

### **Shared understanding as learning**

Everybody agreed that the FRUTAT intervention brought EWs and SWs closer together, although there still is room for improvement. However, persons *D* and *C* stated that “SWs get paid more and are privileged in LDSSs than EWs and that very issue somewhat keeps them from being real close.” All respondents thought that FRUTAT helped LDSS workers in understanding the broader picture and the implications of IV-E policy. Moreover, respondents agreed that there is now a wider vision among EWs and SWs and that the FRUTAT analysts are highly respected in the localities in which they worked.

This point supports one of the hypotheses that a broader or system-wide vision itself is evidence of organizational learning. The organizational learning literature stresses that system vision is a must for organizational learning (Senge, 1990; Watkins and Marsick, 1993; 1996; 2003). It is easy to justify the need for a system vision in this particular case

because until and unless EWs and SWs work together and understand each other, increasing the penetration rate by assigning foster cases to appropriate funding sources would be extremely difficult, if not impossible. Another side of the same coin is that once LDSSs staffers have a broader vision, they can begin to understand the financial implications and legal ramifications of Title IV-E funding and the consequences of not doing the job right.

Since FRUTAT members frequently visited the same localities several times, I asked them whether they thought the LDSSs had learned the policy better even if that might not have been reflected in the penetration rate; I asked as well whether the localities' perceptions of them had changed. Almost all said that they had visited three to eight times and that localities' perceptions had changed dramatically. Localities now have a broader vision than they had several years ago. Localities don't think of FRUTAT staff as auditors or police officers anymore but instead regard them as mentors, coaches, helpers, and friends. Responding to why if there had been such a big change it was not reflected in the penetration rate, person A explained that "sometime penetration rate suffers from the miscommunication between OASIS and LEDGER, the information technology for the financial system in addition to the previously discussed socio-economic factors. So the penetration may not be as reflective of learning as one may think." The rest of the respondents basically voiced the same theme that there was change whether or not it was reflected in the penetration rate.

“It really depends” was the typical response to my question whether the FRUTAT analysts thought the LDSSs now view the penetration rate problem as an opportunity to learn due to intervention and the resulting mutual appreciation and system vision. *G* stated that “there are some people who are working fearlessly and relentlessly for the sake of what they believe, and they will take every problem as opportunity to learn.” *F* saw “more thirst among EWs about learning than SWs or even supervisors,” Person *E* added:

They wanted to learn because it is much harder to correct an error case than do it right at the first place. Time-wise it might take as much as ten times more time to correct an error case than doing it right from the beginning. However, the learning or any other improvements comes from the above. If a director encourages and a supervisor supports, then lower ranked staffers will learn. Otherwise they are overburdened with regular work and do not have time or courage to take initiatives for learning.

*E*'s comment highlights two important points. First, although there is no direct financial incentive for localities to place cases potentially eligible for Title IV-E funding sources because of the paperwork and risks, a residual incentive emerges to place the foster care cases in the appropriate funding category in order to avoid time spent correcting errors. Second, organizational learning needs support to exist and thrive from higher management, an observation strongly supported by other empirical studies of organizational learning (Lipshitz et al., 2007; Bapuji and Crossan, 2004; Argyris, 1996; Watkins and Marsick, 1996; Senge 1990).

FRUTAT members responded that LDSSs staffers may not give honest feedback to each other because person as *F* explained, “An honest feedback often means a negative feedback; since they have to live and work together they avoid their best from giving negative feedback. However, if feedback is positive they will definitely give that feedback honestly.” Similarly the rest of the responses indicate giving honest feedback is only possible if the working environment is collegial, and people are friends of each other. Otherwise, the cost of giving honest feedback is much higher than the benefits, and people rationally avoid this costly action. These responses paint a mixed picture of this particular dimension of an organizational learning environment in LDSSs.

The above sections show that there is a zest for learning in the lower echelon of LDSSs, and that EWs and SWs to some extent developed a shared understanding, LDSSs found FRUTAT analysts to be their allies and helping hands and by implication some learning took place. However, miscommunication between information technologies has served to dampen penetration rates. The following sections focus explicitly on explaining residuals.

### **Themes from the focus group discussion**

This section provides the themes of the focus group. As stated earlier, the focus group included two management level staffers in addition to FRUTAT analysts. The focus group discussion was conducted so that respondents heard others’ opinions and modified their own. Most of the discussion affirmed the interview responses but it also added some more insights in the causes of penetration rate (downward) movement.

### **Missing financial component**

The focus group discussion revealed that the PREP project ignored the finance side of the foster care business, which was a big mistake. The project did focus on the possible division between EWs and SWs but completely ignored the financial side, which was at least as important in influencing the penetration rate as the other two. It is entirely possible that EWs and SWs had correctly classified a case but the finance division did not change the funding sources in the system, and as a result the penetration rate did not reflect learning. Most of the times, this problem produced a dampening effect on the penetration rate, but the contrary was also possible.

### **Micromanagement of the project by sponsor**

Another theme of the discussion was that the sponsor's micromanagement was a problem throughout the project's life. Person *X* said that a project of any length should have a clear plan of action and phase-wise evaluation; however, the project was guided by the wish of VDSS's project liaison without having any direction from the university. *Y* stated that there had been a problem on the university side, and when university officials tried to take some control of a project, the relationship the VTIPG and VDSS became more contentious. This might be recorded as a learning experience for the university. *E* added that "we never become proactive. Rather we had to react upon the direction of the sponsor." *G* noted that "we all came at a time when some prior consultants and VDSS had started doing something regarding IV-E, and it was not explained to us what went wrong and how it could be corrected; rather we were given bits and pieces to go to the localities and work accordingly."

## **Changed attitudes of LDSSs as organizational learning**

The literature suggests that being open to new information instead of a defensive attitude is the first step toward organizational learning (Argyris, 1985). The previous sections have noted that positive changes evidently took place due to the PREP project and FRUTAT members' efforts. These are also reflected in both the increased penetration rates and higher scores in the responses to the organization learning environment questionnaire. In this case of the university and state agency collaboration, several other soft yet positive changes also are noted. It has become clearer that PREP created better learning environments by sharing and imparting policy knowledge and also by breaking down the departmental silos. The FRUTAT members also helped create learning environments in LDSSs by facilitating a better communication as they become a bridge between lower and higher ranking staffers.

In addition to the statistical [hard] evidence, FRUTAT members' contribution also was reflected in the personal expressions of LDSSs staff about the contributions of FRUTAT members to bringing changes particularly in enhancing penetration rates. In response to the PREP project ending notice, LDSSs staffers sent FRUTAT members' emails noting appreciatively the positive impacts of their work. See Figure 7.3.<sup>50</sup> This provides [soft] evidence that organizational learning had taken place at LDSSs. Each bullet represents different email.

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<sup>50</sup> I deleted the name of authors and sources of origin from the email to maintain confidentiality and protect the identity of the email authors. These emails were written by EWs, SWs, supervisors, and directors.

## Figure 7.3

### Appreciative Emails of LDSSs Staffers to FRUTAT Members

- I guess avoiding this email won't stop it from happening. I just can't imagine you guys not being a part of the Title IV-E. I just want to let you know how valuable you have been to me and all the other IV-E workers. There are no words that could describe how important you have been to me with all we have been through these last few years. I am so proud of you for what you have accomplished during this five year period. You and your group have become role models for all of us. I only hope that I get to the point in my career that you have. I still feel I have so much to learn and yet my knowledge of the program has grown immensely due to all the support you have given and the knowledge you have shared. I value greatly the working relationship we have and the friendship that we have maintained over our many years with DSS. I know at time I was challenging but that was only because of how much this program means to me and that I know we can make this program the best in the state. That was all I ever wanted was to have someone listen to the IV-E workers and low and behold the whole world is interested!!!!
- I look forward to working with you on the Federal Audit and hopefully will continue our friendship for many years to come. Thank you again for all you have done and all you have given me. I will miss you more than I can say.
- I am so sorry that I will no longer have the opportunity to work with you, but I have learned so much from you during the short time we had working together. People of your principles, morals and integrity are very rare and I wish you all the best and God's blessings in all you do. Please keep in touch.
- Sorry to see you go. You were my favorite specialist. If you need a job, you can always come to Petersburg
- We are sorry to lose you as you have helped us tremendously. Good luck in all your future endeavors. Again, thanks for all your help.
- I cannot thank you enough for your invaluable help. I wish you the best. Hope you call on us if you need us.
- It has been a pleasure working with you over the past few years. You have always been responsive to our questions and concerns and have provided us with excellent guidance. Best wishes to you in your future endeavors. I know you will be successful in whatever path you choose to take.
- Thank you for all of the assistance that you have given to Frederick County. We wish you well in your future.
- It has been a pleasure working with you. Your knowledge of the IV-E Program and your willingness to help with program issues has been outstanding. We will miss you. I wish you well in your future endeavors.
- Thanks for the update. I really appreciated you taking the time to come to the agency and help me go through the foster care caseload and I will miss being able to tap into your policy expertise and wealth of experience in the future. Thanks for all you have done. It has been rewarding for our staff as well.
- Please pass this along to everyone. Hello everyone I am very sadden to hear about the change, we have indeed formed relationships that have been fruitful. I say fruitful because you have taken the time to show us as Eligibility Worker the way, and now we are reaping the benefit of your time and energy. *You have planted the seed in us to do our jobs with confidence and I thank each and every one of you. You have made us positive thinker and doers for the Title IV-E Program by giving us the advice and the training tools we need to get the job done. I know that I couldn't have made it without you holding my hand through it all.* I will truly miss you all what can I say, our working relationship have been outstanding. There was never a time when I couldn't call you for help. I appreciate the time we shared and I will keep in touch as much as possible and wish you all the best in your next assignment. I am NOT happy about this! But I guess I have no choice but to go along with the brilliant idea someone had to change.
- We owe all our success to you. Thank you for the support ant encouragement you provided to Greene DSS in working the IV-E program. I will miss your positive attitude and your expertise. Good luck to you in all your endeavors.
- I am sad to hear you are leaving me. You have been a great help to me, encouraging and very patient. Thank you for everything and Good Luck!
- I am very sorry to hear this news!! I have also enjoyed working with you and thank you for all of your help during our transition without Diane. You are wonderful person and I will miss you!!
- Thank you for the work you have done with our staff and for the state. I know that agencies are not always open to your visits, but that is usually due to the complexity of the work, not you. My staff and I have enjoyed working with you.

- Sarah, we will certainly miss working with you. It has been a wonderful resource for us to have someone who can answer our questions and be so patient with us trying to unravel the IV-E maze. Best wishes to you!

The emails in Figure 7.3 are neither an exhaustive list, nor did all analysts forward their emails to me. I asked FRUTAT analysts only once to forward any notes that they might have received from the localities evidencing their opinions during the interviews and focus group discussion. I did not follow up on this because the above were more than enough to reflect the respect and trust that FRUTAT members gained over the period in the local departments of social services.

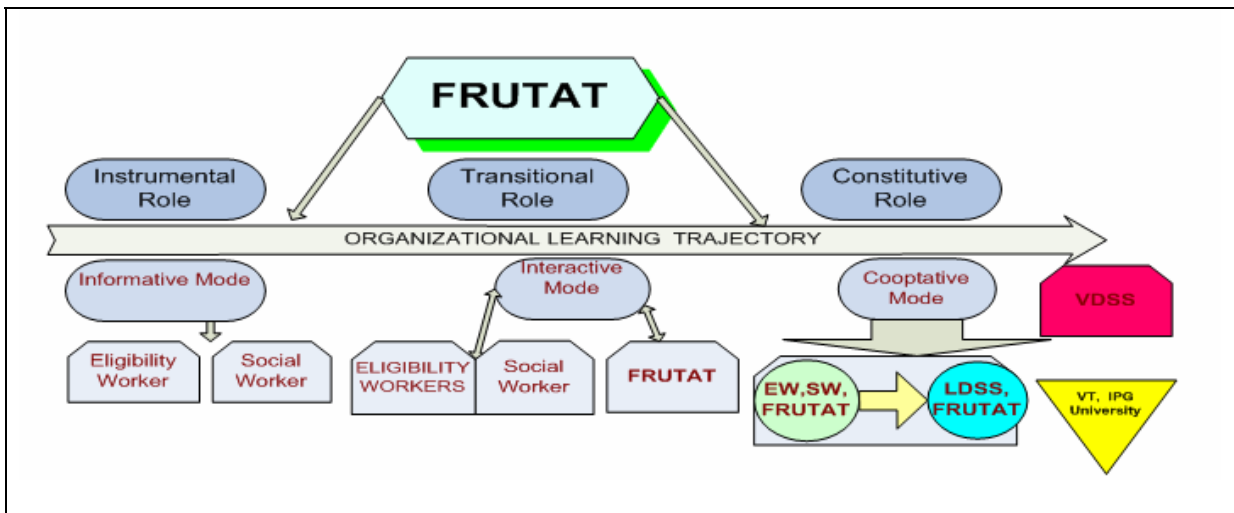
### **Assessing (testing) the process model**

Recall that I introduced the hypothesized process model in Chapter Two and presented its assumptions. This model evidently performed well in capturing the learning dynamics in LDSSs due to the PREP. I presented and explained the model to FRUTAT members after several one-on-one and two-person interviews but before the focus group discussion. I deliberately did this in an effort to avoid initially biased responses. However, it was imperative to describe the model and explain its assumptions in order to guide and facilitate the focus group discussion. For the most part, focus group participants agreed with the process model and its assumptions, and they were fascinated by the model's ability to capture the reality. However, one of the assumptions of the model in terms of IV-E policy management and mutual trust and respect between VDSS and LDSSs was disputed, indeed refuted, by the focus group participants. They indicated that although once in a while they felt as if learning was progressing through the outlined trajectory, most often they believed they were in the informative and interactive modes, not the cooptative mode. The focus



group participants indicated that the university had also made mistakes in managing the project. As a result of these reactions, I revised the model to accommodate their insights and to better capture reality (see Figure 7.4).

**Figure 7.4**  
**The Revised Process Model**



As the above Figure 7.4 depicts, the revised model shows that VTIPG is separated from the other elements in the model, since it could neither maintain the ongoing contractual relationships with VDSS and LDSSs, nor retain FRUTAT members and redeploy them in other projects. I plugged the IPG into the model and then rotated its place (triangle) 180 degrees so that it correctly represents a different picture of the pyramid shape that any

Weberian ideal organization would have, while also depicting the current top heavy shape of IPG with many directors but no staffers to direct.<sup>51</sup>

Similarly, I pushed the VDSS box farther out so it barely touches the arrow that is indicative of the cooptative mode of learning. One unanticipated but very positive result had been the friendship and mutual respect that developed between FRUTAT members and LDSS staffers. As pleasant as this result may sound, in the absence of any organizational connection between FRUTAT members and LDSSs staffers to cement the relationship after the end of the contract, it seems bound to fade way. Moreover, this relationship in no way reflects VDSS staff members winning the hearts of LDSSs and gaining their respect.<sup>52</sup> The rest of the items in the model remain the same.

## **Summary**

In this chapter, I, although implicitly, explained the anomalies in the form of statement excerpts and their explanations from interviews and focus group discussions. I also elaborated on how the project implementation moved from suspicion, skepticism, and resistance to a more collegial relationship based on trust and mutual respect between LDSS staffers and FRUTAT members. However, neither the learning by the localities nor their positive attitudes toward FRUTAT members have reportedly contributed to increasing their trust of VDSS. I found that the socio-economic situation of localities, miscommunication between information technologies systems, and the missing financial component in the PREP intervention were the hidden dampening factors of the penetration rate. This finding supplemented previous

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<sup>51</sup> It may seem as though I am unhappy about being laid-off; which may be partially true, FRUTAT members expressed similar sentiments.

<sup>52</sup> All interviewees repeatedly expressed this theme.

chapters' findings by shedding lights on the factors that were invisibles to both datasets. I also slightly revised the process model to accommodate some of the observations and insights of the interviewed. The final chapter will draw conclusions from all the empirical analyses, review the overall findings, and discuss implications.

# Chapter EIGHT

## Summaries, Conclusions, and Discussion

The purpose of this chapter is to draw broad conclusions from the analyses of the previous chapters and to highlight the implications. First and foremost, this study evaluated the PREP project through the lens of organization learning. Second, it broadly tested the validity and utility of organizational learning theory and more narrowly the validity of an instrument that was designed to measure the presence of learning environments in private sector organizations from the perspective of public sector organizations at the local level. Third, the study developed and refined both variance-based and process models of organizational learning and evaluated those models with survey and interview data. Fourth, it defined and specified the parameters of organizational learning and then cross-validated one set of learning parameters as approximated by the penetration rate with another set of data that measured the presence of a learning environment. Fifth, it introduced several learning categories based on the results of two sets of data and placed localities into each category. This study then triangulated the results of both sets of data using interviews and focus group discussions before drawing the final conclusions.

Additionally, this chapter will offer other insights, among them the inappropriate economic incentive system and the resultant moral hazard as impediments to organizational learning. The foster care system is locally managed, state supervised, and partially federally funded. As a result, the system in Virginia appears to be very cumbersome, different levels of government sometimes clashing in the current system. Despite the constraints posed by the adverse incentive system and the cumbersome structure for organization learning, this

study concludes that the PREP project was, to some extent, successful and that the FRUTAT members made a difference in cultivating organizational learning in LDSSs. However, the dispersed organizational learning seemed to be on the verge of evaporation. Finally, this chapter explores the implications of this study for theory, methods, policy and practice, and future research.

### **Evidence of learning**

The penetration rate data analysis detected evidence of dispersed learning. Multivariate analysis revealed a great deal of learning variation as approximated by the penetration rate. Compared to when the PREP project started, Virginia now enjoys on average about an 11 % higher penetration rate and more federal revenues. This increase in the penetration rate is evidence of organizational learning, which also is corroborated by the presence of an organizational learning environment in many local departments of social services as captured by the survey scores (mean score 4.11 out of 6). The overall increase in penetration rate, of course, is an average, and it varies across regions. The higher mean score than the average provides evidence of the presence of an organizational learning environment (Watkins and Marsick, 1993; 1999; 2003).

The variation was one of the interests of this study, and the analysis revealed some variation by region, but a greater variation over time, which, indeed, is evidence of learning increases in the penetration rate. The fewer variations by region compared to variations over time is attributed to the PREP project's statewide effort to boost the penetration rates. The time variation, in part, is attributed to the phase-wise shifting focus of the project, and

in part it is attributed to both for random error and for program or policy instability over which the project had no control. Both the increase and variation in the penetration rate supports the initial hypothesis and answers one of the research questions about the degree of variation. Why there was so much variation despite the similar efforts exerted by the FRUTAT members was answered by the interviews and focus group discussions; omitted variables such as finance department' involvement in the project, miscommunications between information technologies systems, and a host of socioeconomic factors in the regions were as, or even more important factors, in producing both the dampening effect and the variation in the penetration rate as the PREP project's efforts to mitigate and increase them, a finding which may be called negative feedback (Senge, 1990).

Evidence of organizational learning also appeared in the interviews responses and focus group discussions as well as in the positive comments of the LDSS staffers about FRUTAT members' work. Furthermore, Virginia not only increased penetration rates but also kept eligibility errors at a minimum, resulting in its passing the federal audit in 2007, which it had failed in 2001. Passing the federal audit means savings of tens of millions of dollars in disallowance. It also means from an organizational learning perspective that Virginia was able to detect and correct Title IV-E eligibility determination errors, since it had to have fewer than 10% eligibility errors in 150 randomly selected foster care cases to pass the federal audit. FRUTAT constantly supplied LDSSs with both policy and process knowledge and engaged them in learning. This evidence meets the learning criteria put forth by some scholars who believe that even if one component of the system learns, organizational learning has taken place (Huber, 1991; McDonald, 1995; Pace, 2002)

However, unless learning is institutionalized into organizational routine and structure that can remain intact with staff turnover, it will fade away due to decay in human memory, staff turnover, and policy changes (Levitt and March, 1988, March, 1999). With the end of the contractual relationship between VDSS and VTIPG and the withdrawal of FRUTAT members, organizational learning may slow or even reverse such accomplishments fairly quickly. Organizational learning so far evidently has not been institutionalized by the state, or by individual localities that do not appear to have the capacity to do so.

### **Contributions to organizational learning theory**

The above review of the empirical results from this dissertation can also be summarized in terms of their importance for advancing our knowledge in organizational learning theory. Below are some interpretations of the significance of some of the results.

### **Importance for triangulation**

Most significantly, the comparing and contrasting of the penetration rate and survey data yielded a categorization of the types of learning in LDSSs. Survey results provided information on the LDSSs staffs' ranking on the presence (and absence) of the learning environment in their localities, which provided other evidence that could be compared to the penetration rate data. Four categories of learning, conscious, façade, unaware, and absent, were defined using the results of these two datasets. The comparison also provided support for the hypothesis that higher penetration rates would positively correlate with higher survey scores measuring the presence of organizational learning environments.

More than 60% of the scores of the LDSSs supported this hypothesis, validating the penetration rate as a reasonable proxy for organizational learning in this case study. This result sends a clear message that organizational studies must find multiple parameters to examine the degree of organizational learning. A single parameter of learning without triangulation and only one level analysis may be misleading as it would have been if this study had relied either only on the penetration rate data or only on the survey scores. Thus various sources of data indicating the same directions to the results and multilevel analysis, if possible, are a must for case studies (Yin, 1994; King et al, 1994; and Lieberman, 2005).

### **Importance of organizational learning framework**

Organizational learning theory provides a good framework for organizational studies in general and for intervention program evaluation in particular. This case study evaluated the PREP project through the lens of organizational learning and simultaneously achieved two goals: 1) testing the validity of a certain thread of organizational learning theory for studying local public sector organizations, and 2) evaluating the state's intervention program. This study found that learning can be triggered and fostered in the local level public sector organizations with proper support. However, organizational learning must be a continuous process to build on already achieved gains and to further such gains by learning even more. We live in a dynamic environment and if incremental gain is less than the force of change, then the real gain would either be zero (the status quo) or negative (further in regress). The degree of learning should be greater than the degree of change in the environment in order to be learning.<sup>53</sup> Thus learning must be preserved by

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<sup>53</sup>  $dl/dt > 0$ , where  $dl/dt$  is differencing of learning with respect to time or change in environment.



institutionalizing it into organizational routines and structures and continuing learning efforts. Otherwise, all the gains might dissipate quickly with the passage of time. This finding reaffirms the theoretical proposition that if organizations are to survive and thrive in a dynamic environment they must learn (Senge, 1990; Watkins and Marsick, 1999; March, 1999; Argyris, 1978).

### **Use of mixed methods**

Since this dissertation measured organizational learning in a particular set of public sector organizations, it has the potential to make a contribution to organizational research methodology. This study used mixed methods—a synergetic blending of the precision of quantitative methods and the greater richness of qualitative methods. Although mixed method approaches are gaining popularity across the social sciences, they are critically, if not inevitably, important in program evaluations and case studies. One of the ironies of research in public administration has been that most research fall on the extremes of the qualitative/quantitative spectrum. Thus, if the nature of analysis is more qualitative, data analysis ends at best with some relational tables; and if it is more quantitative, analysis seldom takes the time to collect and use primary data. hopefully, this dissertation's collection of primary data, analysis, triangulation of data, and analytical techniques should contribute to studying learning in public sector organizations, where even quantitative tests of parameters appear to be rare, much less the use of mixed methodologies (Marxi, 2003; Green and Caracelli, 1997).

## **Empirical results for local levels**

This dissertation also attempts apply and test theory by exploring the utility of the organizational learning lens for program evaluations and subjecting organization learning to empirical tests in public sector organizations at the local level. The later is particularly important because organizational learning theories in both public and private sector organizations, has been alleged to be utopian, ideological, and spiritual but not empirical (Garvin, 2000; Lipshitz et al., 2007). Moreover, this study contributes to program evaluation by providing a theoretical anchor for evaluation of intervention programs (Mara 2004; Reichardt and mark, 2004).

## **Contribution to practice**

The findings of this dissertation also should be helpful to senior level public sector managers in understanding learning dynamics in public sector organizations in general and in social service organizations in particular. It explores how departments of social services at the local level response to rapid changes in legal, political, and financial environments. These findings may well be of value to state departments of social services. In particular, the individual drive to learn among the lower-ranking staffers should be good news and point to great opportunities for senior level management to make their organizations better by harnessing the enormous human capacity at their disposal. Similarly, the federal government can benefit from the knowledge and insight of the local perspective. Mid-level managers, social workers, and eligibility workers also may benefit from understanding the broader context in which they work and how their work relates to the goals of state departments.

## **Enigmatic management structure and accountability**

Finally, one more important lesson for organizational learning is that the enigmatic management structure under which public organizations exist in a federal system can yield impediments to learning. The foster care management structure was a recurring theme in the focus group discussion, and almost all participants agreed that the current organizational structure of the state supervised, locally managed and partially federally funded foster care system is administratively cumbersome. However, some opined that this may be the only way of getting local input into the system; the present arrangement might be good for child outcomes even if it is costly and inefficient. In any event, when three levels of government are involved, it is likely that genuine accountability lies nowhere.

Local officials blame the state's mismanagement, and the state points a finger at the localities and the federal government.<sup>54</sup> The federal government wants to minimize variance across the states so that children are not adversely affected due to state income level or other factors. The state department of social services believes the federal government wants "one size to fit all" but in reality "one size fits none." Similarly, localities find more legal and administrative headaches than help from either the state acting itself or on behalf of the federal government. The staffers in VDSS think that they have to supervise localities over which they have no control; the result apparently is a situation of "responsibility without authority," which is doomed to fail, whereas localities see insufficient funding and high-cost mandates from above.

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<sup>54</sup> A state staffer once said to a local staffer at a meeting "You are thinking logically but you have to think federally." Another state staffer in a different context observed, "There are 120 little kingdoms where we have no control," referring to the LDSSs.

## Difficulty of Sustaining Learning

The scatterplots of the locality level penetration rate data (see Appendix D) show that many localities have tended to regress to their initial penetration rates. Even if these localities, for some reason, including by chance or by coercion, once increased their penetration rates, they did not sustain these increased rates (see Appendix B for maximum, minimum, and average penetration rates by locality). When I asked respondents why this may have been the case, the answers included the explanations of falling back into old habits, choosing the easiest way, and being unwilling to take on an extra burden without any incentive or compensation for the extra work. Many local officials still feel that increasing penetration rates is a learning exercise of doing a favor to VDSS rather than doing something right.

The interviewees opined that VDSS also suffers from a silo effect, a compartmental mentality, a culture that emphasizes passing-the-blame on to others and has a long way to go in gaining the respect of localities. Many LDSSs now appear to have better system visions than does VDSS; yet respondents stressed that one must not confuse that with trust of VDSS, which not only remains unchanged but may have even decreased. Moreover, many higher level officials at VDSS appear to have a mentality that has been described as threatened, insecure, and controlling, which turns localities off. This local officials' lack of trust toward VDSS may be causing penetration rates regress.<sup>55</sup>

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<sup>55</sup> Although I have seen in several meetings local officials attitude towards VDSS, FRUTAT analysts knowledge about their job ending at the time of focus group discussion, VDSS project manager's micromanaging of the PREP, and the VDSS staffers' attitude toward FRUTAT analysts may have caused some biased responses.

## **An economic interpretation of impediments to organizational learning**

Although this dissertation used the frameworks of organizational learning and program evaluation to interpret the implementation of the FRUTAT program, it became apparent in the analysis that using some concepts from economic frameworks would also enhance our understanding. Thus, below, I have suggested some additional insights that could come about for future research using an economic framework as a complement to frameworks of organizational learning.

Localities have no incentive to enhance penetration rate under the current funding arrangements. Increasing the penetration rate depends on local officials knowing the proper rules and taking appropriate action, but the localities get no direct benefits from any increased federal funding. Federal funding comes in quarterly allocations to the state, and then the state disperses those resources to localities based on a matching formula. Who gets how much depends on the formula, which is based on the county-level incomes. With the current incentive structure, i.e., the disincentive to enhance the penetration rate, the following problems evidently constrain increases in penetration rates:

- **Higher cost to benefit ratio:** The economic costs, including the additional transactions involving extra paper processing, and the psychological costs of having no say in defining the procedures and yet being required to implement them are much higher for localities trying to increase the penetration rate than any benefits they might receive. The focus group discussion highlighted that the costs and frustrations for localities increase when VDSS cannot provide clear guidance and

necessary support. This theme also was expressed in the interviews and in the localities' emails to FRUTAT analysts. The local officials' major complaint was that when they had questions and tried asking state staffers, they never got timely answers, which increased both economic and psychological costs. Hence, they may deliberately choose not to follow the state's wishes.

- **Moral hazard:** This disagreement might seem to be a *moral hazard* from the state's perspective. *Moral hazard* is a situation in which people or agencies alter their behavior based on a comparison of a legal penalty versus economic incentive. If the reaction to a particular consequence is direct, people behave differently than if it is diluted in a system. For example, people are less careful in maintaining their property or even health if they have insurance to cover any damage. Moral hazards occur when the probability of getting caught and the severity of penalty if caught are compensated and some surplus is left from the economic/financial or even socio-psychosocial gain. More precisely,  

$$\text{Probability} * \text{severity} < \text{gain} \implies \text{the room for moral hazard.}$$

A corollary comes into play when there is no incentive for localities to place foster care cases into federal funding categories, which involves significant additional work for the already overloaded workers. Since there is no direct gain or penalty, they would be expected to assign the cases to the easiest funding source. This choice which reduces costs to local staffers may become the most costly route for VDSS. Thus, it is an instance of moral hazard from the state's perspective, while it is the most efficient way for localities.

However, the act of *moral hazard* also could be seen from the local perspective when viewing the state's focus on dollars rather than on children. This aspect of moral hazard (i.e., any form of deviation from ethics) by a higher authority is more profound yet less recognized in our society. Localities evidently think that the state agency is trying to be a *free rider* in the sense that if the localities work hard and incur costs, the state benefits.

## **Discussion**

Although temporal learning has been detected in this study, in the absence of institutionalization, there is no mechanism to change organizational routines and behaviors so that the learning persists in organizations beyond one generation of staffers (March and Levitt, 1988). Lack of institutionalization seems to me to be a missed opportunity, although I do not know VDSS's utility function well enough to make this claim with a high degree of certainty. A rational economic agent, be that a person or an organization, optimizes its own utility function. The opportunity costs associated with a choice might look like a missed opportunity to an audience, but the agent might have deliberately absorbed the opportunity costs from the benefit of the choice that was taken. Hence, any claim of missed opportunity would be baseless until the utility function is known. However, the current dispersed learning and the penetration rate improvements are scattered among LDSSs across the state; because of the size and resource limitations of the majority of local agencies, the LDSSs cannot by themselves institutionalize the learning by themselves.

The alternative view of the very short-life span of dispersed learning is that if it were thick and concentrated in particular areas, it would be easy to preserve by benchmarking the knowledge and practices and then diffusing them into the localities that were lagging behind. However, when learning is dispersed, thin, and supported by an external group, that learning can diminish very rapidly and ultimately vanish when the group no longer exists to support it. Moreover, VDSS could have captured and capitalized on the current learning by continuing the process in some form or at least by capturing the knowledge of FRUTAT members before they left. In this sense, it looks like a missed opportunity even without our knowing VDSS's utility function.

Despite the above problems, collaboration between the university and the state agency appears to have considerable potential. The university creates knowledge that state and local agencies can use to provide quality services to citizens. If the university's knowledge is utilized through these types of collaboration, state agencies would be able to support not only better foster care but also the integrity of the system and the probity of the programs by enabling the system to serve as many of the most "deserving" clients as possible according to the intent of the law. The collaboration helped LDSSs at least in terms of having IV-E policy knowledge and achieving higher penetration rates through direct corrective actions and symbolic manipulations. This was possible only through the continuous exchange of experience between FRUTAT and LDSS staffers through the process of critical inquiry. While collaboration heightened the probity of socially created public goods (e.g., foster care) and added legitimacy to the business of state and local agencies, it also kept the university informed about the grounded reality of policy implementation problems. This arrangement



arguably made the university seek strategies to “put knowledge to work,” which might have increased its social relevancy (Bryans, 1999).

Finally, there is a fairly severe limit to organizational learning in public sector organizations. The organizational literature suggests that public sector organizations face more constraints in learning because of the constitutionality, wider accountability, and multiple constituencies (Lapalombara, 2003), and these organizations cannot cultivate learning without being cognizant of the power structure of the organization (Betts and Holdon, 2003). This study reaffirms these claims and adds another dynamic to the constraints in organizational learning in public sector organizations at the local level. When people in power view a learning environment as good and therefore feel no need to put more effort in it, the learning in public sector organizations at local level is further constrained.

However, a genuine desire to learn evidently existed with the lower level staffers in LDSSs regardless of the lack of a favorable group and supportive organizational environment for learning. Almost all interviewee expressed the opinion that many eligibility and social workers work with passion, which seems to have defied “Adams’ theory of inequities.”<sup>56</sup> Both the interviews and focus group discussions highlighted the existence of inequities, particularly on the side of eligibility workers; yet many staffers in LDSS seemed to work tirelessly and strive to learn enthusiastically so that they can produce better outcomes for children. These are the people who felt they had benefited most in terms of policy and procedure learning from FRUTAT’s efforts or from the PREP.

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<sup>56</sup> Adams’ theory of inequity occurs when O/I for ‘A’ is > or < than O/I for ‘B’ (‘O’ is the output such as salary, benefits, prestige or recognition), and ‘I’ is input (e.g., labor, sincerity, hard-work, honesty, and loyalty).

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# Appendix A

## ***Understanding Local Social Service Agencies in the Commonwealth of Virginia***

This survey is designed to gather input from social service workers to help in providing a greater understanding of social service organizations. The survey is part of my doctoral dissertation research. Your responses will never be released in a way that would reveal your identity or the identity of your agency. The insights that will emerge from the results of this survey will potentially help both local and state social services agencies.

For each statement below, please click on the one response option that best represents your level of agreement. If you change your mind, you can scroll back and change the answer(s) before you click the submit button. There are no right or wrong answers. I am interested only in your views of what things are like in your agency at the present time.

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**1. In my organization, staff members openly discuss mistakes in order to learn from them.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**2. In my organization, staff members generally identify skills they need for future tasks.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**3. In my organization, staff members generally help each other learn.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**4. In my organization, staff members can get money and other resources to support their learning.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**5. In my organization, staff members are generally given time to support learning.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**6. In my organization, staff members generally view problems in their work as an opportunity to learn.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree



Strongly Disagree

**7. In my organization, staff members are generally rewarded for learning.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**8. In my organization, staff members generally give open and honest feedback to each other.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**9. In my organization, staff members generally listen to others' views before speaking.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**10. In my organization, staff members are generally encouraged to ask "why" regardless of rank.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**11. In my organization, whenever staff members state their views, they also ask what others think.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**12. In my organization, staff members generally treat each other with respect.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**13. In my organization, staff members usually spend time building trust with each other.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**14. In my organization, teams/groups generally have the freedom to adapt their goals as needed.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**15. In my organization, teams/groups treat members as equals, regardless of rank, culture, or other differences.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**16. In my organization, teams/groups generally focus both on the group's task and on how well the group is working.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**17. In my organization, teams/groups revise their thinking as a result of group discussion or information collected.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**18. In my organization, teams/groups are generally rewarded for their achievements as a team/group.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**19. In my organization, teams/groups are confident that the organization will act on their recommendations.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**20. My organization uses two-way communication on a regular basis, such as suggestion systems, electronic bulletin boards, or open meetings.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**21. My organization enables staff members to get needed information at any time quickly and easily.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**22. My organization maintains an up-to-date database of employee skills.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**23. My organization has a system to measure gaps between current and expected performance.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**24. My organization generally makes its lessons learned available to all staff members.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**25. My organization measures the results of time and resources spent on training.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**26. My organization recognizes staff members for taking initiative.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**27. My organization gives staff members choices in their work assignments.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**28. My organization invites staff members to contribute to the organization's vision.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**29. My organization gives staff members control over the resources they need to accomplish their work.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**30. My organization generally supports staff members who take calculated risks.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**31. My organization builds alignment of vision across different levels and work groups.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree

Strongly Disagree

**32. My organization generally encourages staff members to think from a state's perspective.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**33. My organization encourages everyone to bring the clients' views into the decision making process.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**34. My organization generally considers the impact of decisions on employees' morale.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**35. My organization works together with the outside community to meet mutual needs.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**36. My organization encourages staff members to get answers from across the organization when solving problems.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**37. In my organization, the director/supervisor generally supports requests for learning opportunities and training.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**38. In my organization, the director/supervisor shares up-to-date information with staff members about federal and state guidelines and organizational directions.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree  
Strongly Disagree

**39. In my organization, the director/supervisor empowers others to help carry out the organization's vision.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree

Strongly Disagree

**40. In my organization, the director/supervisor mentors and coaches subordinates.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree

Strongly Disagree

**41. In my organization, the director/supervisor continually looks for opportunities to learn.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree

Strongly Disagree

**42. In my organization, the director/supervisor pays attention to the organization's actions to ensure that they are consistent with its value/mission.**

Strongly Agree    Agree    Somewhat Agree    Somewhat Disagree    Disagree

Strongly Disagree

**43. How often do you have staff meetings?**

Daily    Twice a week    Weekly    Biweekly    Monthly    Bimonthly

**Please provide your feedback by typing your response in the following space**

**44. What do you think is missing from this questionnaire that might be helpful to understand variation among local department of social services?**

**45. What do your agency's directors and supervisors pay most the most attention to?**

**What is your locality's FIPS?**

**What is your role/title?**

Eligibility Worker

Social Worker

Supervisor

Director

**What is your highest educational degree?**

High School Degree/GED

Associate Degree (2 years college)

Bachelor's Degree (4 years college)

Master's Degree (6 years college)

**How long have you been working in this agency?**

Less than a year

1-3 years

3-5 years

More than 5 years

**Thank you very much for your time and help!**

## Appendix B

### Statistical Table of the (Locality level) Penetration Rate

<b>Locality</b>	<b>Min_ratio</b>	<b>Min_total</b>	<b>Max_ratio</b>	<b>Max_total</b>	<b>Mean_ratio</b>
Accomack	0.125	3	0.75	8	0.3146
Albemarle	0.1	3	1	11	0.55864
Alexandria	0	2	0.55556	10	0.26182
Alleghany	0	0	1	8	0.04444
Amelia	0.19259	97	0.48214	153	0.37299
Amherst	0	2	0.85714	7	0.33405
Appomattox	0.125	5	0.75	21	0.51556
Arlington	0.28571	10	0.8	14	0.58935
Augusta	0.11111	4	0.57143	10	0.31256
Bath	0.33333	9	0.8	18	0.53986
BedfrdCity	0.2381	14	0.625	35	0.4111
BedfrdCo	0.22222	7	0.61538	26	0.39526
Bland	0.08333	2	1	12	0.55911
Botetourt	0.14634	29	0.63333	52	0.40854
Bristol	0.26207	108	0.63793	179	0.47386
Brunswick	0.2439	29	0.5	71	0.36744
Buchanan	0.33333	5	1	8	0.8425
Buckingham	0.14286	10	0.5	26	0.34831
BuenaVista	0	2	1	11	0.63346
Campbell	0	3	1	10	0.33378
Caroline	0.125	2	0.66667	10	0.31818
Carroll	0.14286	6	1	17	0.51346
CharlesCity	0.09091	3	1	13	0.5046
Charlotte	0.07692	7	0.5	18	0.28096
Charville	0.36364	7	0.875	16	0.63406
Chesapeake	0.13725	94	0.7551	126	0.52358
Chesterfield	0.33333	5	0.9	13	0.635
Clarke	0.22222	5	0.8	32	0.51133
CliftonForge	0.42662	424	0.69265	703	0.59843
ColonialHts	0	5	0.41667	14	0.19125
Covington	0	1	1	9	0.74046
Craig	0	3	1	16	0.82631
Culpeper	0.11111	7	0.625	19	0.38851
Cumberland	0.04444	29	0.6	53	0.42847
Danville	0.42262	112	0.76316	177	0.58038
Dickenson	0	4	1	10	0.6149
Dinwiddie	0.492	151	0.825	287	0.63165
Emporia	0.36585	18	0.84211	41	0.64597
Essex	0.54545	17	0.94737	48	0.79689
FairfxCity	0.38261	303	0.72857	548	0.52355
FairfxCo	0.44619	260	0.72028	477	0.59272
FallsChurch	0.30303	17	0.84615	33	0.63842
Fauquier	0	1	0.5	3	0.0102

Floyd	0.5177	198	0.79227	268	0.62984
Fluvanna	0	3	0.83333	6	0.39367
FranklCity	0.45455	50	0.67742	100	0.55384
FranklCo	0.34028	256	0.50168	329	0.42454
Frederick	0.66667	5	1	22	0.85274
Fredrcksburg	0.27273	16	0.68	33	0.49422
Galax	0.28333	87	0.52174	127	0.42744
Giles	0.50549	142	0.79487	217	0.64497
Gloucester	0.31677	133	0.70714	178	0.55113
Goochland	0.33962	53	0.7	93	0.53799
Grayson	0.45989	139	0.6519	202	0.57445
Greene	0.15789	5	0.6	19	0.30106
Greensville	0.34884	38	0.58537	58	0.47438
Halifax	0	0	1	5	0.1746
Hampton	0.33554	310	0.70606	510	0.50077
Hanover	0	1	0.5	3	0.06803
Harrisonburg	0.23529	27	0.6	50	0.38384
Henrico	0.11111	15	0.5	27	0.28011
Henry	0.25581	33	0.68421	56	0.43355
Highland	0.50909	23	0.76471	59	0.62923
Hopewell	0.2	11	0.70588	22	0.50114
IsleOfWight	0.47222	49	0.7551	77	0.64407
JamesCity	0.33333	0	1	3	0.52033
King&Queen	0.30233	34	0.63636	56	0.51582
KingGeorge	0.17391	14	0.55882	43	0.35785
KingWilliam	0	4	0.8	13	0.40305
Lancaster	0.15152	16	0.44444	35	0.30048
Lee	0	2	0.91667	17	0.41532
Lexington	0.21429	18	0.69565	32	0.48257
Loudoun	0.38095	21	0.75	38	0.58997
Louisa	0.18966	118	0.38406	212	0.28325
Lunenburg	0.07143	3	0.33333	16	0.2436
Lynchburg	0.25	58	0.5339	121	0.42798
Madison	0.23077	21	0.45455	43	0.34265
Manassas	0.10769	53	0.43333	107	0.33966
MansssPark	0.15789	78	0.46316	114	0.3635
Martinsville	0.33333	41	0.65	74	0.49751
Mathews	0.38636	35	0.66667	49	0.52766
Mecklenburg	0.31034	22	0.75	46	0.54388
Middlesex	0.39706	43	0.64444	75	0.50455
Montgomery	0.31818	16	0.79167	33	0.50748
Nelson	0.07143	12	0.47619	35	0.32827
NewKent	0	1	1	11	0.36449
NewportNews	0	1	1	15	0.29966
Norfolk	0.27273	16	0.75	39	0.633
Northhampton	0.2562	55	0.49351	126	0.42378
Northumberland	0.0625	12	0.53333	33	0.34845
Norton	0.09091	8	0.77778	24	0.48503
Nottoway	0.33333	3	1	8	0.8469
Orange	0.17808	47	0.48571	89	0.35458



Page	0.28571	3	1	19	0.59782
Patrick	0	0	0	2	0
Petersburg	0.25	9	0.8125	26	0.47344
Pittsylvania	0.28571	2	1	20	0.62534
Poquoson	0.32653	33	0.71429	74	0.49706
Portsmouth	0.25676	50	0.53704	95	0.39624
Powhatan	0.15493	18	0.86364	71	0.5054
PrinceEdward	0.15	37	0.75	59	0.50463
PrinceGeorge	0	0	0.5	3	0.20513
PrinceWilliam	0	1	1	8	0.423
Pulaski	0.22872	134	0.66447	219	0.46352
Radford	0.28571	4	0.81818	32	0.53682
Rappahannock	0.10345	11	0.54545	41	0.27714
RichmdCity	0	2	0.5	20	0.18449
RichmdCo	0.31579	7	0.8	22	0.56215
RoanokCity	0.34615	18	0.8	40	0.55733
RoanokCo	0	3	0.83333	13	0.35528
Rockbridge	0.41499	279	0.70345	360	0.52785
Rockingham	0.15942	51	0.41935	92	0.28633
Russell	0.4	11	0.63636	28	0.53062
Salem	0.14286	7	0.75	27	0.49678
Scott	0	3	0.66667	14	0.37962
Shenandoah	0.44444	22	0.68571	52	0.60866
Smyth	0.38889	52	0.71233	94	0.54214
Southampton	0.13333	5	0.875	21	0.44456
Spotsylvania	0.31746	25	0.78788	63	0.51923
Stafford	0	6	0.5	14	0.20394
Staunton	0.25	3	1	8	0.50571
Suffolk	0.07692	4	0.71429	28	0.42689
Surry	0.22222	17	0.52174	39	0.37293
Sussex	0.55208	84	0.82143	117	0.68681
Tazewell	0.14706	32	0.78788	50	0.55466
VirginiaBeach	0.1875	3	1	19	0.61299
Warren	0.15909	40	0.70149	89	0.43262
Washington	0	1	1	16	0.59701
Waynesboro	0.29787	32	0.72973	52	0.53563
Westmoreland	0.24	24	0.6	43	0.41624
Williamsburg	0.2963	24	0.73684	46	0.5008
Winchester	0.47788	96	0.68085	153	0.57725
Wise	0.34375	24	0.74194	38	0.51002
Wythe	0.29032	80	0.78947	114	0.63799
York	0.04348	14	0.72917	50	0.3136

---

***Descriptive Statistics of the  
Penetration Rate of Central  
Region***

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Mean	0.463132121
Standard Error	0.030470591
Median	0.47386
Standard Deviation	0.175040217
Range	0.79806
Minimum	0.04444
Maximum	0.8425
Sum	15.28336
Count	33

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***Descriptive Statistics of  
Penetration Rate of Eastern  
Region***

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Mean	0.55075
Standard Error	0.047424731
Median	0.58655
Standard Deviation	0.189698926
Range	0.84254
Minimum	0.0102
Maximum	0.85274
Sum	8.812
Count	16

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***Descriptive Statistics of  
Penetration Rate of Northern  
Region***

---

Mean	0.434893824
Standard Error	0.023193565
Median	0.453965
Standard Deviation	0.135240562
Range	0.57694
Minimum	0.06803
Maximum	0.64497
Sum	14.78639
Count	34

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***Descriptive Statistics of  
Penetration Rate of Northern  
Region***

---

Mean	0.434893824
Standard Error	0.023193565
Median	0.453965
Standard Deviation	0.135240562
Range	0.57694
Minimum	0.06803
Maximum	0.64497
Sum	14.78639
Count	34

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***Descriptive Statistics of Penetration  
Rate of Piedmont Region***

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Mean	0.494252381
Standard Error	0.025483105
Median	0.51002
Standard Deviation	0.116778257
Sample Variance	0.013637161
Range	0.48287
Minimum	0.20394
Maximum	0.68681
Sum	10.3793
Count	21

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# Appendix C

## Descriptive Statistics of the Penetration Rate

### Moments

N	6659	Sum Weights	6659
Mean	0.47026809	Sum Observations	3131.51519
Std Deviation	0.21289225	Variance	0.04532311
Skewness	0.00761093	Kurtosis	0.13290807
Uncorrected SS	1774.41291	Corrected SS	301.761254
Coeff Variation	45.2704003	Std Error Mean	0.00260889

### Location

### Variability

Mean	0.470268	Std Deviation	0.21289
Median	0.473684	Variance	0.04532
Mode	0.500000	Range	1.00000
		Interquartile Range	0.26667

## Quantile of penetration rate

Quantile	Estimate
100% Max	1.0000000
99%	1.0000000
95%	0.8333333
90%	0.7307692
75% Q3	0.6000000
50% Median	0.4736842
25% Q1	0.3333333
10%	0.2000000
5%	0.0833333
1%	0.0000000
0% Min	0.0000000

### Distribution of Caseload by Class (the 2<sup>nd</sup> group)

Table of Region by class

Region	class				Total
Frequency Expected Cell Chi-Square Percent	1	2	3	4	
Central	313 259.73 10.925 7.63	334 315.83 1.0454 8.15	201 275.72 20.249 4.90	302 298.72 0.036 7.37	1150   28.05
Eastern	36 135.51 73.076 0.88	102 164.78 23.919 2.49	190 143.85 14.803 4.63	272 155.85 86.555 6.63	600   14.63
Northern	241 214.56 3.2579 5.88	248 260.9 0.6381 6.05	266 227.77 6.4173 6.49	195 246.77 10.86 4.76	950   23.17
Piedmont	222 169.39 16.34 5.41	273 205.98 21.81 6.66	160 179.82 2.184 3.90	95 194.82 51.143 2.32	750   18.29
Western	114 146.8 7.3305 2.78	169 178.51 0.5069 4.12	166 155.84 0.6622 4.05	201 168.84 6.1251 4.90	650   15.85
Total	926 22.59	1126 27.46	983 23.98	1065 25.98	4100 100.00

Statistic	DF	Value	Prob
Chi-Square	12	357.8827	<.0001
Likelihood Ratio Chi-Square	12	385.6127	<.0001
Mantel-Haenszel Chi-Square	1	3.6298	0.0568
Phi Coefficient		0.2954	
Contingency Coefficient		0.2833	
Cramer's V		0.1706	

### Distribution of caseload by region and class (the 3<sup>rd</sup> group)

Region	class				Total
Frequency	1	2	3	4	
Expected					
Cell Chi-Square					
Percent					
Central	167	135	103	145	550
	141.02	137.72	121.88	149.38	
	4.7863	0.0537	2.9246	0.1284	
	6.68	5.40	4.12	5.80	22.00
Eastern	52	43	33	72	200
	51.28	50.08	44.32	54.32	
	0.0101	1.0009	2.8913	5.7545	
	2.08	1.72	1.32	2.88	8.00
Northern	154	206	198	142	700
	179.48	175.28	155.12	190.12	
	3.6173	5.3841	11.853	12.179	
	6.16	8.24	7.92	5.68	28.00
Piedmont	197	167	122	214	700
	179.48	175.28	155.12	190.12	
	1.7102	0.3911	7.0715	2.9994	
	7.88	6.68	4.88	8.56	28.00
Western	71	75	98	106	350
	89.74	87.64	77.56	95.06	
	3.9134	1.823	5.3867	1.259	
	2.84	3.00	3.92	4.24	14.00
Total	641	626	554	679	2500
	25.64	25.04	22.16	27.16	100.00

#### Statistics for Table of Region by class

Statistic	DF	Value	Prob
Chi-Square	12	75.1384	<.0001
Likelihood Ratio Chi-Square	12	75.2781	<.0001
Mantel-Haenszel Chi-Square	1	7.0268	0.0080
Phi Coefficient		0.1734	
Contingency Coefficient		0.1708	
Cramer's V		0.1001	

Sample Size = 2500

## ANCOVA Results Table (of the 2<sup>nd</sup>)

### Differences of Least Squares Means

Effect	Region	year	_Region	_year	Estimate	Standard Error	DF	t Value	Pr >  t	Adjustment	Adj P
Region	Central		Eastern		-0.1157	0.04745	73	-2.44	0.0172	Tukey-Kramer	0.1171
Region	Central		Northern		0.002322	0.04269	73	0.05	0.9568	Tukey-Kramer	1.0000
Region	Central		Piedmont		0.05030	0.04520	73	1.11	0.2694	Tukey-Kramer	0.7992
Region	Central		Western		-0.04083	0.04626	73	-0.88	0.3803	Tukey-Kramer	0.9024
Region	Eastern		Northern		0.1180	0.04985	73	2.37	0.0206	Tukey-Kramer	0.1363
Region	Eastern		Piedmont		0.1660	0.05201	73	3.19	0.0021	Tukey-Kramer	0.0173
Region	Eastern		Western		0.07482	0.05294	73	1.41	0.1618	Tukey-Kramer	0.6212
Region	Northern		Piedmont		0.04798	0.04771	73	1.01	0.3179	Tukey-Kramer	0.8519
Region	Northern		Western		-0.04315	0.04871	73	-0.89	0.3786	Tukey-Kramer	0.9012
Region	Piedmont		Western		-0.09113	0.05092	73	-1.79	0.0777	Tukey-Kramer	0.3875
year		2001		2002	-0.06278	0.01614	385	-3.89	0.0001	Tukey-Kramer	0.0016
year		2001		2003	-0.08121	0.01593	385	-5.10	<.0001	Tukey-Kramer	<.0001
year		2001		2004	-0.04094	0.01593	385	-2.57	0.0106	Tukey-Kramer	0.1074
year		2001		2005	-0.1656	0.01594	385	-10.38	<.0001	Tukey-Kramer	<.0001
year		2001		2006	-0.1579	0.01716	385	-9.20	<.0001	Tukey-Kramer	<.0001
year		2002		2003	-0.01843	0.006751	385	-2.73	0.0066	Tukey-Kramer	0.0718
year		2002		2004	0.02184	0.006751	385	3.23	0.0013	Tukey-Kramer	0.0165
year		2002		2005	-0.1028	0.006769	385	-15.18	<.0001	Tukey-Kramer	<.0001
year		2002		2006	-0.09507	0.009282	385	-10.24	<.0001	Tukey-Kramer	<.0001
year		2003		2004	0.04027	0.006250	385	6.44	<.0001	Tukey-Kramer	<.0001
year		2003		2005	-0.08434	0.006270	385	-13.45	<.0001	Tukey-Kramer	<.0001
year		2003		2006	-0.07665	0.008925	385	-8.59	<.0001	Tukey-Kramer	<.0001
year		2004		2005	-0.1246	0.006270	385	-19.88	<.0001	Tukey-Kramer	<.0001
year		2004		2006	-0.1169	0.008925	385	-13.10	<.0001	Tukey-Kramer	<.0001
year		2005		2006	0.007699	0.008935	385	0.86	0.3894	Tukey-Kramer	0.9553

## The ANCOVA for the Third Dataset

### Differences of Least Squares Means

Effect	Region	year	_Region	_year	Estimate	Standard Error	DF	t Value	Pr >  t	Adjustment	Adj P
Region	Central		Eastern		-0.01810	0.09894	45	-0.18	0.8557	Tukey-Kramer	0.9997
Region	Central		Northern		0.02890	0.06828	45	0.42	0.6741	Tukey-Kramer	0.9931
Region	Central		Piedmont		-0.00995	0.06878	45	-0.14	0.8857	Tukey-Kramer	0.9999
Region	Central		Western		-0.01348	0.08193	45	-0.16	0.8701	Tukey-Kramer	0.9998
Region	Eastern		Northern		0.04699	0.09608	45	0.49	0.6271	Tukey-Kramer	0.9880
Region	Eastern		Piedmont		0.008151	0.09643	45	0.08	0.9330	Tukey-Kramer	1.0000
Region	Eastern		Western		0.004620	0.1062	45	0.04	0.9655	Tukey-Kramer	1.0000
Region	Northern		Piedmont		-0.03884	0.06459	45	-0.60	0.5506	Tukey-Kramer	0.9742
Region	Northern		Western		-0.04237	0.07844	45	-0.54	0.5917	Tukey-Kramer	0.9826
Region	Piedmont		Western		-0.00353	0.07888	45	-0.04	0.9645	Tukey-Kramer	1.0000
year		2001		2002	-0.04724	0.02358	238	-2.00	0.0463	Tukey-Kramer	0.3434
year		2001		2003	-0.07495	0.02327	238	-3.22	0.0015	Tukey-Kramer	0.0180
year		2001		2004	-0.08803	0.02327	238	-3.78	0.0002	Tukey-Kramer	0.0027
year		2001		2005	-0.1901	0.02328	238	-8.17	<.0001	Tukey-Kramer	<.0001
year		2001		2006	-0.1641	0.02504	238	-6.55	<.0001	Tukey-Kramer	<.0001
year		2002		2003	-0.02772	0.009830	238	-2.82	0.0052	Tukey-Kramer	0.0578
year		2002		2004	-0.04080	0.009842	238	-4.15	<.0001	Tukey-Kramer	0.0007
year		2002		2005	-0.1429	0.009851	238	-14.51	<.0001	Tukey-Kramer	<.0001
year		2002		2006	-0.1168	0.01350	238	-8.66	<.0001	Tukey-Kramer	<.0001
year		2003		2004	-0.01308	0.009051	238	-1.45	0.1497	Tukey-Kramer	0.6993
year		2003		2005	-0.1152	0.009060	238	-12.71	<.0001	Tukey-Kramer	<.0001
year		2003		2006	-0.08910	0.01294	238	-6.89	<.0001	Tukey-Kramer	<.0001
year		2004		2005	-0.1021	0.009070	238	-11.26	<.0001	Tukey-Kramer	<.0001
year		2004		2006	-0.07602	0.01294	238	-5.87	<.0001	Tukey-Kramer	<.0001
year		2005		2006	0.02608	0.01295	238	2.01	0.0452	Tukey-Kramer	0.3377

**Multivariate Analysis of Variance (for the strength of factors)**

Characteristic Roots and Vectors of: E Inverse \* H, where  
 H = Type III SSCP Matrix for Factor  
 E = Error SSCP Matrix

Characteristic Root	Percent	Characteristic Vector Qmean	V'EV=1
0.01026239	100.00	0.03683113	

MANOVA Test Criteria and Exact F Statistics for the Hypothesis of No Overall Factor Effect  
 H = Type III SSCP Matrix for Factor  
 E = Error SSCP Matrix

S=1 M=0 N=492.5

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.98984186	5.06	2	987	0.0065
Pillai's Trace	0.01015814	5.06	2	987	0.0065
Hotelling-Lawley Trace	0.01026239	5.06	2	987	0.0065
Roy's Greatest Root	0.01026239	5.06	2	987	0.0065

Response Category Level Information

Response Category = factors Levels = 3 (Group, Individual, and Organization)

Number of Observations read and Used 990; Dependent Variable: Qmean

Source	DF	Sum of		F Value	Pr > F
		Squares	Mean Square		
Model	2	7.5651644	3.7825822	5.06	0.0065
Error	987	737.1738692	0.7468834		
Corrected Total	989	744.7390336			

R-Square	Coeff Var	Root MSE	Qmean Mean
0.010158	21.02745	0.864224	4.109980

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Factor	2	7.56516444	3.78258222	5.06	0.0065

-----  
 Strength of Factors (Least Squares Means)  
 Adjustment for Multiple Comparisons: Tukey

Factor	Qmean	LSMEAN	LSMEAN Number
--------	-------	--------	---------------



Group	4.02175758	1
Individual	4.22909091	2
Organization	4.07909091	3

Least Squares Means for effect Factor  
 Pr > |t| for H0: LSmean(i)=LSmean(j)

**Dependent Variable: Qmean**

i/j	1	2	3
1		0.0060	0.6706
2	0.0060		0.0668
3	0.6706	0.0668	

**Multivariate Analysis of Variance (for the strength of dimensions)**

Characteristic Roots and Vectors of: E Inverse \* H, where  
 H = Type III SSCP Matrix for Dimensions  
 E = Error SSCP Matrix

Characteristic Root	Percent	Characteristic Vector Qmean	V'EV=1
0.09231396	100.00	0.02235216	

MANOVA Test Criteria and Exact F Statistics for the Hypothesis of No Overall Dimensions Effect

H = Type III SSCP Matrix for Dimensions  
 E = Error SSCP Matrix

S=1 M=2 N=1150.5

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.91548771	35.43	6	2303	<.0001
Pillai's Trace	0.08451229	35.43	6	2303	<.0001
Hotelling-Lawley Trace	0.09231396	35.43	6	2303	<.0001
Roy's Greatest Root	0.09231396	35.43	6	2303	<.0001

**Response category Level Information**

Response category	Levels	Values
Dimensions	7	CL CO CT EE ID SC SL

Number of Observations Read and used 2310

**Dependent Variable: Qmean**

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	184.768705	30.794784	35.43	<.0001

Error	2303	2001.525129	0.869095
Corrected Total	2309	2186.293834	

R-Square	Coeff Var	Root MSE	Qmean Mean
0.084512	22.61679	0.932252	4.121948

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Dimensions	6	184.7687047	30.7947841	35.43	<.0001

**Least Squares Means**

Adjustment for Multiple Comparisons: Tukey

Dimensions	Qmean LSMEAN	LSMEAN Number
CL	4.25718182	1
CO	4.23939394	2
CT	4.02175758	3
EE	3.68945455	4
ID	4.20100000	5
SC	3.83236364	6
SL	4.61248485	7

Least Squares Means for effect Dimensions  
Pr > |t| for H0: LSMean(i)=LSMean(j)

Dependent Variable: Qmean

i/j	1	2	3	4	5	6	7
1		1.0000	0.0204	<.0001	0.9874	<.0001	<.0001
2	1.0000		0.0435	<.0001	0.9984	<.0001	<.0001
3	0.0204	0.0435		0.0001	0.1709	0.1234	<.0001
4	<.0001	<.0001	0.0001		<.0001	0.4348	<.0001
5	0.9874	0.9984	0.1709	<.0001		<.0001	<.0001
6	<.0001	<.0001	0.1234	0.4348	<.0001		<.0001
7	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	

**The REG Procedure**  
**Model: MODEL1**

**Dependent Variable: Ratio**

Number of Observations Read	6750
Number of Observations Used	6348
Number of Observations with Missing Values	402

**Analysis of Variance**

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	19.59217	6.53072	191.68	<.0001
Error	6344	216.14850	0.03407		

Corrected Total            6347        235.74067

Root MSE                    0.18458    R-Square        0.0831  
 Dependent Mean            0.49091    Adj R-Sq        0.0827  
 Coeff Var                    37.60061

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr >  t
Intercept	1	-1.02561	0.08193	-12.52	<.0001
WTCHANGE	1	0.46114	0.05539	8.32	<.0001
CHANGE	1	0.04374	0.01102	3.97	<.0001
Day	1	0.00009388	0.00000508	18.50	<.0001

The REG Procedure

Model: MODEL1

Dependent Variable: WTCHANGE

Number of Observations Read            6750  
 Number of Observations Used            6348  
 Number of Observations with Missing Values    402

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	0.29764	0.14882	47.14	<.0001
Error	6345	20.03299	0.00316		
Corrected Total	6347	20.33063			

Root MSE                    0.05619    R-Square        0.0146  
 Dependent Mean            0.00168    Adj R-Sq        0.0143  
 Coeff Var                    3354.30551

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr >  t
Intercept	1	-0.03125	0.02515	-1.24	0.2140
Ratio1	1	-0.03673	0.00378	-9.71	<.0001
Day	1	0.00000316	0.00000158	2.00	0.0451

Time-series analysis

(The AUTOREG Procedure)

Dependent Variable    Ratio

Ordinary Least Squares Estimates

SSE                    289.903763    DFE                    6657  
 MSE                    0.04355        Root MSE              0.20868  
 SBC                    -1955.4444    AIC                    -1969.0518

Regress R-Square      0.0393      Total R-Square      0.0393  
 Durbin-Watson      0.0810

Variable	DF	Estimate	Standard Error	t Value	Approx Pr >  t
Intercept	1	-1.0159	0.0901	-11.27	<.0001
Day	1	0.0000921	5.5827E-6	16.50	<.0001

Estimates of Autocorrelations

Lag	Covariance	Correlation	-1	9	8	7	6	5	4	3	2	1	0	1	2	3	4	5	6	7	8	9	1	
0	0.0435	1.000000																						*****
1	0.0414	0.950310																						*****
2	0.0403	0.926164																						*****
3	0.0394	0.905830																						*****

Preliminary MSE      0.00394

Estimates of Autoregressive Parameters

Lag	Coefficient	Standard Error	t Value
1	-0.700647	0.012200	-57.43
2	-0.166974	0.014779	-11.30
3	-0.098240	0.012200	-8.05

Algorithm converged.

The AUTOREG Procedure

Maximum Likelihood Estimates

SSE                    18.7418163      DFE                    6654  
 MSE                    0.00282      Root MSE              0.05307  
 SBC                    -20148.771      AIC                    -20182.79  
 Regress R-Square      0.0109      Total R-Square      0.9379  
 Durbin-Watson      2.0249

Variable	DF	Estimate	Standard Error	t Value	Approx Pr >  t
Intercept	1	0.1696	0.0437	3.88	0.0001
Day	1	0.0000184	2.1399E-6	8.58	<.0001
AR1	1	-0.7970	0.0122	-65.27	<.0001
AR2	1	-0.0472	0.0157	-3.01	0.0026
AR3	1	-0.1319	0.0122	-10.81	<.0001

Autoregressive parameters assumed given.

Variable	DF	Estimate	Standard Error	t Value	Approx Pr >  t
Intercept	1	0.1696	0.0437	3.88	0.0001
Day	1	0.0000184	2.1397E-6	8.58	<.0001

AUTOREG Procedure

**Dependent Variable** WTCHANGE

Ordinary Least Squares Estimates

SSE	20.3306345	DFE	6346
MSE	0.00320	Root MSE	0.05660
SBC	-18429.073	AIC	-18442.585
Regress R-Square	0.0000	Total R-Square	0.0000
Durbin-Watson	1.6790		

Variable	DF	Estimate	Standard Error	t Value	Approx Pr >  t
Intercept	1	0.001415	0.0251	0.06	0.9551
Day	1	1.6127E-8	1.5554E-6	0.01	0.9917

Estimates of Autocorrelations

Lag	Covariance	Correlation	-1	9	8	7	6	5	4	3	2	1	0	1	2	3	4	5	6	7	8	9	1	
0	0.00320	1.000000																						
1	0.000254	0.079453																						
2	0.000144	0.044818																						
3	0.000059	0.018517																						

Preliminary MSE 0.00318

Estimates of Autoregressive Parameters

Lag	Coefficient	Standard Error	t Value
1	-0.075905	0.012555	-6.05
2	-0.037825	0.012582	-3.01
3	-0.012110	0.012555	-0.96

Algorithm converged.

The AUTOREG Procedure

Maximum Likelihood Estimates

SSE	20.0305485	DFE	6343
MSE	0.00316	Root MSE	0.05620
SBC	-18495.565	AIC	-18529.344
Regress R-Square	0.0000	Total R-Square	0.0148
Durbin-Watson	1.9549		

Variable	DF	Estimate	Standard Error	t Value	Approx Pr >  t
Intercept	1	0.009576	0.0294	0.33	0.7448
Day	1	-5.29E-7	1.8222E-6	-0.29	0.7716
AR1	1	-0.1308	0.0145	-9.04	<.0001
AR2	1	-0.0851	0.0152	-5.61	<.0001
AR3	1	-0.0321	0.0142	-2.26	0.0236

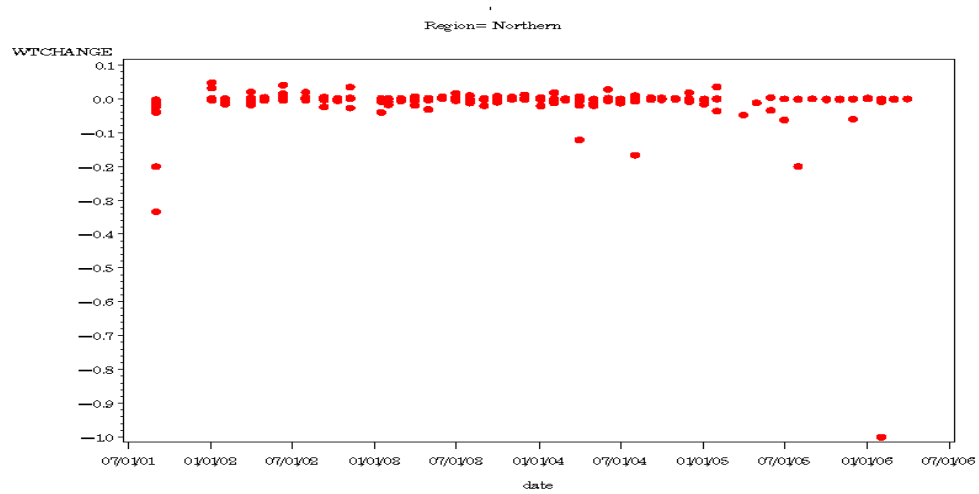
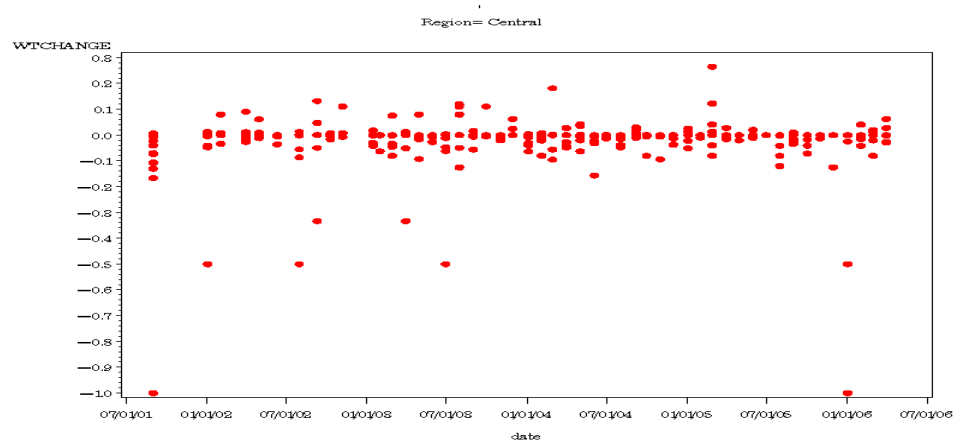
Autoregressive parameters assumed given.

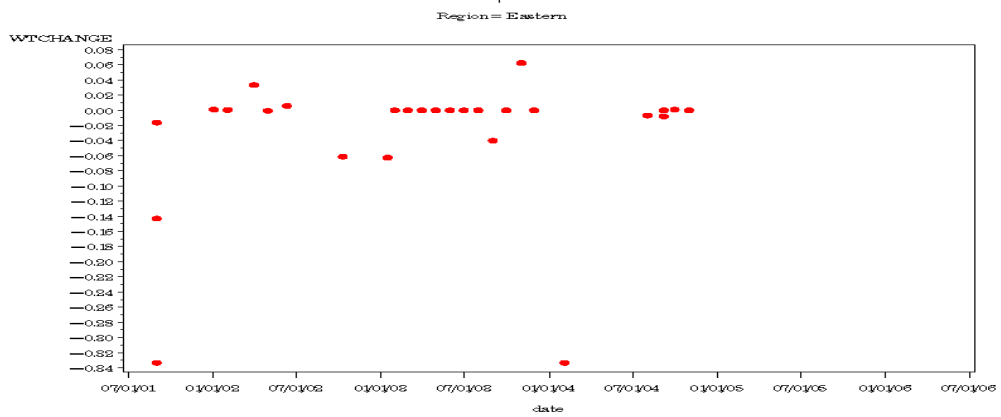
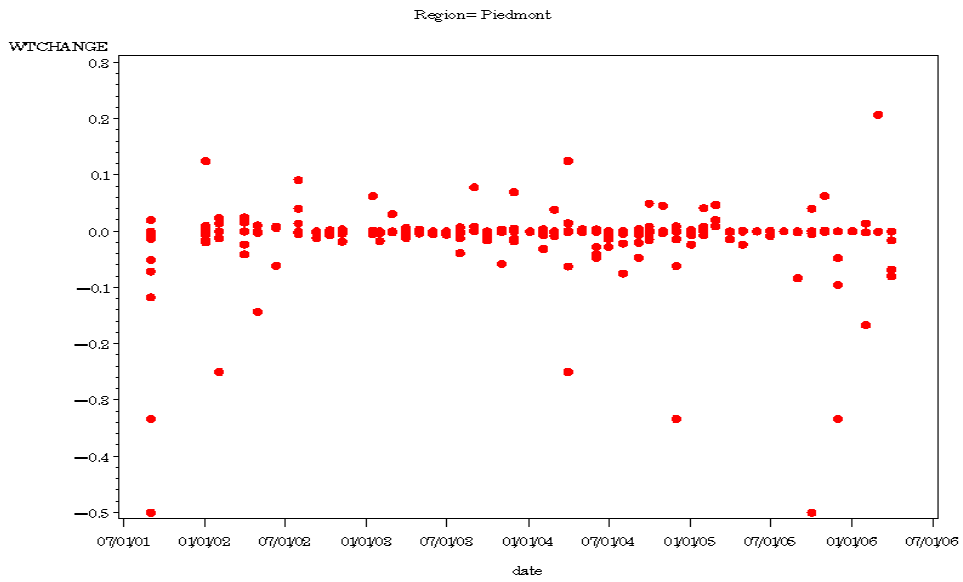
Variable	DF	Estimate	Standard Error	t Value	Approx Pr >  t
Intercept	1	0.009576	0.0294	0.33	0.7446
Day	1	-5.29E-7	1.8211E-6	-0.29	0.7714

# Appendix D

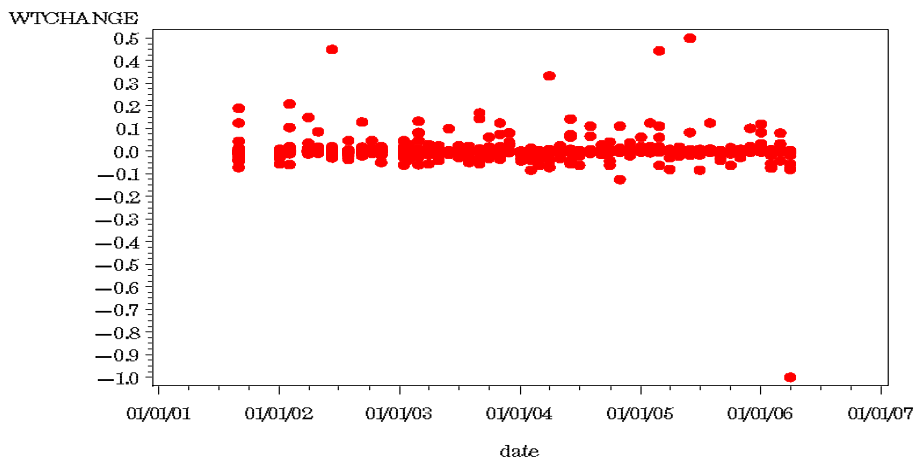
## SAS Figures and scatter Plots

### Scatter plot of the change of Mean Ratio by Region





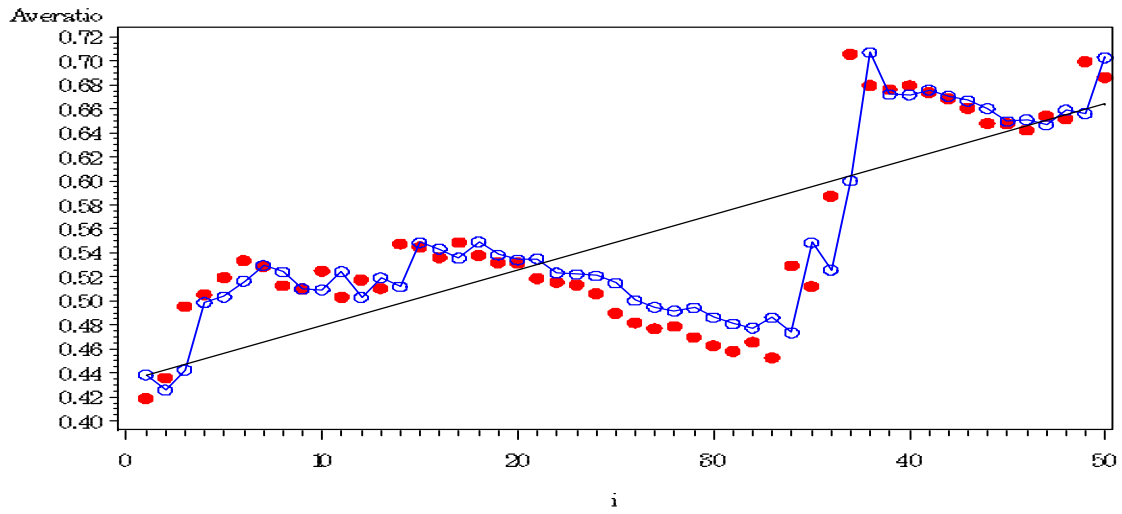
GPLOT with Dates  
Region = Western



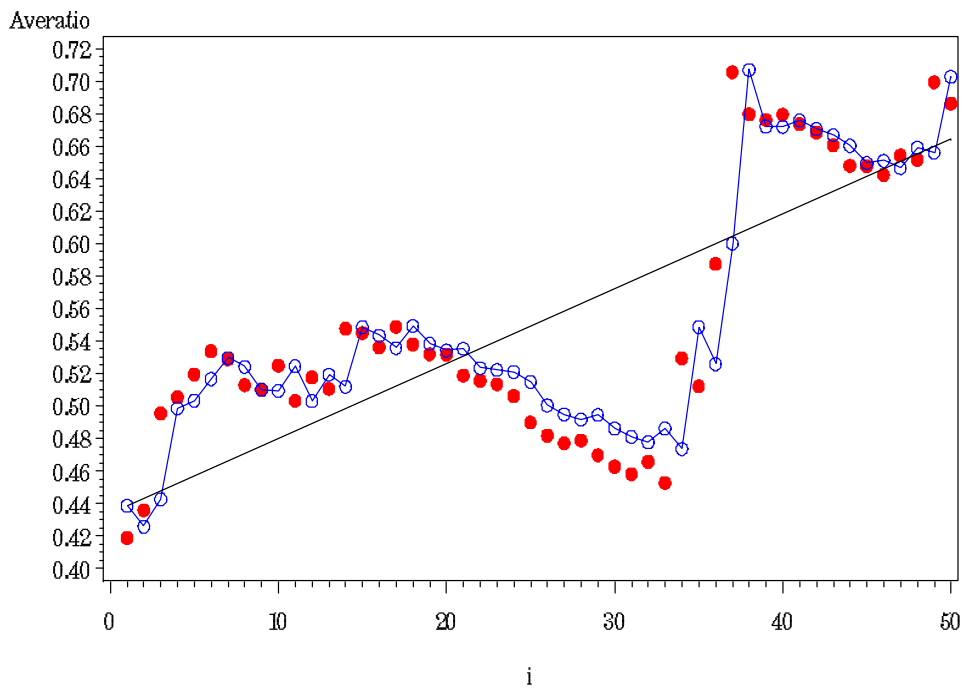


### Eastern Region's Expected, Observed, and Mean of Penetration Rate

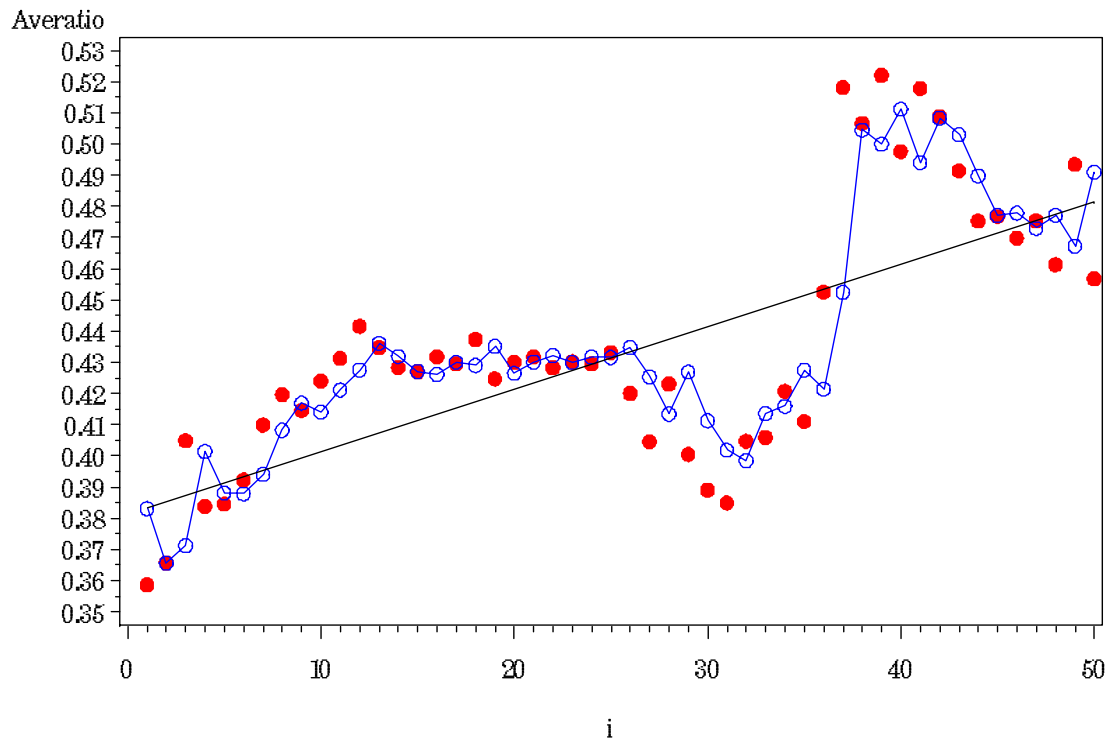
EASTERN\_Predictions for Autocorrelation Model



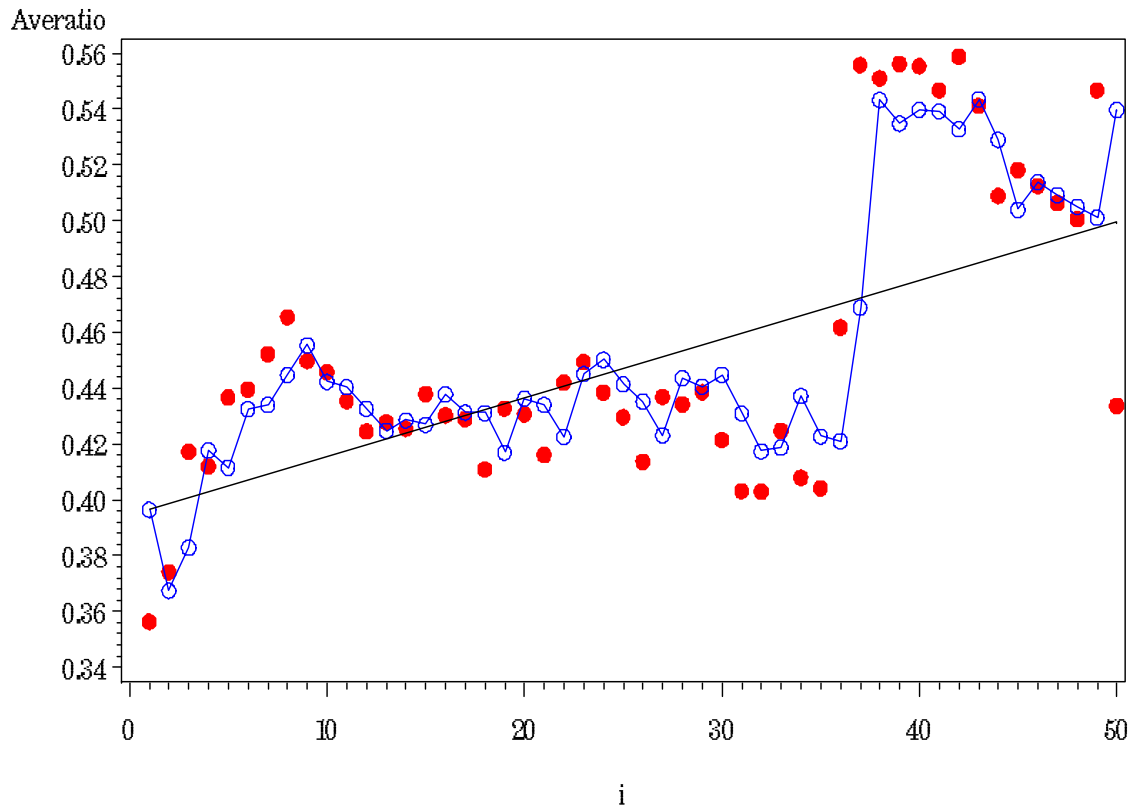
EASTERN\_Predictions for Autocorrelation Model



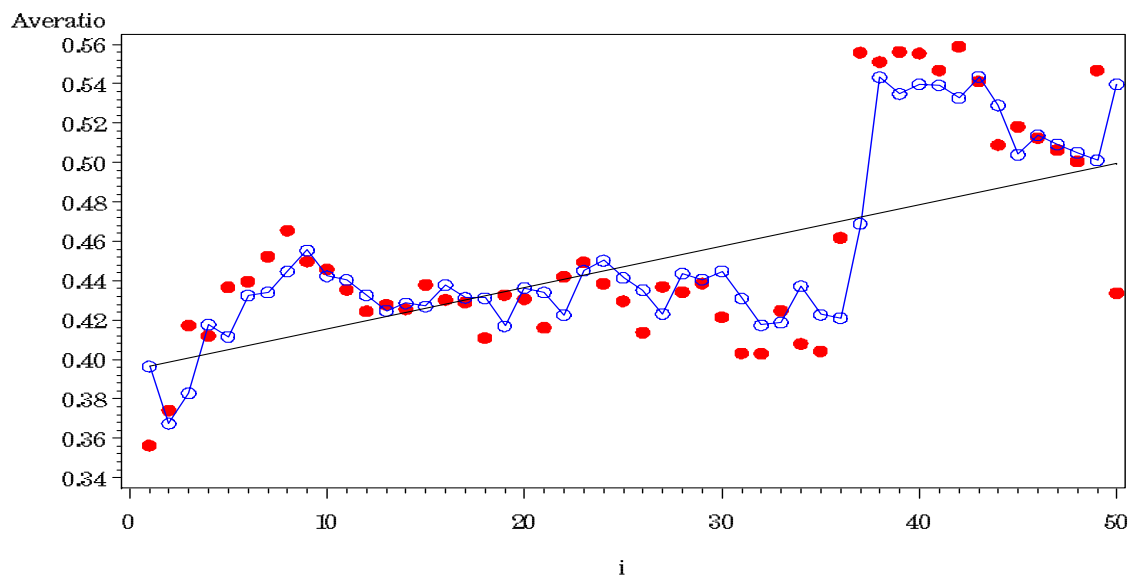
## NORTHERN—Predictions for Autocorrelation Model



## PIEDMONT—Predictions for Autocorrelation Model

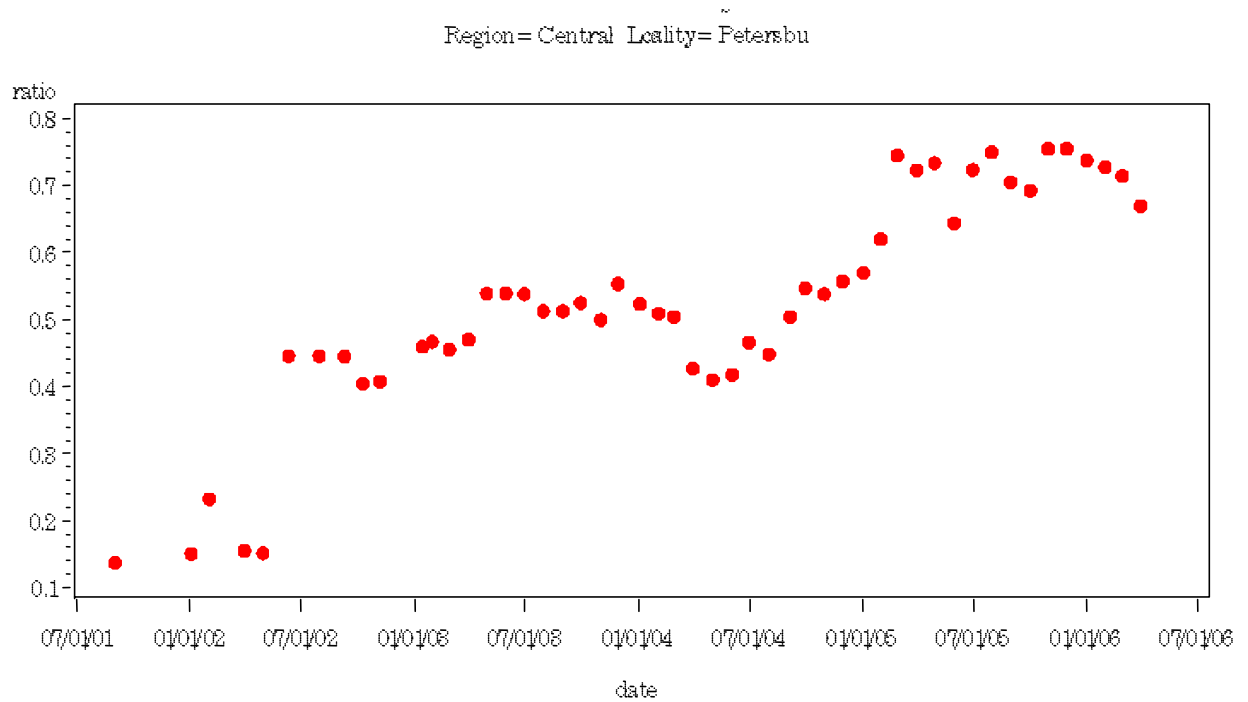


## WESTERN—Predictions for Autocorrelation Model

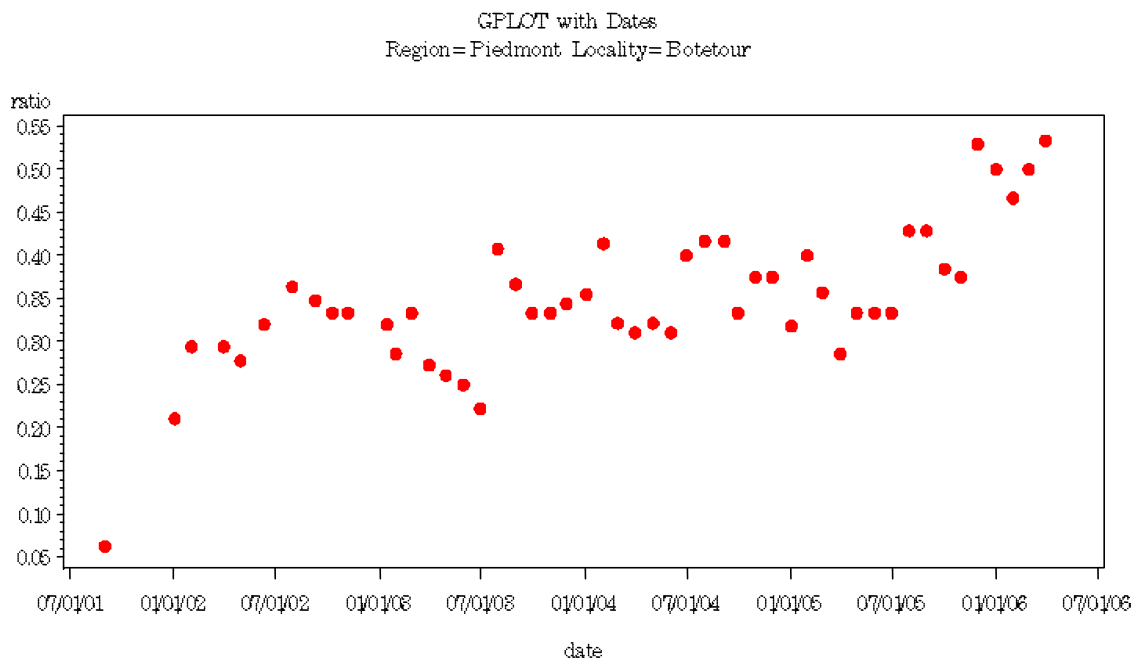


## 1. High/High: Conscious Learning

### 1.a) Petersburg (Central)

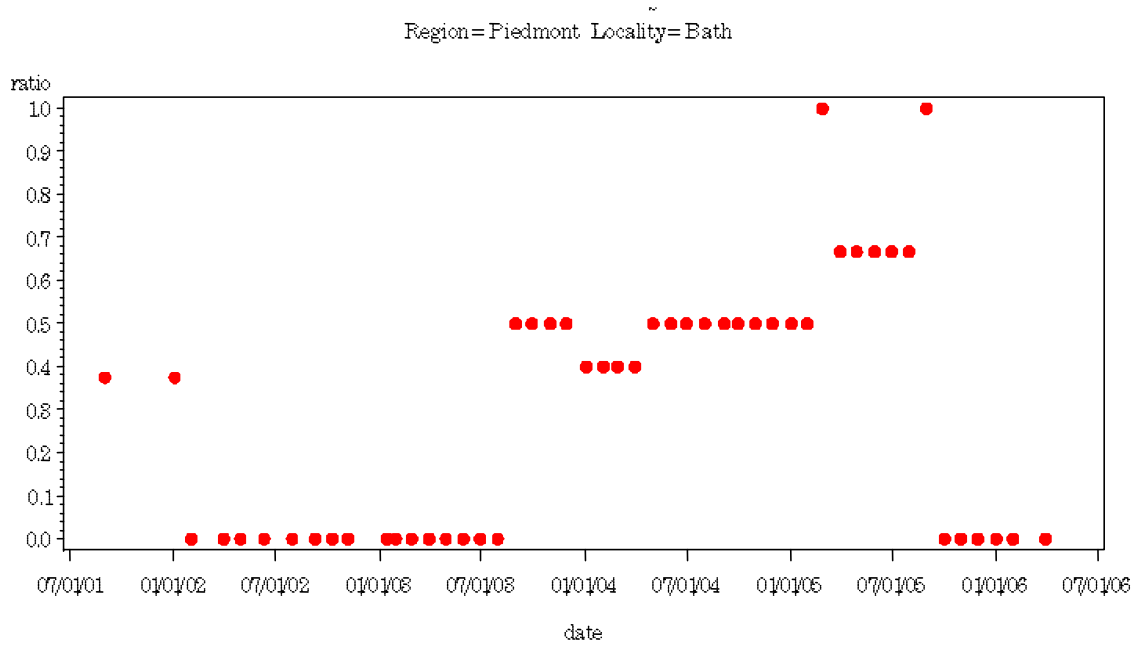


### 1.b) Botetourt (Piedmont)

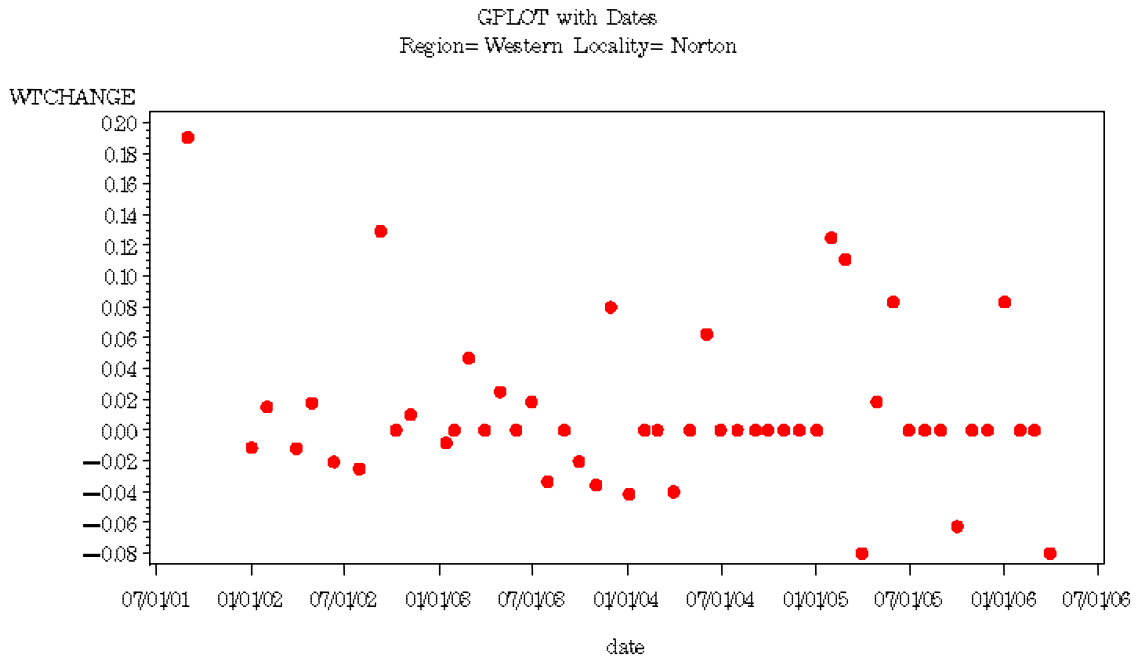


## 2. Low/Low : Absent Learning

### 2.a) Bath (Piedmont)

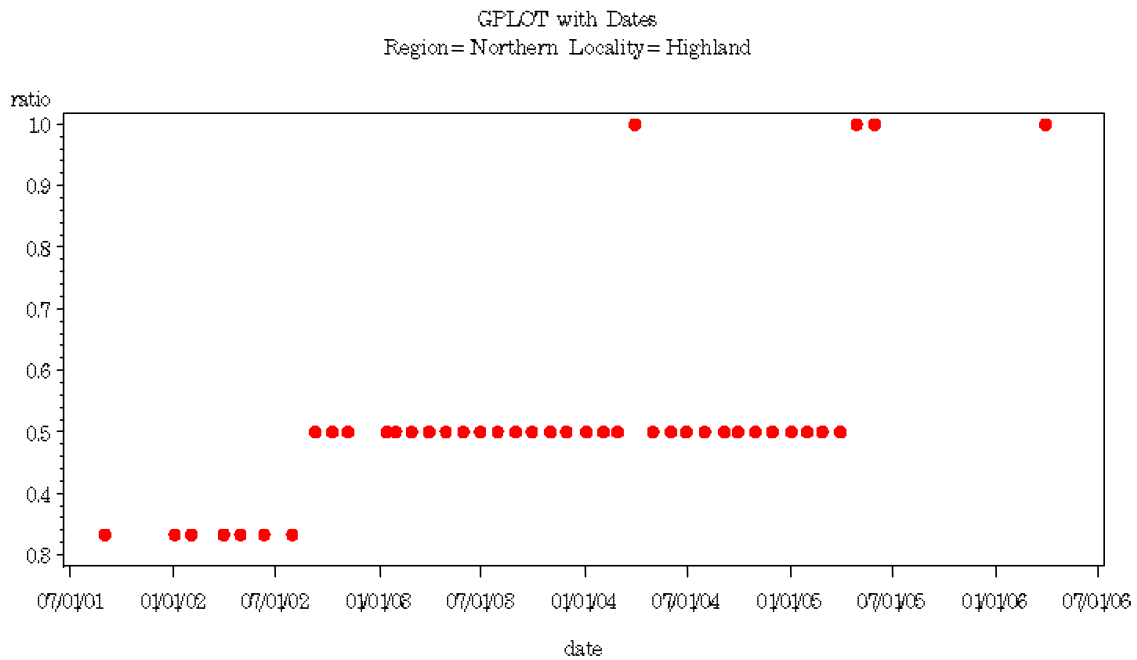


### 2.b) Norton (Western)

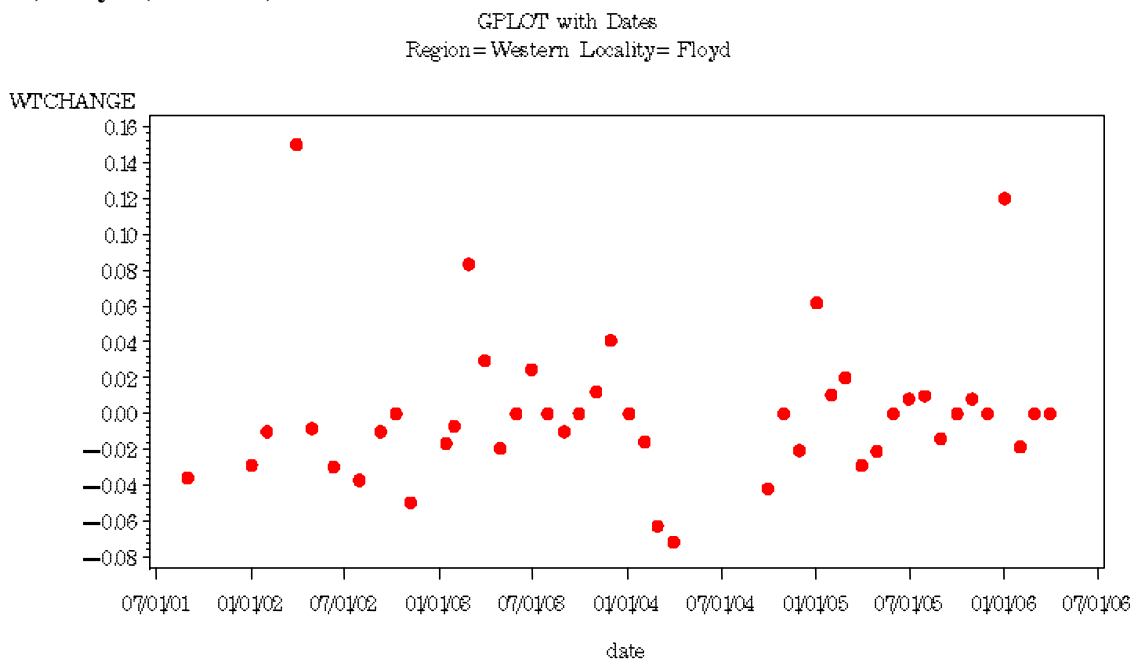


## 3. Low/High : (Façade)

### 3.a) Highland (Northern)

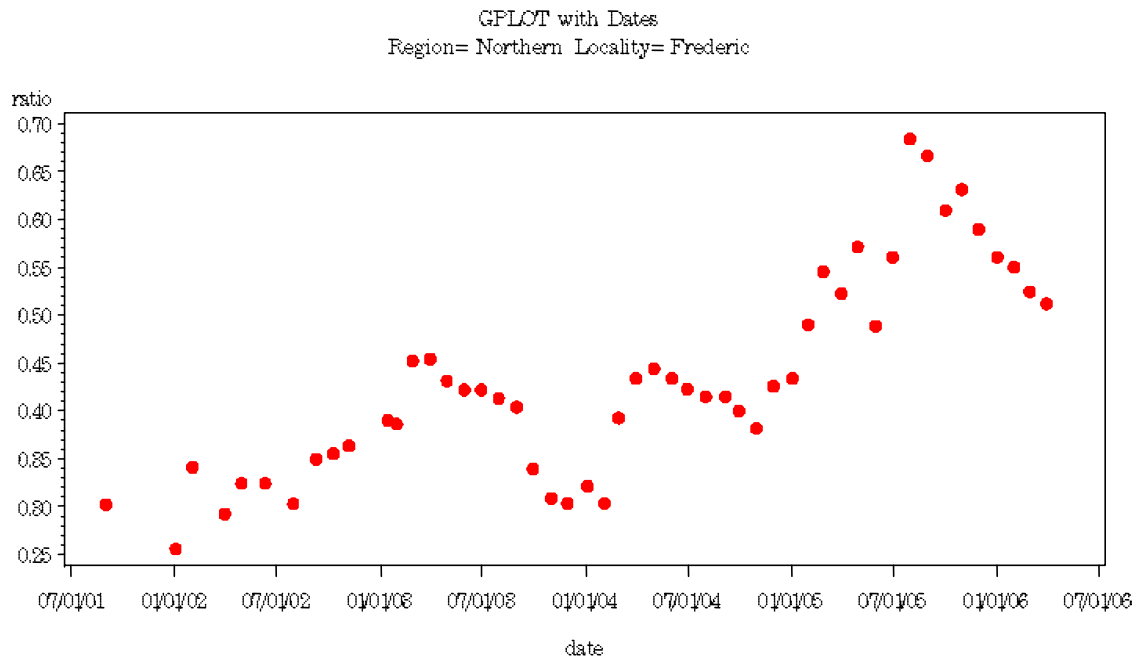


### 3.b) Floyd (Western)



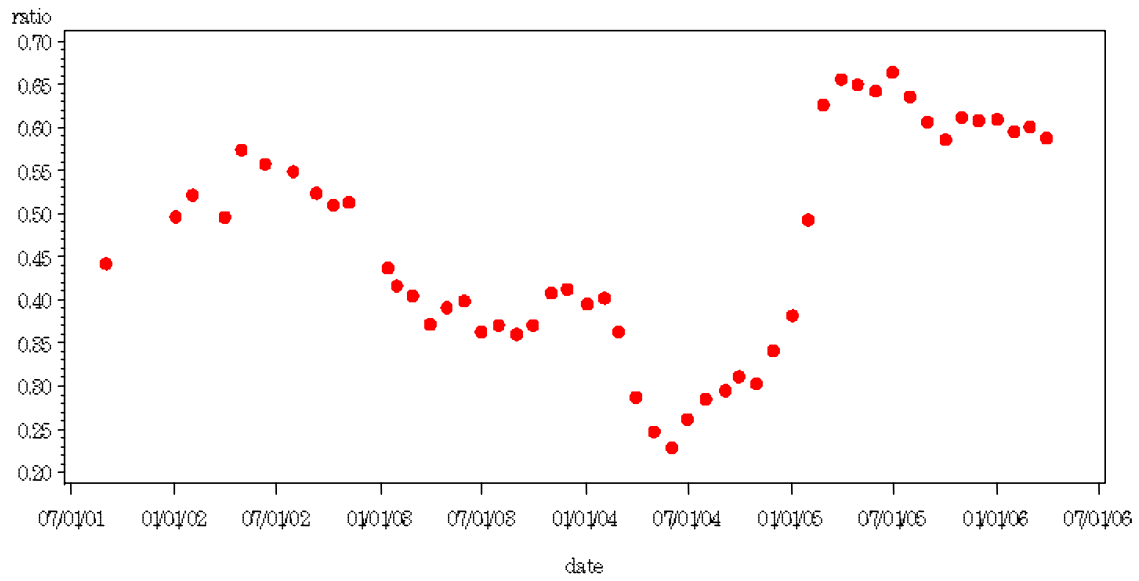
#### 4. High/Low : Unaware

##### 4.a) Frederic (Northern)



##### 4.b) Lynchburg : (Piedmont)

GPLOT with Dates  
Region= Piedmont Locality= Lynchbur





# Appendix E

## SAS codes used for the penetration rate data analyses

```

options formdlm='-' nocenter nodate nonumber ls=120;
title;
goptions reset=global noborder cback=white
ftitle=centx ftext=centx htitle=1 htext=1;
legend1 label=none position=center value=(justify=center);
axis1 label=(angle=90 rotate=0) minor=none;
axis2 minor=none;
symbol1 v=dot c=red i=none h=1;
symbol2 v=none c=blue i=join w=1;

***** Reading in the data from csv file
*****;
libname PRA 'C:\PRA';
data pra.PR;

    infile 'C:\PRA\PRA.csv' firstobs=3 dlm=',' lrecl=1000;
    input Locality$ Region$@@;
    do i=1 to 50;
        input IV_E Total@@;
        ratio=IV_E/Total;
        ratio1=lag(ratio);
        CHANGE= (RATIO-RATIO1)/RATIO1;
        WTCHANGE= CHANGE*TOTAL;
        output;
    end;
run;

proc Print data=pra.pr(obs=13);run;
proc contents data=pra.pr;run;

***** Reading in the date data copied from excel file
*****;
data dates;
input date@@;
informat date mmddy8.;
format date mmddy8.;
* There are 50 dates. To merge with the right i an i is used as
  identifier here too;
i+1;
*Creating day as a number;
year=year(date);
mon=month (date);
day=date+0;
datalines;
9/01/2001 1/03/2002 2/02/2002 3/31/2002 4/30/2002 6/11/2002
7/31/2002 9/10/2002
10/10/2002 11/07/2002 1/15/2003 1/31/2003 2/28/2003 3/31/2003
4/30/2003 5/31/2003

```

```

6/30/2003 7/31/2003 9/01/2003 9/30/2003 11/02/2003 11/30/2003
1/05/2004 2/04/2004
2/29/2004 3/31/2004 5/02/2004 6/03/2004 6/30/2004 8/02/2004
9/06/2004 9/30/2004
10/31/2004 11/30/2004 1/03/2005 1/31/2005 2/27/2005 3/31/2005
4/29/2005 5/31/2005
6/30/2005 7/31/2005 8/31/2005 10/02/2005 10/31/2005 11/30/2005
1/02/2006 2/01/2006
3/01/2006 3/31/2006
;
run;

proc print data=dates;
run;

*Combining dates and other data;
proc sort data=PRA.PR;
by i;
run;

Data PRA.PR;
merge PRA.PR dates;
by i;
*drop i;
run;

proc print data=pra.pr (obs=13);run;
proc univariate data=pra.pr PLOT NORMAL;
var RATIO; run;
proc univariate data=pra.pr PLOT NORMAL;
var wtchange; run;

proc reg data=pra.pr;
model wtchange= ratio day;
output out r=r;
run;
Quit;

*plot ratio vs date by locality;
proc gplot data=PRA.pr;
plot RATIO*date;
by region locality;
format locality $22.;
title 'Plot Ratio by Dates';
run;
*plot WTCHANGE vs date by locality;
proc gplot data=PRA.pr;
plot WTCHANGE*date;
by region locality;
format locality $22.;
title 'GPLOT with Dates';
run;
quit;
*plot ratio vs date by region;
proc gplot data=PRA.PR;
plot ratio*date;
by region;

```

```

run;
quit;
*plot WTCHANGE vs date by region;
proc gplot data=PRA.PR;
plot WTCHANGE*date;
by region;
run;
proc gplot data=PRA.PR;
by region locality;
plot ratio*date;
run;
quit;
proc gplot data=PRA.PR;
plot WTCHANGE*date;
run;
Quit;

*Get max ratio and mean ratio for each locality, output a new dataset
ratiomax;
*****
****;
proc means data=PRA.PR noprint;
by region locality;
var ratio date total;
output out=PRA.ratiomax min=minratio minday mintotal max=maxratio maxday
maxtotal
mean=meanratio meanday meantotal;
run;
proc print data=PRA.ratiomax (obs=6);run;
Proc sort data=PRA.ratiomax;
by region locality;
run;

proc print data=PRA.ratiomax (obs=3);
title 'Proc Print of Ratio Max I';
run;

*boxplot of meanratio vs region and
* maxratio vs region;
proc univariate normal plot data=PRA.ratiomax;
var maxratio meanratio;
by region;
TITLE 'BOX PLOT OF MEANRATIO VS MAXRATIO';
run;

*****;

* The following is the code to test the association of region vs class
*****;
Data pra.pr;
set pra.pr;
if ratio <0.3333 then class=1;
if ratio GE 0.3333 and ratio LT 0.47368 then class=2;
if ratio ge 0.47368 and ratio LT 0.6 then class=3;
if ratio GE 0.6 then class=4;
run;

```

```

proc sort data=pra.pr;
by class region locality;
run;
proc print data=pra.pr (OBS=3);
TITLE'';
run;
proc reg data=pra.pr;
model ratio= day change dummyregion;
run;
quit;

data pra.pr;
set pra.pr;
IF Region=1 then Central=1; ELSE Central = 0;
IF Region=2 then Eastern=1; ELSE Eastern = 0;
IF Region=3 then Northern=1; ELSE Northern = 0;
IF Region=4 then Piedmont=1; ELSE Piedmont = 0;
IF Region=5 then Western=1; ELSE Western = 0;
run;
proc print data= pra.pr (obs=15); run;

proc reg data=pra.pr;
model ratio= day change dummyregion;
run;
quit;
proc sort data=pra.pr;
by region; run;

proc reg data=pra.pr;
by region;
model Ratio= Day Ratio1;
Title 'Regression Analysis on Penetration Rate by Region';
run;
quit;

*the Chi square test;
proc freq data=pra.pr1;
tables region class region*class/out=FreqCnt chisq expected cellchi2
norow nocol nocum;
run;
proc print data=Freqcnt;run;
*****
***;

* Proc mix procedure to test the difference among regions;
/*proc mixed data=PRA.PR method=ml covtest;
class region locality year;
model ratio=region year /s;
repeated / type=UN subject=locality r;
lsmeans region/diff adjust=tukey;
ods output lsmeans=lsml;
lsmeans year/diff adjust=tukey;
ods output lsmeans=lsm2;
run;

```

```

*PROC MIXED WITH VARIABLE WTCHANGE;
proc mixed data=PRA.PR method=ml covtest;
class locality region year;
model  ratio=region year /s;
repeated / type=UN subject=locality r;
lsmeans region/diff adjust=tukey;
ods output lsmeans=lsml;
lsmeans year/diff adjust=tukey;
ods output lsmeans=lsm2;
run;
QUIT;*/

```

```

proc mixed data=PRA.PR method=ml covtest;
class locality region year;
model  ratio=region year /s;
repeated / type=ar(1) subject=locality r;
lsmeans region/diff adjust=tukey;
ods output lsmeans=lsml;
lsmeans year/diff adjust=tukey;
ods output lsmeans=lsm2;
run;

```

```

*PROC MIXED WITH VARIABLE WTCHANGE;
proc mixed data=PRA.PR method=ml covtest;
class locality region year;
model  change=region year /s;
repeated / type=ar(1) subject=locality r;
lsmeans region/diff adjust=tukey;
ods output lsmeans=lsml;
lsmeans year/diff adjust=tukey;
ods output lsmeans=lsm2;
run;
QUIT;

```

```

proc mixed data=PRA.PR method=ml covtest;
class locality region year;
model  ratio=region year /s;
repeated / type=cs subject=locality r;
lsmeans region/diff adjust=tukey;
ods output lsmeans=lsml;
lsmeans year/diff adjust=tukey;
ods output lsmeans=lsm2;
run;
QUIT;

```

```

Title 'Proc Mixed for WTCHANGE';
proc mixed data=PRA.PR method=ml covtest;
class locality region year;
model  WTCHANGE=region year /s;
repeated / type=cs subject=locality r;
lsmeans region/diff adjust=tukey;
ods output lsmeans=lsml;
lsmeans year/diff adjust=tukey;
ods output lsmeans=lsm2;
run;
QUIT;

```

```

*time series;
proc sort data=PRA.PR;
by region locality;

```

```
run;

proc freq data=pra.pr;
table region;run;

data center;
set pra.pr;
where region='Central';
run;

data east;
set pra.pr;
where region='Eastern';
run;

data west;
set pra.pr;
where region='Western';
run;

data north;
set pra.pr;
where region='Northern';
run;

data pied;
set pra.pr;
where region='Piedmont';
run;

proc sort data=center; by i;run;
proc sort data=east; by i; run;
proc sort data=west; by i;run;
proc sort data=north; by i;run;
proc sort data=pied; by i;run;

Proc means data=center;
by i;
var ratio;
output out=sumcenter mean=Averatio;
run;
Proc means data=east;
by i;
var ratio;
output out=sumeast mean=Averatio;
run;

Proc means data=west;
by i;
var ratio;
output out=sumwest mean=Averatio;
run;

Proc means data=north;
by i;
var ratio;
```

```

output out=sumnorth mean=Averatio;
run;

Proc means data=pied;
by i;
var ratio;
output out=sumpied mean=Averatio;
run;

proc print data=sumcenter ;run;
proc print data=sumeast ;run;
proc print data=sumwest ;run;
proc print data=sumnorth ;run;
proc print data=sumpied ;run;

proc reg data=pra.pr;
model ratio= ratiol day;
run;
quit;
proc glm data=pra.pr;
class region;
model ratio= day change day*change;
lsmeans var chang day day*change/pdiff stderr;
run;
quit;

proc autoreg data=pra.pr;
    model ratio = day / nlag=5 method=ml;
    output out=pa p=ratiohat pm=trendhat;
run;

* below use autoreg procedure for time series analysis;

title 'CENTRAL-Plot of Autoregressive Prediction';
proc autoreg data=sumcenter;
model averatio=i/ nlag=2 method=ml;
    output out=pg p=ratiohat pm=trendhat;
run;

    proc gplot data=pg;
        symbol1 v=dot i=none;
        symbol2 v=circle i=join;
        symbol3 v=none i=join;
        plot averatio * i = 1 ratiohat * i = 2
            trendhat * i = 3 / overlay ;
        run; quit;;
run;

title 'EASTERN_Plot of Autoregressive Prediction';
proc autoreg data=sumeast;
model averatio=i/ nlag=2 method=ml;
    output out=pg p=ratiohat pm=trendhat;
run;

    proc gplot data=pg;
        symbol1 v=dot i=none;
        symbol2 v=circle i=join;

```

```

        symbol3 v=none i=join;
        plot averatio * i = 1 ratiohat * i = 2
              trendhat * i = 3 / overlay ;
        run; quit;;
run;

title 'NORTHERN-Plot of Autoregressive Prediction';
proc autoreg data=sumnorth;
model averatio=i/ nlag=2 method=ml;
      output out=pg p=ratiohat pm=trendhat;
run;

proc gplot data=pg;
  symbol1 v=dot i=none;
  symbol2 v=circle i=join;
  symbol3 v=none i=join;
  plot averatio * i = 1 ratiohat * i = 2
        trendhat * i = 3 / overlay ;
  run; quit;;
run;

title 'PIEDMONT-Plot of Autoregressive Prediction';
proc autoreg data=sumpied;
model averatio=i/ nlag=2 method=ml;
      output out=pg p=ratiohat pm=trendhat;
run;

proc gplot data=pg;
  symbol1 v=dot i=none;
  symbol2 v=circle i=join;
  symbol3 v=none i=join;
  plot averatio * i = 1 ratiohat * i = 2
        trendhat * i = 3 / overlay ;
  run; quit;;
run;

title 'WESTERN-Plot of Autoregressive Prediction';
proc autoreg data=sumpwest;
model averatio=i/ nlag=2 method=ml;
      output out=pg p=ratiohat pm=trendhat;
run;

proc gplot data=pg;
  symbol1 v=dot i=none;
  symbol2 v=circle i=join;
  symbol3 v=none i=join;
  plot averatio * i = 1 ratiohat * i = 2
        trendhat * i = 3 / overlay ;
  run; quit;;
run;

proc print data=pg (obs=5); run;
proc reg data=pra.pr;
model wtchange= ratio1 day;
run;
Quit;

title 'Predictions for Autocorrelation Model for Central Region';
proc autoreg data=CR;
  model ratio = day / nlag=2 method=ml;

```



```

        output out=pg p=ratiohat pm=trendhat;
run;
title 'Predictions for Autocorrelation Model';
proc gplot data=pg;
    symbol1 v=dot i=none;
    symbol2 v=circle i=join;
    symbol3 v=none i=join;
    plot ratio * day = 1 ratiohat * day = 2
          trendhat * day = 3 / overlay ;
run; quit;

proc glm data=PRA.PR;
class region locality;
    MODEL ratio = day change day*CHANGE/ p clm;
    output out=gp p=ratiopred r=resid;
    RUN;
    QUIT;
proc print data =gp (obs=3);
run;

```

## SAS codes used for the Survey Data Analysis

```

Title 'Survey Data Anlaysis';

proc print data=work.SDA2;run;
*proc insights data=work.SDA2;
run;
Proc means data=work.sda2;
var QM QM1_7 QM8_13 QM14_19 QM20_25 QM26_31 QM26_31 QM32_36 QM37_42;
run;
Proc gplot data=work.sda2;
plot QM*QM1_7;
run;

Proc univariate data=work.sda2 normal plot;
var QM1_7 QM8_13 QM14_19 QM20_25 QM26_31 QM26_31 QM32_36 QM37_42;
run;
/*Proc univariate data=work.sda2 normal plot;
var QM;
run;*/
Proc freq data=work.sda2;
run;
**Multivariate Analysis;
proc GLM data=work.sda2;
class MtngF Region Title EducL ExpY;
model QM QM1_7 QM8_13 QM14_19 QM20_25 QM26_31 QM26_31 QM32_36 QM37_42=
MtngF Region Title EducL;
lsmeans MtngF Region Title EducL ExpY/pdiff adjust=TUKEY;
MANOVA H=region;

```

```
MANOVA H=MtngF;
MANOVA H=title;
MANOVA H=EducL;
MANOVA H=ExpY;
run;
Quit;
** Multivariate Analysis;
proc GLM data=work.sda2;
class MtngF Region Title EducL ExpY;
model Q1-Q7= MtngF Region Title EducL;
lsmeans MtngF Region Title EducL/pdiff adjust=TUKEY;
MANOVA H=region;
MANOVA H=MtngF;
MANOVA H=title;
MANOVA H=EducL;
run;
**GLM for Mean Analysis;
proc GLM data=work.sda2;
class MtngF Region Title EducL ExpY;
model qm= MtngF Region Title EducL ExpY;
lsmeans MtngF Region Title EducL/pdiff adjust=TUKEY;
run;
Quit;
```