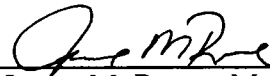


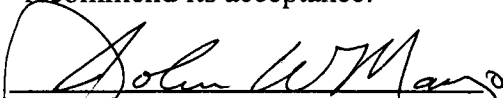


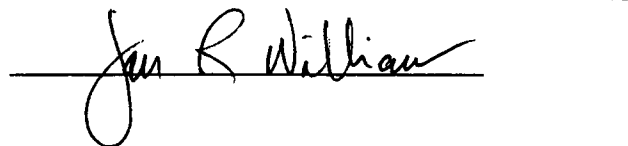
To the Graduate Council:

I am submitting herewith a dissertation written by Priscilla Wisner Linderman entitled "Performance Outcomes Related to the Implementation of Work Teams in a Telecommunications Organization." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Business Administration.



James M. Reeve, Major Professor

We have read this dissertation and recommend its acceptance:

Accepted for the Council:



Associate Vice Chancellor and  
Dean of the Graduate School

PERFORMANCE OUTCOMES RELATED TO THE  
IMPLEMENTATION OF TEAMING IN A  
TELECOMMUNICATIONS ORGANIZATION

A Dissertation  
Presented for the  
Doctor of Philosophy  
Degree  
The University of Tennessee, Knoxville

Priscilla Wisner Linderman

August 1997

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## ABSTRACT

The purpose of this study was to evaluate the impact of work teams on employee performance. This project presented a rare opportunity to link performance outcomes to teaming using a quasi-experimental field study methodology. By measuring constructs of employee productivity, service quality, and satisfaction prior to the implementation of teaming and again after the change, and by comparing a treatment group to a control group, the effects of teaming on employee performance were assessed empirically.

A multivariate analysis of variance was performed on four dependent variables representing productivity: average call length, bridge rate, products sold, and strategic revenues. The independent variable was team-based or not. The effect of teaming on productivity was significant, with changes in the means confirming that teamed employees demonstrated larger gains in productivity than non-teamed employees.

Service quality was evaluated using a paired-difference t-test, as data for service quality were only available for the treatment group. Although the difference in service quality after the implementation of TBO was significant, the absence of corresponding control group data means that alternative explanations for the difference could not be ruled out.

Employee satisfaction was measured using a Work Attitudes Survey, administered prior to teaming and again ten months later. Using a matched-pairs analysis with a subset of the data, the treatment group demonstrated significant improvement in satisfaction while the control group did not. An analysis of variance (ANOVA) was also

done using the full set of data. Although the mean change in the treatment group was 31% greater than in the control group the ANOVA failed to detect between-group differences. However, a second survey instrument and other anecdotal evidence support the contention of improved satisfaction in the treatment group.

In conclusion, this study showed strong performance increments after the introduction of teaming. Significant improvements were found in each of the three constructs: productivity, service quality, and satisfaction. By employing a rigorous set of design characteristics to measure the impact of work teams on performance, the results of this study significantly add to the debate about work team effectiveness.

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## CHAPTER ONE

### INTRODUCTION

#### *Motivation*

Quality circles, focus groups, self-directed work teams, project teams, semi-autonomous work teams, etc. all represent the management concept of "teaming," which is one of the major business innovations of the 1990's. There is evidence that work teams are used in a majority of U.S. companies, and that the trend is increasing [(Odenwald 1996), (Dee 1995)]. Although the primary motivation for companies to implement teaming concepts is to enhance performance (Lawler, Mohrman, and Ledford 1992), the empirical evidence of teams' overall impact on organization performance is inconclusive.

The purpose of this study is to evaluate employee performance resulting from a job redesign in a telecommunications company, using measures that align closely with the organization's strategy. The company is restructuring its consumer sales offices by forming work teams of sales consultants. This change presented a rare opportunity to link performance outcomes to an organizational redesign using a quasi-experimental field study methodology. By measuring employee performance prior to the job redesign and again after the change, and by comparing a treatment group of sales consultants to a control group, the effects of teaming on employee performance can be assessed empirically.

## Practical Relevance

The organization that was the focus of this study has implemented a team-based organization (TBO) strategy because it believed that teaming leads to increased employee performance, which thereby leads to increased organizational performance. Prior to implementing TBO, this company has tried other management methods to increase employee productivity, quality, and/or satisfaction. Except for a yearly employee attitudes survey, the company has done very little to link organizational design changes with employee performance outcomes.

This study provides a link to empirically test the effects of the TBO implementation on employee performance and to provide feedback to the company about the value of TBO. In addition it creates a methodology for this (and other) organizations to evaluate the effects of change initiatives.

## Research Opportunity

A number of researchers<sup>1</sup> have stressed the need for field-based research employing scientific methods of observation to assess performance outcomes. Yet relatively few studies have been published which empirically link a job process redesign, such as the implementation of teams, to performance outcomes. Much of the published research suffers from methodological and operational problems.<sup>2</sup> These problems include

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<sup>1</sup> For examples, see Pasmore *et al.* (1982), Cummings, Molloy, and Glen (1977), Yin (1989), Kaplan (1986), and Bruns and McKinnon (1993).

<sup>2</sup> The detail in this section is discussed more fully in Cummings, Molloy, and Glen (1977), Guzzo and Shea (1992), and Goodman, Devadas, and Hughson (1988).

the absence of empirical analyses and control groups in the research design, the use of qualitative information as a proxy for quantitative data when measuring productivity, the lack of multiple measures, the focus on measuring changes in attitudes rather than changes in productivity or other economic variables and the lack of a long enough time span to adequately assess behavioral effects. Another common criticism is that many investigations take place in laboratory-type situations, where it is very difficult to replicate real business conditions.<sup>3</sup>

This research is intended to respond to this academic call by employing strong design characteristics in a field setting. The design characteristics include the following: a pilot study, an untreated control group, pre-test and post-test data, multiple constructs of performance, quantitative data that is linked to operational performance, and a relatively long time span of data collection. The study is also inter-disciplinary, linking elements of strategy, organizational behavior and performance evaluation.

### ***Organization of this Document***

Chapter Two reviews previous research related to teaming and develops related hypotheses. Chapter Three describes the research site and the organizational change. The following three chapters discuss the experimental design and data analysis relevant to each of the three identified components of performance: Chapter Four describes the

---

<sup>3</sup> Guzzo and Shea (1992) estimate that less than 5% of the research on groups takes place with groups in their natural settings.

productivity analysis, Chapter Five the service quality analysis, and Chapter Six the employee satisfaction analysis. A summary discussion of results is found in Chapter Seven.

## CHAPTER TWO

### REVIEW OF PRIOR RESEARCH AND HYPOTHESES DEVELOPMENT

#### *Team Based Organizations*

Sundstrom, DeMeuse, and Futrell (1990) define work teams as small groups of interdependent individuals who share responsibility for their organization's outcomes. Some work teams are usually short-term in nature with limited authority, such as suggestion teams, project teams, and task forces. Others, termed semi-autonomous and self-managing or self-directed work teams, are characterized by their high degree of autonomy and low degree of direct supervision [(Shonk, 1992) (Banker *et al.*, 1996)].

According to sociotechnical theories of organizational behavior, teams form a link between the individual and the organization, making the organization more effective and helping to advance organizational goals [(Drucker 1980) (Gladstein 1984)]. Byrne (1993) cites teaming as the primary building block of the new horizontal corporation, making it possible for companies to react with more speed and flexibility in today's competitive environment.

Bowen and Lawler (1995) describe the "high involvement" organization as one in which employees are empowered by company practices that distribute power, information, knowledge, and rewards. "High involvement" organizations reap returns from practices that empower employees, such as self-managed teams. The benefits of a high-involvement organization include employees who are more accountable for

performance outcomes and are more satisfied, a higher level of customer satisfaction, and increased organizational returns.

### *Anecdotal Evidence*

In a study of 20 companies using semi-autonomous or self-managing teams described by Wellins, Byham, and Dixon (1994), the prevalent reason given for implementing teams was the increased competitive pressure faced by these companies. Specifically, the management of these companies believed that implementing teams would help the companies contain costs, improve quality, and, in general, perform better in the marketplace. The actual results in these companies were impressive: 55% reported cost reductions, 85% reported increased productivity, and 40% reported lower scrap and rework rates. Other positive results were inventory reductions, decreases in employee absenteeism, and faster response times.

In a survey conducted by the New York Stock Exchange Office of Economic Research (as reported by Shonk 1992) corporations with 500-plus employees were asked which efforts used by their organizations to improve productivity have had the most impact. The use of teams was the most frequently mentioned response. Anecdotal evidence is also offered by Dumaine (1990) and Orsburn *et al.* (1990) that self-managed work teams improve productivity. However, there is a great amount of variance in research findings regarding the effects of teaming on productivity, quality, and satisfaction.

### *Empirical Evidence*

Pasmore *et al.* (1982) reviewed 134 experiments involving sociotechnical research. Of the 71 studies that dealt with autonomous work groups, 58% reported increased productivity, 53% reported a positive increase in attitudes, and 58% reported improvements in quality outcomes. Meta-analysis conducted by other researchers [(Cummings, Molloy, and Glen 1977) (Macy and Izumi 1993)] report similar results. These researchers note that the success rates (positive findings) in the samples are likely to be biased, since successes are more likely to be published than failures. They also strongly caution that any findings of significance are severely weakened by the general lack of rigor in the research designs.

Numerous studies have been published that measure some combination of productivity, quality, and satisfaction variables. The data used for many of these studies were self-report data, either because the researcher did not have access to company records or because the level of detail needed by the researcher was not available. These studies also vary widely on the operationalization of the variables and the research design used to collect and analyze the data. Few used control groups, and most designs were post-test comparisons of means. Cummings, Molloy, and Glen (1977) and Pasmore *et al.* (1982) provide excellent discussions of research designs and methodological issues related to research on work teams.

Appendix Table A-1, Review of Selected Teaming Literature, summarizes a number of studies that used work teams as the primary treatment variable. The following

discussion describes features of some of these studies that are especially relevant to this research project.

The Topeka pet foods plant opened by General Foods is one of the earlier descriptions of self-directed work teams found in the literature (Walton 1972). General Foods had one pet foods plant that was experiencing numerous problems, mostly resulting from a disenfranchised work force. The company opened a new plant in Topeka, Kansas, organizing employees into self-managing teams from the start. The results at the new plant included lower absenteeism and turnover, higher productivity, and higher quality ratings.

A study by Cohen and Ledford (1994) examined work group effectiveness in a telecommunications company using teams drawn from technical, clerical, customer service, and managerial ranks. The researchers used measures of accidents, absenteeism, and employee self-reported measures of performance effectiveness, satisfaction, and quality. They expressed their desire to use productivity measures that related directly to the company's strategic goals, but these data were not available. Overall, self-managing teams were found to be more effective than traditionally-managed employees in technical, clerical, and management functions, but no evidence of effectiveness was found for the customer service employees.

Campion, Medsker, and Higgs (1993) studied 78 work groups in a financial organization. Productivity was defined by two organizational measures: unfinished work (reversed scored) and a survey of manager judgments. Satisfaction was measured using the organization's opinion survey. Employee productivity showed a modest correlation

with employee self-management, but no significant effects were found for employee satisfaction. The managers of these work groups demonstrated modest productivity and satisfaction effects.

Gladstein (1984) studied 100 sales teams in the communications industry. Effectiveness was defined by three measures: sales revenue change in the fiscal quarter following the teaming, a self-report of performance, and a self-report of satisfaction. Although a significant relationship was found for the increases in the self-reported performance and satisfaction measures, there was no sales revenue change.

Other studies have focused on quality as the primary measure of performance. Batt and Appelbaum (1995) studied workers in the telecommunications and apparel industries. Quality and job satisfaction were both measured using survey instruments. For the whole sample, both outcomes were significantly higher for the self-managed groups. However, the customer service sub-sample alone did not report higher job satisfaction levels.

Crom and France (1996) describe the effect of teaming at a cardboard packaging plant in the United Kingdom. After implementing work teams, the company reduced lead times by 65 - 75%, and reduced scrap from 3.5% to 1%. The company estimated a one-million dollar gain from the reduction in scrap rate alone.

As is evident from Table A-1, prior research has varied widely on research design characteristics, the operationalization of variables, and reported outcomes. Few studies used both pre-test and post-test measures, and control groups are absent for many studies. Productivity was often defined using self-report data, or "softer" organizational data

(such as accidents or absenteeism). Very few investigations employed financial or efficiency measures to operationalize productivity or quality. Results of these studies are also mixed. There appears to be no consensus on the effect of teaming on productivity, quality, or job attitudes.

### ***Performance Measurement***

In the past decade, there has been much debate in the management accounting literature about performance measurement. Historically, cost accounting has focused on financial information (Young and Selto 1991). But just using financial information is no longer sufficient [(Bruns and McKinnon 1993), (Hopwood 1972), (Kaplan 1983 and 1984b)].

Hopwood (1972) makes the distinction between “accounting” data (i.e. financial information) and “managerial” data. Accounting data are information about outcomes, while managerial data are information about the detailed processes which lead to outcomes. Kaplan (1983) suggests that financial data alone do not tell the whole story. He recommends that managers (and researchers) expand their performance measurement systems to include non-financial information, such as productivity and quality data. In their discussion of the importance of a balanced scorecard of performance, Kaplan and Norton (1992) recommend the use of operational measures that are linked to corporate goals, because these drive future financial performance.

Defining performance for any one organization is dependent upon the organization's business objectives and strategy. Lawler, Mohrman, and Ledford (1992) measure performance by a number of factors, including productivity, quality, customer service, worker satisfaction, and profitability. Kaplan (1984a) specifically mentions non-financial measurements of productivity, quality, and worker attitudes as essential elements of analyzing a company's performance. Becker and Gerhart (1996) suggest that measures of performance be based on variables that "have inherent meaning for a particular context." They recommend that at the business unit level, measures that are conceptually linked to firm performance, such as productivity and customer satisfaction, are deemed especially meaningful.

### *Hypotheses*

In this study performance is defined through three constructs: productivity, service quality, and employee satisfaction. These three constructs align closely with the company's strategic initiatives, and are of key operational importance at the business unit level.

The following hypotheses are proposed to test the effect of teaming on performance:<sup>4</sup>

**H1: Implementing a team based organization will not have an effect on employee productivity.**

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<sup>4</sup> All hypotheses are stated in the null.

**H2: Implementing a team based organization will not have an effect on service quality.**

**H3: Implementing a team based organization will not have an effect on employee satisfaction.**

The construct of productivity in this study was defined using four components that are operationally important to the company. These components are average call length, “bridge” rate, products sold per on-line hour, and strategic revenues per order.<sup>5</sup> In addition to the primary productivity hypothesis (H1), hypotheses were tested for each of the four components of productivity. The hypotheses are the following:

**H1a: Implementing a team based organization will not have an effect on average call length.**

**H1b: Implementing a team based organization will not have an effect on the bridge rate.**

**H1c: Implementing a team based organization will not have an effect on the number of products sold per on-line hour.**

**H1d: Implementing a team based organization will not have an effect on strategic revenues per order.**

After a description of the research site and TBO treatment in Chapter Three, each construct of performance will be discussed in detail in the subsequent chapters.

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<sup>5</sup> Each of these measures is fully defined and discussed in Chapter Four.

## CHAPTER THREE

### SITE DESCRIPTION

#### *Introduction*

*Telecomm, Inc.*<sup>6</sup> (*Telecomm*) provides comprehensive telephone services to business and residential customers. It operates in one of the most competitive markets in the U.S. and is a regulated public-service company. As such the company is the primary provider of local telephone service in its designated geographic region.

The nature of the telecommunications industry is changing almost daily. Business segments and markets in which *Telecomm* previously enjoyed a monopoly have been opened to new entrants, and *Telecomm* is increasingly forced to vie for customer dollars. The Telecommunications Reform Act, signed by President Clinton in February 1996, further opens *Telecomm's* core business services to a host of potential rivals.

As a public service company, *Telecomm* is under great pressure from regulators and the public to maintain high levels of customer service while controlling costs. Historically and currently, the company has operated under a cost-plus environment (i.e., allowable expenses incurred by the company have been used to determine future rates). Regulatory hearings are under way that could change this entire system. One possibility is that *Telecomm* could be allocated a fixed revenue amount and would record

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<sup>6</sup> *Telecomm* is a fictitious name for a real company. As part of the research agreement with the company, the anonymity of the company and the confidentiality of individual employee measures have been promised by the researcher.

as earnings the difference between the fixed amount and the company's costs. This change would provide tremendous additional incentives and pressures for *Telecomm* to control costs and to increase the productivity of its workforce.

*Telecomm* is currently attempting to meet these challenges by implementing a major organizational change. This change involves restructuring employees into work teams. *Telecomm* defines a team as "a small number of people with complementary skills who are committed to a common purpose, performance goals, and approach for which they are accountable to the customer, the company, and themselves." The goal of this team approach is "delighting every customer and each other with high-performance work teams that behave like owners."<sup>7</sup>

Specifically, *Telecomm* believes that a team-based organization (TBO) will increase both employee productivity and satisfaction. The company is also expecting that a TBO will enable an increased customer responsiveness that will translate into improved customer satisfaction. Although managers at *Telecomm* are confident that a TBO will have positive organizational results, they have been struggling with how to measure performance outcomes related to this organizational change. This need has created the research opportunity to measure and evaluate the effects of a TBO on performance.

As one line of business, *Telecomm* operates a number of Residential Sales and Service Centers (RSSC) in a contiguous geographic district. Each RSSC is staffed by a manager, a number of assistant managers (also called "coaches"), and a contingent of

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<sup>7</sup> From *Telecomm* Team-Based Organization training document.

sales consultants. The work of the RSSC is to provide sales and service support to residential customers within the RSSC district. There is no geographic segmentation by RSSC within the district. When a customer calls a residential service telephone number, that customer's call is forwarded automatically to the sales consultant in the district who has been waiting the longest between calls.

The sales consultant then processes that call by taking an order or clarifying a service issue. Some calls, such as those with specific billing inquiries, technical maintenance problems, or "foreign exchange"<sup>8</sup> requests are forwarded by the sales consultants to special service teams. On average, a sales consultant handles 40 to 60 calls per day.

Sales consultants from three RSSCs form the sample population for this study. The three offices are all located in the same state within a 25-mile radius of each other. The control group is a group of 86 sales consultants<sup>9</sup> located in a large metropolitan RSSC that is not implementing a TBO until 1997. The treatment group is comprised of 74 sales consultants from two RSSCs that share the same manager, with the offices located in a metropolitan area and a suburban area. The treatment group is managed under a TBO philosophy.

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<sup>8</sup> Foreign exchange is *Telecomm* terminology for a customer request for local dialing capability to another ("foreign") exchange within the district.

<sup>9</sup> Headcount figures given are for December 1996.

### *Description of TBO Treatment*

In late March 1996 the employees in the treatment group were reorganized into work teams. Assignment to work teams was done randomly by each employee drawing a color-coded piece of paper from a box. Employees with the same paper color were grouped as a team, resulting in 14 teams of seven to nine employees each. Each team participated in 24 hours of formal TBO training over a five-month period. Although the teams had staggered training schedules, they all began and ended formal training at about the same time. The training program is standardized and includes modules on company goals and objectives, the processes of employee empowerment, and team development. While the basic job function of the sales consultant remains the same, some of the job characteristics have changed (e.g., the degree of supervision and the extent of cross-training) thereby creating a different social and work structure for the sales consultant.

The process of implementing a TBO was accomplished through many initiatives. As a first step, an "office committee" was formed. The office committee consists of four sales consultants and a coach; participation in the office committee was voluntary. The office committee acts in a facilitative role, gathering input from the sales consultants and offering suggestions and solutions to the office manager. The office committee is structured so that members rotate off after a six-month period, allowing other sales consultants to assume these roles.

After teams were formed in each office, a physical move was made to group team members together. Modular furniture was changed to remove high walls in between team

members in order to facilitate communication and interaction. Team training sessions began, teams chose names, and each member chose a "leadership role" (e.g. communications leader, recognition leader, scheduling leader, team leader). These roles are designed to rotate among team members on a regular basis.

Teams typically meet once each week to discuss results, problems, and other work related issues. Some weekly sessions are structured by a team facilitator or office coach to address a specific issue; other sessions are structured by the team itself.

Teams communicate with the office committee about issues that are of concern. For example, during a busy period *Telecomm* needed all sales consultants to work a certain amount of overtime hours. Prior to TBO, the manager might have mandated a Saturday work schedule. With TBO, the office committee would communicate the problem to the teams, who would discuss the problem and offer solutions. The office committee would use a consensus approach to sift through the teams' solutions, and would then offer a solution to the manager. The solution might involve working longer weekday hours or having a choice of Saturdays to come in for overtime. The noteworthy changes are that the sales consultants are involved in the decision making and no one individual makes all the decisions.

The process of team forming and building is an iterative process that takes place over time. While the initiation of a TBO began in these offices in March 1996, the process of teaming is an on-going one. The longitudinal nature of the data collection (October 1995 through December 1996) is designed to capture the results of the change to a TBO.

### *Data Sources*

The RSSC environment at *Telecomm* is highly automated, with multiple measures recorded for every sales consultant transaction. *Telecomm* must report these objective measures to the public service commission, and they are audited by the company on a regular basis. Therefore there is a strong degree of validity in the data that are collected for the sales consultants' transactions.

Data for this research were collected from multiple sources, including:

- company documentation - organization charts, training proposals and objectives, company handbooks, and memos;
- archival records - employee service records, personnel data, sales consultant transaction data, and financial data;
- interviews - with employees participating in the job redesign, coaches, *Telecomm* management, and the consultants working to implement the training;
- focus groups - with a group of sales consultants from each of the TBO offices;
- survey data - surveys of employee attitudes about job satisfaction and changes in work roles.

Field visits were made to *Telecomm* to conduct interviews, gather background information, and to collect and verify operational data. A protocol was developed for each field visit to maximize the value of the visit, to aid in the data collection process, and to help maintain a chain of evidence (Yin 1989).<sup>10</sup>

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<sup>10</sup> The protocol for each field visit is contained in Appendix B.

It is worthwhile to note that *Telecomm* routinely collects and reports the data being used by the researcher to study productivity and service quality, thereby mitigating a Hawthorne effect. The only additional information collected was the survey data, which was collected from both the control and treatment group subjects. Due to an agreement between *Telecomm* and the researcher, the raw data collected for this project cannot be disclosed.

## CHAPTER FOUR

### PRODUCTIVITY ANALYSIS

#### *Introduction*

For every contact between a sales consultant and a customer, *Telecomm* routinely measures a number of performance outcomes. Outcomes measured on a daily basis include number of calls handled, call length, time on-line, the number of products sold, the type of products sold, and the corresponding product revenues. Each month, these results are summarized and reported to the sales consultants. Monthly productivity data for all sales consultants in both the treatment and control groups were used for this study.

The job of the sales consultant can be seen graphically in Figure 4-1. This figure is an example of five calls handled by a sales consultant in a 45-minute time interval (on-line hours equals .75, or 45/60 minutes). During this time the sales consultant takes five customer calls. Only two of the calls (calls 2 and 3) resulted in a sales order. The other three calls (calls 1, 4 and 5) are customer queries, possibly relating to a new product offering, a billing problem, or a change in service. Each order is made up of one or more product sales. Examples of products are call waiting, caller-ID, three-way calling, and additional lines.

*Telecomm* has designated certain products as strategic products<sup>11</sup>, meaning that the products are of key importance to *Telecomm*. In Figure 4-1, an "S" following the product

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<sup>11</sup> These are additional lines, caller-ID, call waiting, and answer call.

name defines that product as strategic. The example of the sales consultant's job in Figure 4-1 provides a framework to discuss the choice of productivity measures.

| On-line hours = .75 (45/60 minutes) |   |   |                                     |                                     |
|-------------------------------------|---|---|-------------------------------------|-------------------------------------|
| Call 1<br>(5.8 minutes)<br>no order | Call 2<br>(9.3 minutes)<br>order  | Call 3<br>(8.8 minutes)<br>order  | Call 4<br>(6.2 minutes)<br>no order | Call 5<br>(3.9 minutes)<br>no order |
|                                     | <ul style="list-style-type: none"> <li>• additional line (S)</li> <li>• call waiting (S)</li> </ul> | <ul style="list-style-type: none"> <li>• call waiting (S)</li> <li>• repeat call</li> <li>• calling card</li> </ul> |                                     |                                     |

**Figure 4-1. Example of a sequence of calls handled by a sales consultant.**

Productivity measures were chosen with the help of *Telecomm* managers. The criteria for choosing the measures were that they are operationally or strategically important to *Telecomm* and that the sales consultant is able to affect the measured outcome. Also, due to the large volume of data collected for this study, the productivity measures must be based on data currently available in *Telecomm* databases.

Given these criteria, four dependent variables were chosen to represent the construct of sales consultant productivity. These are:

- average call length (ACL) - The length of each customer call is measured in minutes. ACL is computed by summing the length of each call and dividing by the number of calls handled. In Figure 4-1, the ACL is 6.8 minutes ( $[5.8+9.3+8.8+6.2+3.9]/5$ ). *Telecomm* desires a low ACL, so that each sales consultant can handle more calls, thereby keeping headcount lower. However, the results of a *Telecomm* internal analysis indicate that on average a longer ACL results in more product revenue and in lower levels of sales consultant stress. Debate within *Telecomm* about the best level of ACL is ongoing.
- "bridge rate" (BRIDGE) - This measure represents the sales consultant's ability to take advantage of each call opportunity by generating an order from that call.

BRIDGE is calculated as the number of orders divided by the number of calls. In Figure 4-1 the bridge rate equals 40% (2 orders / 5 calls). A higher bridge rate indicates a sales consultant who is more effective at generating sales.

- products sold per on-line hours (PRODUCTS) - PRODUCTS measures how productive the sales consultant is at selling *Telecomm* products. It is calculated as the total number of products sold divided by the total on-line hours. In Figure 4-1 PRODUCTS equals 6.67 (5 products / .75 on-line hours). A higher PRODUCTS amount indicates a more productive sales consultant.
- strategic revenues (STRREV) - Each strategic product has a revenue amount associated with it. STRREV is calculated as the sum of all strategic revenues generated by a sales consultant divided by the total number of orders written. In Figure 4-1, assuming that strategic revenues<sup>12</sup> for additional lines is \$20 and for call waiting is \$14, STRREV equals \$24  $([\$20+14+14] / 2 \text{ orders})$ . A greater STRREV amount indicates a sales consultant who is more effective at selling strategic products.

The productivity data used in this study are routinely monitored and reported by *Telecomm* for each sales consultant; therefore no unique procedures were put into place to collect these data. Data for each of these variables were collected monthly from October 1995 to December 1996.

In addition to the productivity measures, certain demographic data were available for each sales consultant. These data were age, gender, and length of service (LOS) as a *Telecomm* employee.<sup>13</sup> There was no *a priori* expectation that differences within these demographic measures would be related to the productivity variables. However, in order to understand and account for any apparent differences related to age, gender, or length of service, the relationship between these dimensions and the productivity outcomes was examined using a correlation matrix. As shown in Table 4-1, no significant correlations

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<sup>12</sup> Actual strategic revenue amounts are confidential to *Telecomm*.

<sup>13</sup> Data on length of service as a sales consultant were not available.

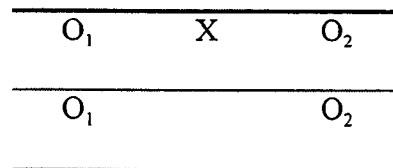
were found (all p-values >.05). Therefore none of these variables were included in the data analysis as a covariate.

**Table 4-1. Correlation of LOS, AGE, and GENDER with productivity variables. (Pearson correlation coefficient and p-value listed).**

|          | LOS         | AGE         | GENDER      |
|----------|-------------|-------------|-------------|
| STRREV   | .012 (.90)  | .105 (.28)  | -.045 (.64) |
| BRIDGE   | -.010 (.91) | -.043 (.61) | -.048 (.56) |
| PRODUCTS | -.056 (.51) | -.081 (.34) | .026 (.75)  |
| ACL      | .071 (.47)  | .090 (.35)  | -.099 (.31) |

### *Experimental Design*

The overall methodology of this study was quasi-experimental. Cook and Campbell (1979, page 6) describe quasi-experiments as those having "...treatments, outcome measures, and experimental units, but do not use random assignment to create the comparisons from which treatment-caused change is inferred." In effect, the researcher must assume that the treatment and control groups are nonequivalent. Therefore the experimental design used to test the productivity hypotheses was the following:<sup>14</sup>



<sup>14</sup> This notation follows Cook and Campbell (1979). An "O" is used to represent a non-random group. O<sub>1</sub> represents the sample of pre-test observations, O<sub>2</sub> represents the sample of post-test observations, and X represents the treatment.

For each of the four productivity measures, a pre-test variable was computed as the mean of the October, November, and December 1995 measures.<sup>15</sup> A post-test variable was computed as the mean of the October, November, and December 1996 measures. The post-test period was chosen to maximize the time between implementation of the TBO change (March 1996) and the test of the effects, within the timeframe of this research project. The pre-test period was then selected to match the months of the post-test period, one year earlier. Matching of the periods was done to enhance comparability by minimizing any potential seasonality effects. The pre-test and post-test variables used in the study are listed in Table 4-2.

**Table 4-2. Productivity variables.**

| Measure                        | Pre-test variable | Post-test variable |
|--------------------------------|-------------------|--------------------|
| average call length            | ACL954Q           | ACL964Q            |
| bridge rate                    | BRDG954Q          | BRDG964Q           |
| products sold per on-line hour | PROD954Q          | PROD964Q           |
| strategic revenues per order   | STR954Q           | STR964Q            |

Only sales consultants with both pre-test and post-test data were included in the productivity tests because in the analysis the post-test measures were compared to the pre-test measures for each sales consultant. There were 68 sales consultants in the control group and 42 sales consultants in the treatment group with usable data.

To test hypothesis H1 (the productivity hypothesis), a multivariate analysis of covariance (MANCOVA) model was used, which includes the pre-test measure in the

<sup>15</sup> For example, BRDG954Q equals the mean of the bridge rate for October-December, 1995.

model as a covariate to adjust for pre-existing differences between the treatment and the control groups.<sup>16</sup> The adjustment for pre-existing differences is done because the treatment and control groups are assumed to be nonequivalent, due to the non-random selection procedure. The MANCOVA contained the four post-test observations for each subject as outcome variables ( $Y_1, Y_2, Y_3, Y_4$ ), the four corresponding pre-test observations as covariates ( $X_1, X_2, X_3, X_4$ ), a dummy variable to indicate control or treatment group (TC), and four interaction terms.<sup>17</sup> The MANCOVA model was evaluated using the Wilks' Lambda criterion.

To determine if there existed a difference between the treatment group and the control group over time for each of the components of productivity, a progressive set of analysis of covariance (ANCOVA) models was used.<sup>18</sup> The first model tests for non-parallel and significantly different data patterns. If the data do not fit the non-parallel model, the data are then fitted to a model which assumes that the data patterns are parallel and significantly different. If the data do not fit the parallel model, the researcher must assume that the data patterns are statistically equivalent and that no significant differences exist. Each of these models is discussed in turn.

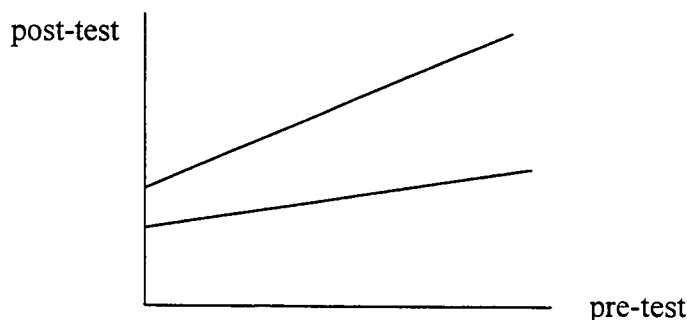
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<sup>16</sup> Cook and Campbell (1979) also discuss using elementary analysis of variance, gain score analysis, and blocking or matching as possible statistical evaluation techniques. Elementary analysis of variance and gain score analysis were rejected because neither method adjusts for pre-test differences between the control and treatment groups. Blocking or matching was rejected because this method requires the deletion of cases that cannot be matched, which would reduce the sample size.

<sup>17</sup> The model statement was:  $Y_1, Y_2, Y_3, Y_4 = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 TC + \beta_6 (X_1 TC) + \beta_7 (X_2 TC) + \beta_8 (X_3 TC) + \beta_9 (X_4 TC) + \epsilon$ .

<sup>18</sup> See Neter, Wasserman and Kutner (1990) for a full discussion of these tests.

The first model assumes the data follow a non-parallel pattern. In this pattern, as shown in Figure 4-2, the data patterns of the control and treatment groups change at different rates.<sup>19</sup>



*Figure 4-2. Assumption of non-parallel data patterns.*

The general equation to test if this differential change is significant is:

$$Y_1 = \beta_0 + \beta_1 X_1 + \beta_2 TC + \beta_3 (X_1 TC) + \varepsilon$$

where  $Y_1$  = post-test observation

$X_1$  = pre-test observation

TC = dummy variable (0 = control group, 1 = treatment group)

$\beta_0$  = intercept of the control group regression line

$\beta_1$  = slope of the control group regression line

$\beta_2$  = adjustment to intercept of treatment group regression line

$\beta_3$  = adjustment to slope of treatment group regression line

The equations for the control and treatment groups are:<sup>20</sup>

**control group:**  $Y_1 = \beta_0 + \beta_1 X_1 + \varepsilon$

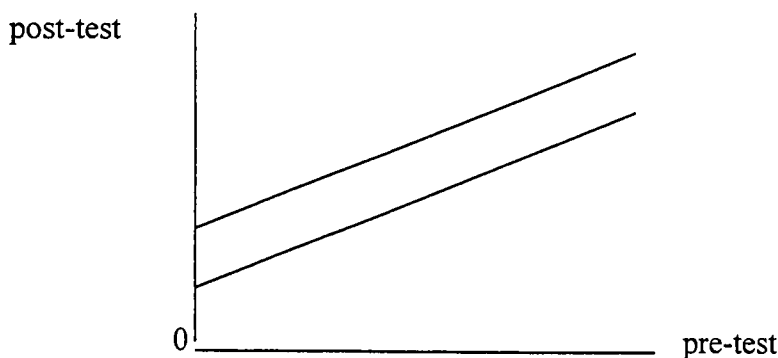
**treatment group:**  $Y_1 = (\beta_0 + \beta_2) + (\beta_1 + \beta_3) X_1 + \varepsilon$

<sup>19</sup> The slopes in Figure 4-2 are depicted as positive. Actual data patterns could have both patterns with positive slopes, both patterns with negative slopes, or data patterns moving in opposite directions.

<sup>20</sup> In the control group, TC = 0, therefore  $\beta_2 TC$  and  $\beta_3 (X_1 TC)$  each equal 0 and drop out of the equation. In the treatment group, TC = 1, therefore  $\beta_2 TC = \beta_2$ , which is an adjustment to the intercept term. The term  $\beta_3 (X_1 TC) = \beta_3 X_1$ , which is an adjustment to the slope of the regression line.

The test of the null hypothesis for non-parallelism is  $H_0: \beta_3 = 0$ . If  $\beta_3 \neq 0$ , then the conclusion is that the data patterns fit the non-parallel pattern, and that the differences in the slopes are significant. If  $\beta_3 = 0$  cannot be rejected, the researcher must conclude that the data follow a parallel pattern and must therefore be evaluated using a parallel model.

The second ANCOVA model assumes the data patterns are parallel. In this pattern, the slopes of the regression line plotted through the data are equivalent, but the intercepts are different. Figure 4-3 describes this pattern.<sup>21</sup>



**Figure 4-3. Assumption of parallel data patterns.**

In this pattern, the data follow similar (parallel) paths. The general equation to test if the difference in the intercept terms is significantly different from zero is:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 TC + \varepsilon$$

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<sup>21</sup> The slopes in Figure 4-3 are depicted as positive. Actual data patterns could have slopes that are positive, negative, or stay constant.

The equations for the control and treatment groups are:

**control group:**  $Y = \beta_0 + \beta_1 X_1 + \varepsilon$

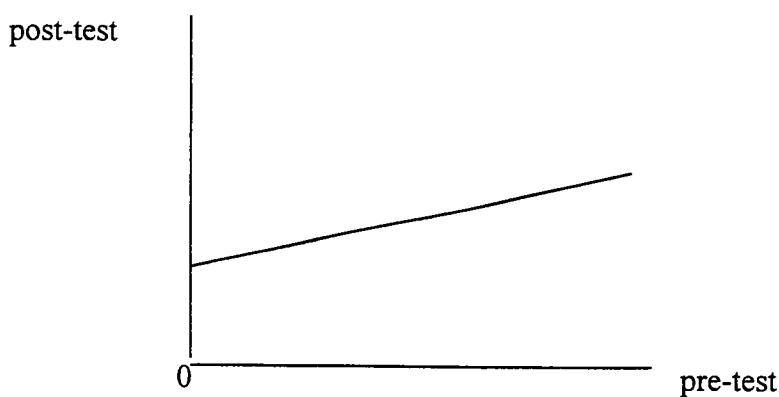
**treatment group:**  $Y = (\beta_0 + \beta_2) + \beta_1 X_1 + \varepsilon$

The test of the null hypothesis for parallelism is  $H_0: \beta_2 = 0$ . If  $\beta_2 \neq 0$ , then the conclusion is that the difference in the intercept terms, after the adjustment for pre-test differences, is significant. If  $\beta_2 = 0$ , then the researcher must conclude that the two patterns of data are equivalent and follow the data pattern shown in Figure 4-4.

If the data patterns are equivalent, one regression line for both groups can be drawn through the data. The equation for this line is:

$$Y_1 = \beta_0 + \beta_1 X_1 + \varepsilon$$

If the two data patterns can be represented by one regression equation, their differences are statistically insignificant.



*Figure 4-4. Assumption of equivalent data patterns.*

### *Data Analysis and Results*

As recommended by Tabachnick and Fidell (1996), the data were evaluated for assumptions of normality, outliers, multicollinearity, and homogeneity of variance-covariance matrices. Normality was examined by plotting the data against a normal curve and by using bar charts. No substantial departures from normality were apparent. A number of tools were used to examine the data for outliers, including stem-and-leaf plots, box plots, and frequency tables. Data containing outlier values from three observations were removed from the dataset, reducing the sample size to 107 (control group  $n = 67$ , treatment group  $n = 40$ ).<sup>22</sup>

Tabachnick and Fidell (1996) advise that multicollinearity is a problem if the correlation between two dependent variables exceeds 0.70. If correlation between multiple dependent variables is high, it would be very difficult to interpret the results, because it would be unclear if the variables are unique or the same. As shown in Table 4-3, correlation between the productivity variables does not exceed 0.57, therefore multicollinearity is not a problem in this set of data.

**Table 4-3. Correlation matrix of dependent variables.  
(Pearson correlation coefficients).**

|      | ACL | BRIDGE | PRODUCTS | STRREV |
|------|-----|--------|----------|--------|
| ACL  | .   | .566   | -.301    | .276   |
| BRDG |     | .      | .375     | .098   |
| PROD |     |        | .        | .384   |
| STR  |     |        |          | .      |

<sup>22</sup> Subsequent analysis revealed four potentially influential outliers. The data models were run with and without these observations, with no change in the results. Therefore these observations were not deleted.

The equality of the variance/covariance matrix for the MANCOVA was evaluated using the Box's M statistic. The Box's M statistic was significant ( $p < .002$ ), meaning that the equality of the covariance matrices between the treatment and control group could not be assumed.<sup>23</sup> Tabachnick and Fidell (1996) recommend the researcher use the Pillai's Trace criterion instead of the Wilks' Lambda criterion to evaluate the MANCOVA if the Box's M statistic is significant at  $p < .001$  and the sample sizes are unequal. Because the Box's M p-value of  $p < .002$  is not significant at  $p < .001$ , the Wilks' Lambda criterion was used to evaluate the MANCOVA result. The Pillai's Trace criterion is also reported for the model.

Table 4-4 reports the results of the MANCOVA model. The significance test for the Wilks' Lambda criterion is  $Pr > F = .0243$ , meaning that the null hypothesis of no significant differences in productivity as a result of TBO can be rejected. There is strong evidence that the two groups differ in productivity outcomes. To evaluate this result further, the individual productivity variables were also analyzed.

**Table 4-4. MANCOVA test criteria and F statistics.**

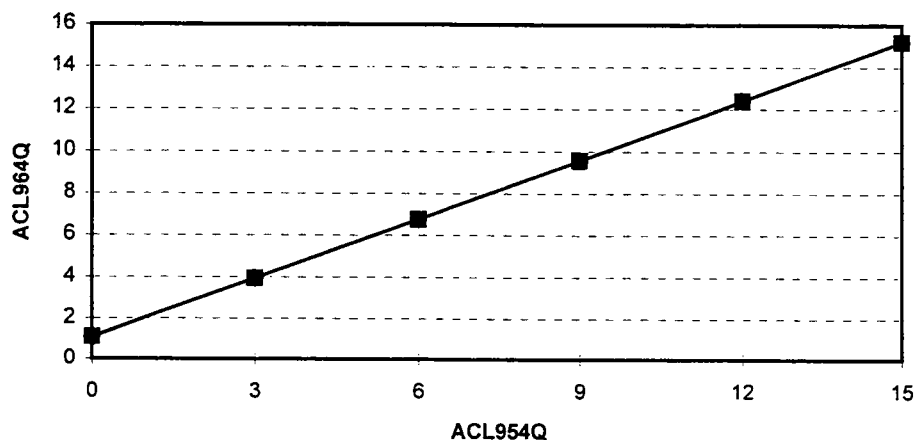
| Statistic              | Value  | F     | Numerator<br>DF | Denominator<br>DF | Pr > F |
|------------------------|--------|-------|-----------------|-------------------|--------|
| Wilks' Lambda          | 0.8887 | 2.943 | 4               | 94                | 0.0243 |
| Pillai's Trace         | 0.1113 | 2.943 | 4               | 94                | 0.0243 |
| Hotelling Lawley Trace | 0.1252 | 2.943 | 4               | 94                | 0.0243 |
| Roy's Greatest Root    | 0.1252 | 2.943 | 4               | 94                | 0.0243 |

<sup>23</sup> Box's M is deemed a "notoriously sensitive" test, especially when sample sizes are unequal (Tabachnick and Fidell 1996, p. 382).

Using the progressive ANCOVA models described in the previous section, an analysis was made of ACL, BRIDGE, PRODUCTS, and STRREV. The analysis of each of these variables will be discussed in turn.

### Average Call Length (ACL)

Three sets of output were generated from testing the effect of TBO on ACL. This output is contained in Appendix Exhibit C-1 (ACL test of non-parallelism), C-2 (ACL test of parallelism), and C-3 (ACL equivalent data patterns). The parameter estimates from the output are used to provide corresponding graphs of the regression lines for the treatment and control groups. The non-parallel and parallel test graphs are found in Appendix Figures D-1 and D-2, and the equivalent-data graph is shown in Figure 4-5. One regression line represents this data pattern.<sup>24</sup>



*Figure 4-5. ACL data pattern.*

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<sup>24</sup> The equation for the line is:  $Y_1 = 1.128 + .938X_1$ .

In the test of non-parallelism reported in Exhibit C-1, the significance of  $\beta_3$  was evaluated using the parameter estimates for ACL954Q\*TC. Although there appears from the graph (Figure D-1) to be some interaction effect, this effect is not significantly different from zero ( $\text{Pr} > |T| = .4961$ ), so the null hypothesis ( $\beta_3 = 0$ ) cannot be rejected.

Given that the analysis did *not* conclude that the data patterns of the two groups are non-parallel and significantly different, the second step was to perform a test of parallelism. The test of significant differences given the parallelism model was evaluated using the  $\beta_2$  coefficient in Exhibit C-2. For ACL, the hypothesis of  $\beta_2 = 0$  cannot be rejected since the parameter estimate for  $\beta_2$  is insignificant ( $\text{Pr} > F = .7497$ ). Because the ACL data failed to pass both the non-parallel and parallel tests, the conclusion is that no significant differences in ACL can be detected between the treatment and the control groups.

### **Bridge Rate (BRIDGE)**

The results of the BRIDGE test for non-parallelism are contained in Appendix Exhibit C-4. The significance of  $\beta_3$  was evaluated using the parameter estimate for BRDG954Q\*TC (Exhibit C-4). The hypothesis of no difference in bridge rates between the TBO and non-TBO groups was rejected at  $\text{Pr} > |T| = .0002$ . This result can be clearly seen in Figure 4-6, which provides a graph of the regression lines for the

treatment and control groups.<sup>25</sup>

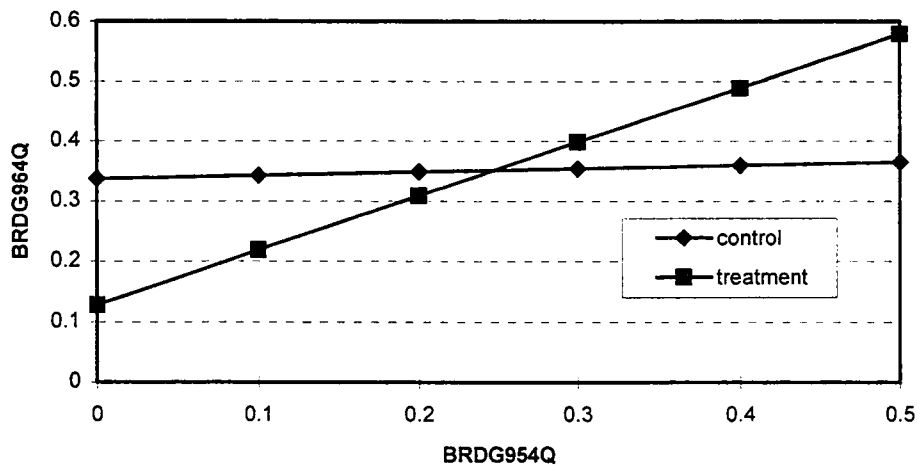


Figure 4-6. BRIDGE data pattern.

### Products Sold per On-line Hour (PRODUCTS)

Two sets of output were generated from testing the PRODUCTS variable. This output is contained in Appendix Exhibit C-5 (PRODUCTS test of non-parallelism) and Exhibit C-6 (PRODUCTS test of parallelism). The parameter estimates from the output are used to provide corresponding graphs of the regression lines for the treatment and control groups. The non-parallel test graph is found in Appendix Figure D-3, and the parallel test graph is shown in Figure 4-7.

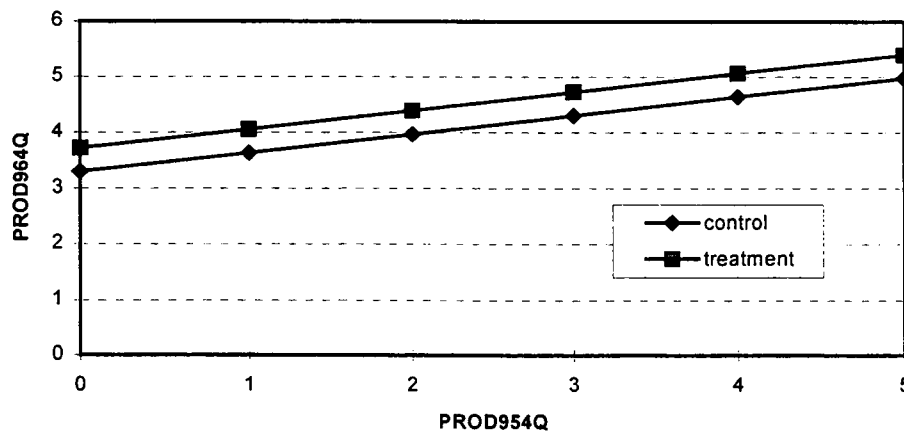
The significance of  $\beta_3 = 0$  was evaluated using the parameter estimate for PROD954Q\*TC, found in Exhibit C-5. The hypothesis of no difference in PRODUCTS

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<sup>25</sup> The regression equation for the control group is  $Y_1 = .337 + .055 X_1 + \epsilon$  and for the treatment group is  $Y_1 = (.337 -.209) + (.055 + .847) X_1 + \epsilon$ .

between the TBO and non-TBO groups could not be rejected at  $Pr > |T| = .1830$ . Because the data did not fit the non-parallel model, it was next tested with the parallel model.

The parameter estimate for  $\beta_2$  in Exhibit C-6 was used to evaluate the parallel test result. The hypothesis of no difference in PRODUCTS between the TBO and non-TBO groups was rejected at  $Pr > |T| = .0496$ . This result can be clearly seen in Figure 4-7, which shows a graph of the regression lines for the treatment and control groups. The graph shows that the data patterns of the two groups are parallel, and that they start with different intercepts. The significance of the  $\beta_2$  parameter estimate confirms that the difference between the groups is significant.<sup>26</sup>



**Figure 4-7. PRODUCTS data pattern.**

<sup>26</sup> The regression equation for the control group is  $Y_1 = 3.296 + .335 X_1 + \epsilon$  and for the treatment group is  $Y_1 = (3.296 + .421) + .335 X_1 + \epsilon$ .

### Strategic Revenues per Order (STRREV)

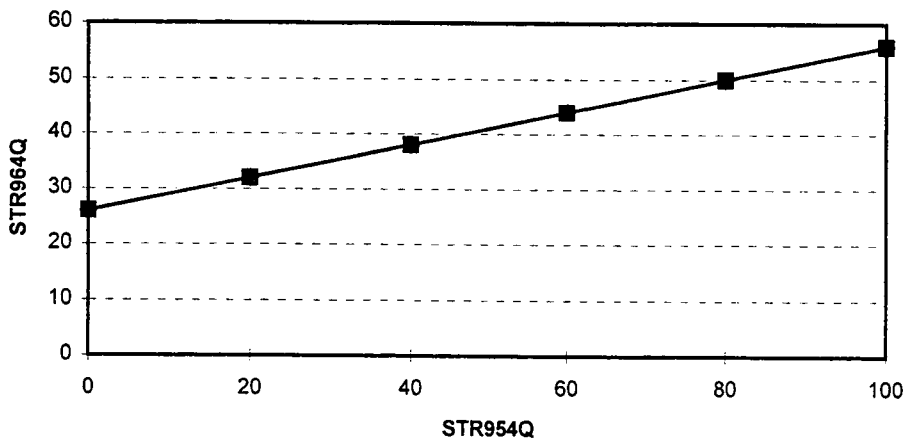
Three sets of output were generated from testing the effect of TBO on STRREV. This output is contained in Appendix Exhibit C-7 (STRREV test of non-parallelism), C-8 (STRREV test of parallelism), and C-9 (STRREV equivalent data patterns). The parameter estimates from the output are used to provide corresponding graphs of the regression lines for the treatment and control groups. The non-parallel and parallel test graphs are found in Appendix Figures D-4 and D-5, and the equivalent-data graph is shown in Figure 4-8.

In the test of non-parallelism, the significance of  $\beta_3$  was evaluated using the parameter estimates for STR954Q\*TC in Exhibit C-7. This effect is not significantly different from zero ( $\text{Pr} > |T| = .7535$ ), so the null hypothesis ( $\beta_3 = 0$ ) cannot be rejected.

Given that the analysis did *not* conclude that the data patterns of the two groups are non-parallel and significantly different, the second step was to perform a test of parallelism. The test of significant differences given the parallelism model was evaluated using the  $\beta_2$  coefficient in Exhibit C-8. For STRREV, the hypothesis of  $\beta_2 = 0$  cannot be rejected since the parameter estimate for  $\beta_2$  is insignificant ( $\text{Pr} > F = .2926$ ). Because the STRREV data failed to pass both the non-parallel and parallel tests, the conclusion is that no significant differences in STRREV can be detected between the treatment and the control groups. One regression line represents the STRREV data pattern shown in Figure 4-8.<sup>27</sup>

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<sup>27</sup> The equation for this line is:  $Y_1 = 26.016 + .299 X_1 + \varepsilon$ .



*Figure 4-8. STRREV data pattern.*

### *Summary of Productivity Analysis*

The productivity analysis indicates that TBO has a positive effect on sales consultant productivity. This is demonstrated by the MANCOVA results, with the effects driven primarily by the BRIDGE and PRODUCTS variables. Comparing the changes in the mean values of the variables further supports the conclusion that sales consultants in the TBO environment had larger gains in productivity than sales consultants in the non-TBO environment. Table 4-5 details the mean productivity values.

The changes in the ACL mean values indicate that ACL is increasing for both the treatment and control groups. Despite the efforts that *Telecomm* has made over the past year to decrease ACL, these data provide evidence that ACL is lengthening. Although the

differential change in ACL was not significant, the increase is slightly less for the treatment group than for the control group (8.8% vs. 10.2%).

The bridge rate increased over 32% in the treatment group, compared to a 16% increase in the control group. The differential change in BRIDGE was highly significant, clearly indicating that the TBO sales consultants were more productive than the control group sales consultants at bridging to sales.

The number of products sold per on-line hour increased 42% in the treatment group but only 32% in the control group. This difference is significant, and indicates that the treatment group is achieving positive results in selling *Telecomm* products. In the post-test period, the treatment group is selling 10% more products per on-line hour than the control group (4.86 vs. 4.42 products/hour).

In both the treatment and control groups, STRREV declined. The decline was greater in the treatment group, although the differences were not statistically significant. Because this result was counter-intuitive, the product revenues contained in the raw data and the input of the data was re-verified. No data problems were found. In addition to strategic revenue dollars, the dataset also contained the number of strategic products sold by each sales consultant. To validate the STRREV results, the analysis was repeated using the number of strategic products in place of strategic revenues. The results did not substantially change.

The results of the MANCOVA, combined with the examination of the comparative mean statistics, demonstrate that sales consultant productivity in the

treatment group has increased relative to the productivity in the control group after the implementation of TBO.

**Table 4-5. Means and standard deviations of productivity variables.**

| Group     | Variable | 1995  | 1995      | 1996  | 1996      | Difference<br>1995-1996 |
|-----------|----------|-------|-----------|-------|-----------|-------------------------|
|           |          | Mean  | Std. Dev. | Mean  | Std. Dev. |                         |
| Control   | ACL      | 6.70  | 2.09      | 7.38  | 2.46      | 10.2%                   |
|           | BRIDGE   | 0.30  | 0.09      | 0.35  | 0.05      | 16.7%                   |
|           | PRODUCTS | 3.34  | 0.98      | 4.42  | 1.05      | 32.3%                   |
|           | STRREV   | 37.71 | 7.20      | 36.99 | 4.51      | (1.9%)                  |
| Treatment | ACL      | 7.87  | 2.83      | 8.56  | 2.75      | 8.8%                    |
|           | BRIDGE   | 0.31  | 0.06      | 0.41  | 0.11      | 32.3%                   |
|           | PRODUCTS | 3.41  | 0.88      | 4.86  | 1.18      | 42.5%                   |
|           | STRREV   | 40.52 | 5.90      | 38.67 | 4.29      | (4.6%)                  |

## CHAPTER FIVE

### SERVICE QUALITY ANALYSIS

#### *Introduction*

*Telecomm* measures sales consultant service quality using a program called Team Improvement Process Support (TIPS). TIPS is a new program, begun with a pilot test in November 1995 and fully operational for 1996. The TIPS criteria is a list of 13 behaviors that *Telecomm* believes a sales consultant should exhibit on a customer call. Examples of behaviors include demonstrating job knowledge, treating the customer with courtesy, completing paperwork correctly, and thanking the customer for calling *Telecomm*.

A monthly scorecard is kept on each sales consultant. The scorecard is a matrix format that lists the TIPS behaviors down the left side and the call observations across the page. Table 5-1 is an example of a TIPS scorecard. If a behavior is appropriate to the call being observed the coach marks it as an opportunity (Opp.).<sup>28</sup> If the sales consultant demonstrates that behavior, a mark is placed in the "met" column. Each call is scored by dividing the number of opportunities met by the number of opportunities. At the end of the month, a monthly score is computed by dividing the total number of opportunities met by the total number of opportunities. For example, in Table 5-1 the monthly score is 81%. TIPS ratings can range from 0 - 100%.

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<sup>28</sup> Not all behaviors relate to every call. For example, one item relates to how the sales consultant verifies a customer's credit status. If no credit verification is required, the sales consultant is not graded on this item.

Sales consultant TIPS data are generated by a coach observing a sales consultant's calls. Some calls are observed with the coach sitting beside the sales consultant; others are observed with the coach at a remote station. Each sales consultant is rated numerous times throughout the year, but not every sales consultant is rated each month.

**Table 5-1. TIPS scorecard.**

| Behavior  | Call 1 |     | Call 2 |     | Total * |     |
|---|--------|-----|--------|-----|---------|-----|
|   | Opp.   | Met | Opp.   | Met | Opp.    | Met |
| Treat the customer with respect and courtesy.           | 1      | 1   | 1      | 1   | 2       | 2   |
| Use the appropriate brand/close.                        | 1      | 1   | 1      | 1   | 2       | 2   |
| Committed to helping the customer.                      | 1      | 1   | 1      | 1   | 2       | 2   |
| Demonstrate authority and empowerment.                  | 1      | 1   | 1      | 1   | 2       | 2   |
| Transition/bridge to sales.                             | 1      |     | 1      | 1   | 2       | 1   |
| Demonstrate knowledge to satisfy customer needs.        | 1      |     | 1      | 1   | 2       | 1   |
| Meet all jurisdictional requirements.                   | 1      | 1   | 1      | 1   | 2       | 2   |
| Utilize appropriate process offering products/services. | 1      |     | 1      | 1   | 2       | 1   |
| Make appropriate save attempt.                          |        |     |        |     |         |     |
| Complete appropriate terminal activity/paperwork.       | 1      | 1   | 1      |     | 2       | 1   |
| Follow appropriate credit verification.                 |        |     | 1      | 1   | 1       | 1   |
| Make efficient use of on-line time.                     | 1      | 1   | 1      | 1   | 2       | 2   |
| Follow appropriate billing/adjustment procedures.       |        |     |        |     |         |     |
| Overall Total   | 10     | 7   | 11     | 10  | 21      | 17  |
| TIPS Score  | 70%    |     | 91%    |     | 81%     |     |

\* Between 10 and 20 calls are typically observed each month per sales consultant.

### **Experimental Design**

TIPS data are available for each sales consultant in the treatment group, but corresponding data are not available for the control group.<sup>29</sup> Because only treatment

<sup>29</sup> Control group sales consultant ratings were not available for the period January - March 1996, and some sales consultant ratings were tabulated on an annual, rather than a monthly, basis.

group data are used, the experimental design for the service quality test is the one-group pre-test post-test design:

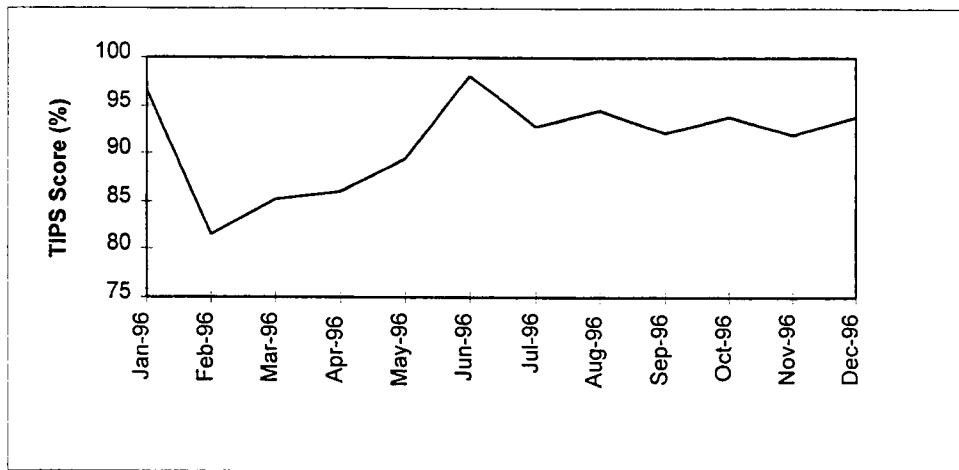
$$\frac{O_1 \quad X \quad O_2}{\quad}$$

There are a number of limitations to using a one-group pre-test post-test design, because it is impossible to separate the treatment effect from other effects that may be taking place. These limitations will be discussed more fully in the Data Analysis and Results section of this chapter.

The TIPS pre-test score (TIPSQTR1) for each sales consultant is computed as the mean of the January, February, and March 1996 TIPS ratings. The TIPS post-test score (TIPSQTR4) for each sales consultant is computed as the mean of the October, November, and December 1996 ratings. A third variable, TIPSDIF, is computed as TIPSQTR4 minus TIPSQTR1. The TIPSDIF variable was evaluated using a paired-difference t-test, which determines if the average paired difference is significantly different from zero.

### ***Data Analysis and Results***

Within the treatment group, 80 sales consultants had TIPS ratings in 1996. Figure 5-1 is a graph of the mean TIPS rating for all sales consultants from January to December 1996. It is evident from the graph that TIPS ratings increased throughout the year.



**Figure 5-1. Average TIPS Scores (January - December 1996).**

Twenty-nine (29) sales consultants had ratings in both the pre-test and the post-test time periods; therefore their data were used in the paired-difference t-test. Basic statistical data related to this test are found in Table 5-2.

**Table 5-2. TIPS simple statistics.**

|          | Mean | Standard Deviation | Minimum | Maximum |
|----------|------|--------------------|---------|---------|
| TIPSQTR1 | 85.7 | 13.2               | 44.6    | 100.0   |
| TIPSQTR4 | 92.9 | 7.6                | 71.4    | 100.0   |
| TIPSDIF  | 7.3  | 13.7               | -18.7   | 48.0    |

The difference in TIPS scores was significant at  $p > |T| = .0078$  ( $T=2.86$ ), meaning that the null hypothesis of no service quality differences was rejected. There is evidence that service quality has significantly increased in the treatment group *after* the implementation of TBO. However, because the data analysis is limited to the treatment

group it cannot be said with certainty that the increase in TIPS scores *resulted from* the TBO intervention. There are other potential explanations for this difference.

One plausible reason for an increase in TIPS scores is that the TIPS program was new, so the sales consultants were receiving feedback about service quality that had not been available previously. Another potential reason for the difference is that a maturation effect was taking place, meaning that sales consultants were becoming more proficient in this aspect of their job with the passage of time.

Interpretation of the result could also be confounded by an instrumentation effect if measurements were not consistent between the pre-test and post-test periods. As the coaches doing the ratings gained experience with the TIPS program, they may have adjusted their methods of evaluating calls.

Office-level data which reports a single TIPS score for each office on a monthly basis suggest that the control group also achieved higher TIPS ratings toward the end of 1996. However, due to a combination of measurement error in the data (incomplete data for July and December) and the structure of the data (one data point per office per month), these data cannot be statistically evaluated. Without corresponding sales consultant-level data from the control group, the only conclusion that can be drawn from this analysis is that the TIPS scores in the treatment group exhibited a significant increase between the pre-test and the post-test periods.

## CHAPTER SIX

### EMPLOYEE SATISFACTION ANALYSIS

#### *Introduction*

To help evaluate changes in employee satisfaction after the implementation of TBO, two survey instruments were used. These are the Work Attitudes Survey and the Changes in Work Roles Survey. Both surveys were developed by the researcher with the input of *Telecomm* management. Sales consultant participation in the survey project was on a voluntary and anonymous basis.

The Work Attitudes Survey (Appendix E-1) is a 39-item scale designed to measure employee satisfaction. The survey included items from two previously-validated scales: the Warr, Cook, and Wall (1979) scale of intrinsic job satisfaction and the Dobbins and Zaccaro (1986) group cohesiveness scale.<sup>30</sup> Also included in the survey were two self-report items of satisfaction.<sup>31</sup> To mitigate an order effect, two versions of the survey instrument were used, each containing the same questions but in a different sequence.

Prior to use in this project, the survey instrument was reviewed by *Telecomm* managers and by a number of faculty members and doctoral students at the University of Tennessee, Knoxville (UTK). It was pilot tested with a small sample (n=14) of UTK

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<sup>30</sup> The reliabilities for the 8-item Warr, Cook, and Wall and the 7-item Dobbins and Zaccaro scales are .82 and .91, respectively.

<sup>31</sup> See Appendix E-1 for a breakdown of each scale's questions.

employees. The reliability rating (Cronbach's alpha) for that pilot test was 0.95.

After completing the Work Attitudes Survey items, respondents were asked to supply three pieces of demographic data: gender, length of service with *Telecomm*, and length of service as a sales consultant. They were also asked to supply the first five letters of their mother's maiden name. The key piece of data sought was the first five letters of the mother's maiden name. These data were used to match pre-test surveys with post-test surveys, enabling a matched-pairs experimental design.

The second survey used was the Changes in Work Roles Survey (Appendix E-2). This 18-item survey was designed to provide descriptive data on how sales consultants in the treatment group perceive the effect TBO has had on their jobs.

Finally, two focus groups were conducted in January 1997 with eight sales consultants from each of the two treatment offices (a total of 16 sales consultants participated). These focus groups provided anecdotal evidence of the impact of TBO.

### ***Experimental Design***

The Work Attitudes Survey was administered to both the control and treatment groups in March 1996 (pre-test) and again in January 1997 (post-test). The March 1996 date to give the survey was chosen by *Telecomm* to precede the sales consultants' initial TBO training. Therefore the experimental design for the employee satisfaction test is the untreated control group with pre-test and post-test measures:

|                |   |                |
|----------------|---|----------------|
| O <sub>1</sub> | X | O <sub>2</sub> |
| O <sub>1</sub> |   | O <sub>2</sub> |

The Work Attitude Survey responses were arranged on a 5-point Likert scale with the following values: (1) strongly disagree, (2) disagree, (3) neutral, (4) agree, and (5) strongly agree. Respondents could also choose “does not apply” or skip the question; in either case the response was treated as a missing value. As recommended by Tabachnick and Fidell (1996), missing values were replaced with the mean value of the appropriate survey group (e.g. the mean of the treatment group pre-test surveys for an item was used to replace the missing value for that item on a treatment group pre-test survey).

A pre-test score (PRESAT) was calculated for each sales consultant as the mean response score on the March 1996 survey (mean =  $\Sigma(\text{item}_1, \text{item}_2, \dots, \text{item}_{39})/39$ ). A post-test score (POSTSAT) was calculated for each sales consultant as the mean response score on the January 1997 survey. The possible range of both PRESAT and POSTSAT scores was 1.0 to 5.0.

A matched pairs t-test was used to analyze the survey response data for those surveys matched using the mother’s maiden name (n = 26). Also, an analysis of variance model (ANOVA) was used to analyze the differences in the treatment and control group means between the pre-test and post-test periods. This additional test enabled an analysis

using a larger set of survey data (pre-test n = 87, post-test n = 60).<sup>32</sup>

The Changes in Work Roles Survey is meant to provide descriptive data only; therefore it is not associated with an experimental design. The response scale was a 5-point Likert scale with the following values: (1) strongly disagree, (2) disagree, (3) neutral, (4) agree, and (5) strongly agree.

### ***Data Analysis and Results***

One hundred and twenty-eight (128) Work Attitude Surveys were returned in March 1996 and eighty-nine (89) were returned in January 1997. Control group response rates were 51% (March 1996) and 48% (January 1997). Treatment group response rates were 93% (March 1996) and 70% (January 1997).

Reliability coefficients (Cronbach's alpha) were examined for the 39-item Work Attitude Survey scale, as well as for each of the subscales imbedded in the survey. Cronbach's alpha for the full scale was 0.93, indicating high inter-item reliability (Nunnally and Bernstein, 1994). The three subscales also exhibited strong inter-item reliability, with the following metrics: Warr, Cook, and Wall (8 items, alpha = 0.85); Dobbins and Zaccaro (7 items, alpha = 0.84); self-report of satisfaction (2 items, alpha = 0.90).

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<sup>32</sup> Because the purpose of this analysis was to measure changes in employee satisfaction between the pre-test and post-test periods, sales consultants with less than one year's length of service were not included in the analysis (the pre-test, post-test periods were ten month's apart). Sales consultants who did not report length of service were also excluded.

A correlation analysis of the subscales and the full scale was done to verify that the survey instrument measured like concepts of satisfaction. As demonstrated by the correlation matrix shown in Table 6-1, there is a significant amount of correlation between each of the subscales and the full scale. This correlation gives confidence that the survey had strong construct validity (Nunnally and Bernstein, 1994).

Normality of the dataset was examined by examining plots of the data, as well as plotting the data alongside a normal curve. No departures from normality were detected.

**Table 6-1. Work Attitudes Survey sub-scale correlation matrix.  
(Pearson correlation coefficients).**

|                      | Full Scale | Self-Report | Dobbins and Zaccaro | Warr, Cook, and Wall |
|----------------------|------------|-------------|---------------------|----------------------|
| Full Scale           | .          | .796 ***    | .688 ***            | .884 ***             |
| Self-Report          |            | .           | .428 ***            | .643 ***             |
| Dobbins and Zaccaro  |            |             | .                   | .527 ***             |
| Warr, Cook, and Wall |            |             |                     | .                    |

\*\*\* significant at .001

A matched-pairs analysis was conducted on the data from the 26 sales consultants who self-identified using their mother's maiden name. As shown in Table 6-2, the control group data do not demonstrate a significant difference in satisfaction between the pre-test (PRESAT) and the post-test (POSTSAT) scores ( $t=1.28$ ,  $p>|T| = .249$ ). The treatment group data do show a very significant difference in satisfaction ( $t=4.80$ ,  $p>|T| = .000$ ).

**Table 6-2. Matched pairs analysis for Work Attitudes Survey.**

| group     | variable | # pairs | mean | std.dev. | t-value | df | p> T |
|-----------|----------|---------|------|----------|---------|----|------|
| control   | PRESAT   | 7       | 2.63 | .52      | 1.28    | 6  | .249 |
|           | POSTSAT  |         | 2.84 | .65      |         |    |      |
| treatment | PRESAT   | 19      | 3.10 | .35      | 4.80    | 18 | .000 |
|           | POSTSAT  |         | 3.55 | .41      |         |    |      |

This outcome provides evidence to reject the null hypothesis of no differences in satisfaction between the TBO and non-TBO sales consultants, and the change and direction of the means indicates that the TBO employees experienced greater increases in satisfaction. The control group mean increased 8.0%, while the treatment group mean increased 14.5%. However, interpretation of the match-pairs analysis result is hampered by the small sample size of the matched-pairs test.

Further analysis was done using the changes in group means of both the control and treatment groups over time, which is a less sensitive test than the matched pairs analysis. Table 6-3 reports the simple statistics for this set of data. As shown by the data, the change in satisfaction scores over time was positive for each group. The control group mean increased from 2.38 to 2.76 (16%). The treatment group mean increased from 2.89 to 3.49 (21%). Although the treatment group showed a larger increase in mean satisfaction than the control group, the ANOVA statistical test failed to reject the null hypothesis of no between-group differences ( $Pr > F = .233$ ).

**Table 6-3. Work Attitude Survey simple statistics by group.**

| Group     | Variable | n  | mean | std. dev. | minimum | maximum |
|-----------|----------|----|------|-----------|---------|---------|
| control   | PRESAT   | 26 | 2.38 | .45       | 1.5     | 3.0     |
|           | POSTSAT  | 26 | 2.76 | .67       | 1.4     | 3.8     |
| treatment | PRESAT   | 61 | 2.89 | .39       | 2.0     | 3.9     |
|           | POSTSAT  | 34 | 3.49 | .46       | 2.1     | 4.2     |

Although the ANOVA statistical test failed to support between-group differences over time, the changes in the means support the contention that TBO enhances employee satisfaction. The inability of the ANOVA model to sense statistical differences could be attributed to a factor related to the data. This factor is that the two groups are nonequivalent and exhibit significantly different means at the pre-test (t-test of difference in PRESAT means:  $t = -5.8, p > |T| = .000$ ). This pre-test difference could not be statistically adjusted using a covariate as suggested by Nunnally and Bernstein (1994), because the pre-test surveys cannot be matched with the post-test surveys in this set of data.

The Changes in Work Roles survey provides further data that the TBO sales consultants are experiencing positive changes in satisfaction. Included in Appendix Table A-2 is the mean response per item, which ranged from 3.08 to 4.02. Since all of these values are greater than 3.0 (neutral), these survey responses indicate that sales consultants are more satisfied since the implementation of TBO.

In the focus groups, sales consultants were asked the question:

**If you moved to another office and had to choose between working as an individual sales consultant or working as a member of a TBO team, which would you choose, and why?**<sup>33</sup>

Of the sixteen sales consultants in the focus groups, every single one responded that they would choose working as part of a TBO team. In describing why they preferred the TBO environment, respondents said that they liked having input into decisions, that the company seemed to treat them with more respect, that they enjoyed helping their teammates do a better job, and they felt as they were treated more like adults in the TBO environment.

The following chapter summarizes and discusses the findings related to the TBO impact on employee performance.

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<sup>33</sup> Sales consultants were asked to supply written, anonymous responses to this question at the end of the focus group session, so that their responses were not biased by the other members of the focus group.

## CHAPTER SEVEN

### DISCUSSION OF RESULTS

#### *Summary of Results*

To test the effect of a TBO on performance, three main constructs of performance were evaluated. These were productivity, service quality, and satisfaction. *Telecomm* implemented the TBO program expecting to see improvements in each of these areas. Through this research project, conclusions can be drawn about these potential improvements.

To summarize, the individual hypotheses proposed and the results of the data analyses are:

#### Productivity Hypotheses

**H1 Implementing a team based organization will not have an effect on employee productivity.**

Result: Null rejected. Significant productivity increase demonstrated for the treatment group.

**H1a Implementing a team based organization will not have an effect on average call length.**

Result: Null not rejected.

**H1b Implementing a team based organization will not have an effect on the bridge rate.**

Result: Null rejected. Significant bridge rate increase demonstrated for the treatment group.

**H1c Implementing a team based organization will not have an effect on number of products sold per on-line hour.**

Result: Null rejected. Significant products sold per on-line hour increase demonstrated for the treatment group.

**H1d Implementing a team based organization will not have an effect on strategic revenues per order.**

Result: Null not rejected.

Service Quality Hypothesis

**H2 Implementing a team based organization will not have an effect on service quality.**

Result: Null rejected. Significant service quality increase demonstrated for the treatment group.

Employee Satisfaction Hypothesis

**H3 Implementing a team based organization will not have an effect on employee satisfaction.**

Result: Null rejected with matched-pairs data. Null not rejected with full dataset (less sensitive test). Difference in means and other anecdotal evidence support rejecting the null hypothesis.

This study demonstrated that strong performance increments were achieved after the introduction of a team-based organization. Significant improvements were found in each of the three constructs: productivity, service quality, and satisfaction. By employing a rigorous set of design characteristics in a field setting to measure the impact of work teams on performance, the results of the study significantly add to the debate about work team effectiveness.

## *Contributions*

This study extends previous work team research in a number of ways. First, the study incorporates the constructs of productivity, quality, and satisfaction under one comprehensive study of performance. Productivity and quality data were provided by the company, using measures that are standardized for all employees. The use of organizational data, rather than self-report information, adds a rigor to the data analysis that was not present in many previous studies. The setting of the research project and the use of organizational data help to ensure that relevance was not sacrificed for statistical rigor.

Given that companies change processes for business reasons, not research project reasons, it was very fortunate to have a business change that used a staggered implementation approach. This enabled the use of a research design which included an untreated control group as well as pre- and post-test measures. This research design allowed the researcher to control for potential rival hypotheses and to make stronger conclusions about the effects of the treatment.

This study adds to the social science literature because it incorporated strong design features in a natural organizational setting. It adds to the accounting literature in that it described the use of available operating data to measure and analyze performance in a real-world situation. It also provided an example of an empirical analysis of specific productivity effects that could form the basis of a business cost/benefit analysis.

The study also contributes to the debate about the effectiveness of teaming. Previous research on the linkages between teaming and productivity, quality, and employee attitudes has resulted in mixed results. Much of the evidence regarding the effectiveness of teaming has been anecdotal; this study adds an empirical dimension to this discussion.

### *Limitations*

While being able to study the effects of job redesign in a field study is a strength of this research, it also results in many limitations. The most obvious limitation is that the study has limited generalizability because it involves only one company which is in a highly-regulated unionized industry. However, the study has high generalizability to other telecommunications operating companies, and also is one of the few examples of effects of teaming in a service environment.

Research has shown that group performance changes over time and moves through a series of developmental stages (Ancona and Caldwell, 1992). No attempt is made in this project to determine the developmental stages of the teaming process. The length of the data collection period was designed in part to help capture the effect of the change on performance, not to monitor developmental changes.

Cook and Campbell (1979) list a number of validity threats in quasi-experimental research. These include mortality, selection bias, history, selection-maturation bias, and heterogeneity in the extent of treatment implementation. This study potentially suffers

from each of these threats, although measures have been taken where possible to either control for these threats or to evaluate their effects on the data.

Selection bias is a threat because the subjects are part of naturally occurring groups; they were not randomly selected or assigned to a control and a treatment group. Because random selection is not present, the researcher must assume that the groups are nonequivalent (Cook and Campbell, 1979). Even if the groups appear equivalent on pre-test measures, the subjects may be maturing at different rates or may be influenced by factors that are not apparent in the pre-test data. To statistically account for this potential bias in the two groups, the pre-test data was used as a covariate in the productivity analyses.

Selection bias may also exist in the offices implementing a TBO versus those offices that are not. The timing of when to begin implementing a TBO was a decision made by each RSSC manager, but *Telecomm* expects that all RSSCs in the district will restructure into a TBO within the next year. The threat of selection bias at the RSSC level was minimized by using demographic variables to analyze for systematic differences between the control group and the treatment group.

History is a threat because events may take place between the pre-test and the post-test that could affect performance outcomes, such as a fundamental change in the company, a change in office management, or a change in the TBO incentive system. To address this problem, every effort was being made during field visits and in communications with *Telecomm* to track relevant changes on the company, district, and RSSC level that might have influenced the outcomes.

Another limitation of this study is that a “Hawthorne” effect may have resulted from employees knowing that they’re being studied. However, all of the productivity and service quality data were already routinely recorded by *Telecomm*. Thus, no new procedures for productivity or service quality were put into place for this study. The only data not previously gathered by *Telecomm* was that provided directly by the sales consultants on the two surveys used in the study.

### ***Agenda for Future Research***

While this study has provided empirical support for the effect of teaming on performance, it also opens the door to a number of research questions. In the study, performance was defined as productivity, service quality, and employee satisfaction. Each of these constructs was investigated by itself, for the data were not linked together to make a joint analysis of the three constructs possible. It would be interesting to know how these components of performance worked together, and it would be valuable for business managers to understand which are the driving components. For example, does satisfaction lead to productivity, or does productivity lead to satisfaction?

Another extension of this research would be to link performance changes to a cost/benefit analysis. By extrapolating the financial benefits of increased performance to a measure of increased income, and by collecting and evaluating cost data, a researcher could construct a financial model of performance outcomes.

Research that evaluates the information content of non-financial measures of performance would be useful to both academics and practitioners. Establishing the links between these measures and managers' judgments would show how these measures are used to manage operations. Establishing the links between these measures and actual financial performance would also provide valuable information about the relationship between operational data and financial outcomes.

Research that evaluates alternative non-financial performance measures would also be valuable in that it would give both the academic and financial community additional information about the quality of non-financial measures. This research would also be useful in constructing a cost/benefit analysis.

In the measures used in this study, the service quality measure could be strengthened. First, having a control group would eliminate some competing hypotheses about differences in outcomes. Also, a customer measure of service quality would be helpful in understanding this construct. The service quality rating was an internal measure, which only measured what *Telecomm* thinks is important to the customer. Providing validation of these results through an independent quality measure would be interesting.

Finally, this study provides one example of the effect of TBO on performance. Additional research which demonstrates the infusion rate of change and which validates these findings would be valuable. It seems that businesses sometimes "give up" on change efforts because they don't experience a difference in outcomes. For example, if research shows that the effects of teaming aren't apparent for six to nine months, this

would give business managers valuable information. As part of a continuing research project with *Telecomm*, performance outcomes of the treatment and control groups will be studied throughout 1997. The control group began their TBO implementation in early 1997, so the data will give additional information about the impact of TBO on performance, and potentially about the infusion rate of change.

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## **APPENDICES**

## **Appendix A**

### **Tables**

Table A-1. Review of selected teaming literature

Table A-2. Changes in Work Roles Survey mean responses

**Table A-1: Review of selected teaming literature.<sup>34</sup>**

| Author(s)                          | Description <sup>36</sup>   | Industry               | Design                       | Control Group? | Dependent Variables  |  |  |                    | Results <sup>35</sup> |           |  |
|------------------------------------|---|------------------------|------------------------------|----------------|--|--|--|--------------------|-----------------------|-----------|--|
|                                    |   |                        |                              |                | Productivity   | Quality  | Attitudes  | Productivity       | Quality               | Attitudes |  |
| Walton (1972)                      | Plant with teams compared to other plants   | food proc. plant       | post-test                    | no             | 1. absenteeism<br>2. turnover  | 1. quality control   | anecdotal  | 1. +<br>2. +       | 1. +                  | mixed     |  |
| Gladstein (1984)                   | Equipment sales teams   | Telecomm               | post-test                    | no             | 1. revenue for 1 Qtr<br>2. self-report   | none   | 1. self-report<br>8 items  | 1.0<br>2. +        | none                  | 1. +      |  |
| Buller and Bell (1986)             | Team building effect for miners   | mining                 | pre-test<br>post-test        | yes            | 1. tons per manshift   | 1. grade of silver<br>2. grade of ore  | none   | 1.0                | 1.0<br>2.0            | none      |  |
| Wall <i>et al.</i> (1986)          | Autonomous work groups compared with traditionally managed employees                                      | food production        | post-test, repeated measures | yes            | 1. self-report   | none   | 1. self-report<br>30 items   | 1.0                | none                  | 1. mixed  |  |
| Cordery, Mueller, and Smith (1991) | Greenfield site with autonomous work groups vs. traditional work site                                     | minerals proc.         | post-test, repeated measures | yes            | 1. absenteeism<br>2. turnover<br>(data collected at group level only)                    | none   | 1. self-report<br>33 items   | 1. +<br>2. +       | none                  | 1. +      |  |
| Campion, Medsker, and Higgs (1993) | Correlation of work groups characteristics to outcomes  | financial org'n        | post-test                    | no             | 1. unfinished work<br>2. manager judgments<br>4 items                                    | none   | 1. self-report<br>71 items<br>(data collected at group level only) | 1. +<br>2. +       | none                  | 1.0       |  |
| Cohen and Ledford (1994)           | Teams, stratified by type of work (clerical, craft, customer svc.) and by mgt groups (empl., supv'r, mgt) | Telecomm               | post-test                    | matched pairs  | 1. accidents<br>2. absenteeism<br>(data collected at group level only)<br>3. self-report | 1. self-report<br>13 items<br>2. org'nal data for cust. svc sub-sample<br>1 item | 1. self-report<br>24 items   | 1.0<br>2.0<br>3. + | 1. +<br>2.0           | 1. +      |  |
| Batt and Appelbaum (1995)          | Teams of network craft and customer service workers   | Telecomm               | post-test                    | no             | none   | 1. self-report<br>1 item   | 1. self-report<br>4 items  | none               | 1. +                  | 1. mixed  |  |
| Crom and France (1996)             | Teams of craft, office, and production employees  | apparel                | post-test                    | no             | none   | 1. self-report<br>1 item   | 1. self-report<br>7 items  | none               | 1. +                  | 1.0       |  |
|                                    | Teams of production employees   | cardboard manufacturer | pre-test<br>post-test        | no             | none   | 1. scrap rate<br>2. set-up times   | none   | none               | 1. +<br>2. +          | none      |  |

<sup>34</sup> Shaded areas indicate a perceived weakness in the study.

<sup>35</sup> Key: 0 indicates no change, + indicates positive change.

<sup>36</sup> Only tests related to a teaming treatment are discussed in this table. Additional tests of effects, such as effects of group composition or size, that are outside of the scope of this study's treatment focus are not included in this review.

**Table A-2. Changes in Work Roles Survey mean responses.**

(Scale is a 5-point Likert: Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree.)

| Since I began working on my TBO team at <i>Telecomm</i> ....                    | Mean response |
|---|---------------|
| ....I have a better understanding of how to increase customer satisfaction.     | 3.60          |
| ....I am held more accountable for my productivity.                             | 3.70          |
| ....I receive more recognition for the work I do.*                              | 3.08          |
| ....I am responsible for maintaining team productivity levels.                  | 3.67          |
| ....I am responsible for backing-up by teammates in their TBO roles.            | 4.02          |
| ....I enjoy my work more now.   | 3.40          |
| ....The members of my TBO team cooperate better to get the job done.            | 3.98          |
| ....I have a clear understanding of my TBO team role.                           | 3.69          |
| ....I am more involved in decisions that effect my work.                        | 3.50          |
| ....I feel more encouraged to come up with new and better ways of doing things. | 3.70          |
| ....I am more willing to put forth extra effort toward my job.                  | 3.80          |
| ....I am less confused about my job duties.*                                    | 3.64          |
| ....Interactions with my coach are more adult-to-adult.                         | 3.86          |
| ....The team coach helps my TBO team to meet team goals.                        | 3.79          |
| ....I am better able to handle my work load.                                    | 3.20          |
| ....My TBO team role helps me to be a better sales consultant.                  | 3.31          |
| ....I feel more empowered to achieve team goals.                                | 3.74          |
| ....I feel more satisfied with my job.*   | 3.46          |

\* Original question was asked in the negative. It has been rewritten here to keep analysis consistent.

## **Appendix B**

### **Field Visit Protocols**

## **Appendix B. Field Visit Protocols.**

### **Protocol for Field Visit: 2/23/96**

#### **Documents needed:**

1. Organization chart for *Telecomm*
2. Organization chart for Customer Service RSSCs
3. Organization chart for treatment group offices - pre- and post- work teams
4. Organization chart for a non-team customer service office
5. Training handbook
6. Memos about the job redesign
7. Memos from company related to productivity measures or initiatives

#### **Information needed / Questions:**

1. Background information on customer service objectives
  - Regulatory requirements
  - Company strategy
2. What is the number one performance objective for the customer service offices?
3. What are other performance priorities?
4. How is quality measured for the customer service offices?
5. What is the union structure of the workforce, and how does this effect the customer service group?
6. Have there been any seasonality effects noted in the productivity measures?
7. Location of customer service offices in geographic region, and number of employees in each office.
8. Breakdown of employees by managers, supervisors, sales consultants, etc.
9. What have been the staffing levels over the past year, and what is anticipated in the next year?
10. What are the requirements for becoming a sales consultant?
11. What is the pay range of sales consultants?
12. How much turnover (involuntary vs. voluntary?) is there for sales consultants? Why do people leave?
13. Is the work force growing or shrinking? (*Telecomm* in general, customer service in specific.)
14. How do the treatment and/or control group offices differ from the other customer service offices? (in any respect: market, managers, performance, etc.)
15. How and why did the TBO initiative get started?
16. Is there a "champion" for TBO? If so, who?
17. Why were these offices selected for implementing TBO?
18. What are the objectives of TBO?
19. Discuss the training schedule for the TBO.

20. How is performance measured for the sales consultants? What feedback are employees given about their performance (how often, what format, ...)?
21. Need a copy of sales consultant evaluation (generic). Would like access to 1995 and 1996 employee evaluations.
22. How is performance measured for the coaches?
23. How is performance measured for the manager?
24. Have there been any seasonality effects noted in the productivity measures?
25. Discuss any changes in the performance measurement system that will accompany the TBO approach.
26. Discuss any changes in the incentive or bonus systems that will be implemented with the TBO approach.
27. Has any cost/benefit analysis been done for this project or similar projects?
28. Data that are available re: 1995 performance, and control variables.

**Protocol for Field Visit: 6/27 & 28, 1996**

**Questions for control group manager**

1. Are there existing teams (e.g. High Rollers, Dream Team, etc.)?
2. How can the survey response rate be increased?
3. What do the sales consultants know about TBO?
4. When will this office convert to TBO?
5. Could individual TIPS data for 1996 be made available?
6. In what ways is this office fundamentally different than other *Telecomm* RSSCs? Are there any differences between this group and the treatment group?

**Questions for treatment group manager**

1. Is TBO training still on schedule?
2. What are the visible effects of TBO in the RSSCs?
3. Are any frustrations evident among the employees or the managers?

**Data needed:**

1. See 1996 Sales Data Sheets.
2. TIPS data for 1996 by sales consultant and monthly by office.
3. Control group 1995 Agent Performance Reports (received 4,5,6,7).
4. Control group 1995 Adherence Reports (received 4,6,7 and a combined 4/5).
5. Control group monthly SMARTS data.
6. Agent Performance Reports (# calls, avg. duration) for all offices.
7. Adherence Reports (Sch. Open, Closed Sch. Open, Tot. Adh) for all offices.

**Protocol for field visit: 8/28/96**

1. Attend meeting of corporate TBO implementation group. Present an overview of my dissertation study.
2. Meet with Telecomm human resources consultants to discuss measurements and data collection.
3. Meet with human resources VP to outline study.
4. Sit in on TBO office committee meeting at treatment group office.
5. Collect data.

**Protocol for field visit: 10/3/96**

1. Meeting with *Telecomm* consumer services President and directors. Present basics of dissertation research and preliminary findings. Also at meeting - director of TBO for *Telecomm*, managers of treatment and control groups, human resources consultant, and TBO office committee.
2. Collect data.

**Protocol for field visit: 1/14 & 15, 1997**

1. Administer Work Attitude Survey in treatment and control groups.
2. Administer Changes in Work Roles survey in treatment groups.
3. Interview managers of both the treatment and control groups.
4. Meet with sales consultants in control group.
5. Conduct focus groups.
6. Collect data. Resolve data issues.

## **Appendix C**

### **Exhibits**

Exhibit C-1. ACL test of non-parallelism

Exhibit C-2. ACL test of parallelism

Exhibit C-3. ACL equivalent data patterns

Exhibit C-4. BRDG test of non-parallelism

Exhibit C-5. PRODUCTS test of non-parallelism

Exhibit C-6. PRODUCTS test of parallelism

Exhibit C-7. STRREV test of non-parallelism

Exhibit C-8. STRREV test of parallelism

Exhibit C-9. STRREV equivalent data patterns

## Exhibit C-1. ACL test of non-parallelism.

### General Linear Models Procedure

Dependent Variable: ACL964Q

| Source          | DF  | Sum of Squares | Mean Square  | F Value | Pr > F |
|-----------------|-----|----------------|--------------|---------|--------|
| Model           | 3   | 560.54574131   | 186.84858044 | 114.80  | 0.0001 |
| Error           | 103 | 167.64063186   | 1.62757895   |         |        |
| Corrected Total | 106 | 728.18637317   |              |         |        |

| R-Square | C.V.     | Root MSE  | ACL964Q Mean |
|----------|----------|-----------|--------------|
| 0.769783 | 16.30383 | 1.2757660 | 7.8249481    |

| Source     | DF | Type I SS    | Mean Square  | F Value | Pr > F |
|------------|----|--------------|--------------|---------|--------|
| ACL954Q    | 1  | 559.62062777 | 559.62062777 | 343.84  | 0.0001 |
| TC         | 1  | 0.16572754   | 0.16572754   | 0.10    | 0.7503 |
| ACL954Q*TC | 1  | 0.75938600   | 0.75938600   | 0.47    | 0.4961 |

| Source     | DF | Type III SS  | Mean Square  | F Value | Pr > F |
|------------|----|--------------|--------------|---------|--------|
| ACL954Q    | 1  | 525.82798762 | 525.82798762 | 323.07  | 0.0001 |
| TC         | 1  | 0.91526293   | 0.91526293   | 0.56    | 0.4550 |
| ACL954Q*TC | 1  | 0.75938600   | 0.75938600   | 0.47    | 0.4961 |

| Parameter  | Estimate        | T for H0:<br>Parameter=0 | Pr >  T | Std Error of<br>Estimate |
|------------|-----------------|--------------------------|---------|--------------------------|
| INTERCEPT  | 0.8760720209 B  | 1.66                     | 0.0995  | 0.52710542               |
| ACL954Q    | 0.9711615107 B  | 12.93                    | 0.0001  | 0.07513129               |
| TC         | 0.6001082610 B  | 0.75                     | 0.4550  | 0.80025372               |
|            | 0.0000000000 B  | .                        | .       | .                        |
| ACL954Q*TC | -0.0711103151 B | -0.68                    | 0.4961  | 0.10410518               |
|            | 0.0000000000 B  | .                        | .       | .                        |

## Exhibit C-2. ACL test of parallelism.

### General Linear Models Procedure

Dependent Variable: ACL964Q

| Source          | DF       | Sum of Squares | Mean Square  | F Value      | Pr > F |
|-----------------|----------|----------------|--------------|--------------|--------|
| Model           | 2        | 559.78635531   | 279.89317765 | 172.86       | 0.0001 |
| Error           | 104      | 168.40001786   | 1.61923094   |              |        |
| Corrected Total | 106      | 728.18637317   |              |              |        |
|                 | R-Square | C.V.           | Root MSE     | ACL964Q Mean |        |
|                 | 0.768740 | 16.26196       | 1.2724901    | 7.8249481    |        |

| Source  | DF | Type I SS    | Mean Square  | F Value | Pr > F |
|---------|----|--------------|--------------|---------|--------|
| ACL954Q | 1  | 559.62062777 | 559.62062777 | 345.61  | 0.0001 |
| TC      | 1  | 0.16572754   | 0.16572754   | 0.10    | 0.7497 |

| Source  | DF | Type III SS  | Mean Square  | F Value | Pr > F |
|---------|----|--------------|--------------|---------|--------|
| ACL954Q | 1  | 525.07565858 | 525.07565858 | 324.27  | 0.0001 |
| TC      | 1  | 0.16572754   | 0.16572754   | 0.10    | 0.7497 |

| Parameter | Estimate        | T for H0:<br>Parameter=0 | Pr >  T | Std Error of<br>Estimate |
|-----------|-----------------|--------------------------|---------|--------------------------|
| INTERCEPT | 1.124293175 B   | 2.95                     | 0.0039  | 0.38083686               |
| ACL954Q   | 0.934125036     | 18.01                    | 0.0001  | 0.05187385               |
| TC        | 1 0.083631331 B | 0.32                     | 0.7497  | 0.26141233               |
|           | 2 0.000000000 B | .                        | .       | .                        |

### Exhibit C-3. ACL equivalent data patterns.

General Linear Models Procedure

Number of observations in data set = 107

Dependent Variable: ACL964Q

| Source          | DF  | Sum of Squares | Mean Square  | F Value | Pr > F |
|-----------------|-----|----------------|--------------|---------|--------|
| Model           | 1   | 559.62062777   | 559.62062777 | 348.59  | 0.0001 |
| Error           | 105 | 168.56574540   | 1.60538805   |         |        |
| Corrected Total | 106 | 728.18637317   |              |         |        |

| R-Square | C.V.     | Root MSE  | ACL964Q Mean |
|----------|----------|-----------|--------------|
| 0.768513 | 16.19230 | 1.2670391 | 7.8249481    |

| Source  | DF | Type I SS    | Mean Square  | F Value | Pr > F |
|---------|----|--------------|--------------|---------|--------|
| ACL954Q | 1  | 559.62062777 | 559.62062777 | 348.59  | 0.0001 |

| Source  | DF | Type III SS  | Mean Square  | F Value | Pr > F |
|---------|----|--------------|--------------|---------|--------|
| ACL954Q | 1  | 559.62062777 | 559.62062777 | 348.59  | 0.0001 |

| Parameter | Estimate    | T for H0:<br>Parameter=0 | Pr >  T | Std Error of<br>Estimate |
|-----------|-------------|--------------------------|---------|--------------------------|
| INTERCEPT | 1.128031271 | 2.98                     | 0.0036  | 0.37902695               |
| ACL954Q   | 0.937980363 | 18.67                    | 0.0001  | 0.05023853               |

### Exhibit C-4. BRDG test of non-parallelism.

#### General Linear Models Procedure

Dependent Variable: BRDG964Q

| Source          | DF       | Sum of Squares | Mean Square | F Value       | Pr > F |
|-----------------|----------|----------------|-------------|---------------|--------|
| Model           | 3        | 0.17561655     | 0.05853885  | 11.67         | 0.0001 |
| Error           | 103      | 0.51685832     | 0.00501804  |               |        |
| Corrected Total | 106      | 0.69247486     |             |               |        |
|                 | R-Square | C.V.           | Root MSE    | BRDG964Q Mean |        |
|                 | 0.253607 | 18.97676       | 0.0708381   | 0.3732889     |        |

| Source      | DF | Type I SS  | Mean Square | F Value | Pr > F |
|-------------|----|------------|-------------|---------|--------|
| BRDG954Q    | 1  | 0.03809628 | 0.03809628  | 7.59    | 0.0069 |
| TC          | 1  | 0.06211810 | 0.06211810  | 12.38   | 0.0006 |
| BRDG954Q*TC | 1  | 0.07540217 | 0.07540217  | 15.03   | 0.0002 |

| Source      | DF | Type III SS | Mean Square | F Value | Pr > F |
|-------------|----|-------------|-------------|---------|--------|
| BRDG954Q    | 1  | 0.09636028  | 0.09636028  | 19.20   | 0.0001 |
| TC          | 1  | 0.04701688  | 0.04701688  | 9.37    | 0.0028 |
| BRDG954Q*TC | 1  | 0.07540217  | 0.07540217  | 15.03   | 0.0002 |

| Parameter   | Estimate       | T for H0:<br>Parameter=0 | Pr >  T | Std Error of<br>Estimate |
|-------------|----------------|--------------------------|---------|--------------------------|
| INTERCEPT   | 0.3374083823 B | 11.19                    | 0.0001  | 0.03015204               |
| BRDG954Q    | 0.0552237512 B | 0.57                     | 0.5697  | 0.09681887               |
| TC          | 1              | -.2089084852 B           | -3.06   | 0.06824900               |
|             | 2              | 0.0000000000 B           | .       | .                        |
| BRDG954Q*TC | 1              | 0.8465680995 B           | 3.88    | 0.21839220               |
|             | 2              | 0.0000000000 B           | .       | .                        |

### Exhibit C-5. PRODUCTS test of non-parallelism.

#### General Linear Models Procedure

Dependent Variable: PROD964Q

| Source          | DF  | Sum of Squares | Mean Square | F Value | Pr > F |
|-----------------|-----|----------------|-------------|---------|--------|
| Model           | 3   | 17.29846441    | 5.76615480  | 5.17    | 0.0023 |
| Error           | 103 | 114.87132523   | 1.11525558  |         |        |
| Corrected Total | 106 | 132.16978964   |             |         |        |

| R-Square | C.V.     | Root MSE  | PROD964Q Mean |
|----------|----------|-----------|---------------|
| 0.130881 | 23.04002 | 1.0560566 | 4.5835742     |

| Source      | DF | Type I SS   | Mean Square | F Value | Pr > F |
|-------------|----|-------------|-------------|---------|--------|
| PROD954Q    | 1  | 10.85824967 | 10.85824967 | 9.74    | 0.0023 |
| TC          | 1  | 4.43544132  | 4.43544132  | 3.98    | 0.0488 |
| PROD954Q*TC | 1  | 2.00477342  | 2.00477342  | 1.80    | 0.1830 |

| Source      | DF | Type III SS | Mean Square | F Value | Pr > F |
|-------------|----|-------------|-------------|---------|--------|
| PROD954Q    | 1  | 12.30586652 | 12.30586652 | 11.03   | 0.0012 |
| TC          | 1  | 0.70738618  | 0.70738618  | 0.63    | 0.4276 |
| PROD954Q*TC | 1  | 2.00477342  | 2.00477342  | 1.80    | 0.1830 |

| Parameter   | Estimate       | T for H0:<br>Parameter=0 | Pr >  T | Std Error of<br>Estimate |
|-------------|----------------|--------------------------|---------|--------------------------|
| INTERCEPT   | 3.623671843 B  | 7.87                     | 0.0001  | 0.46053986               |
| PROD954Q    | 0.237452769 B  | 1.79                     | 0.0758  | 0.13237310               |
| TC          | -0.669099039 B | -0.80                    | 0.4276  | 0.84013547               |
|             | 0.000000000 B  | .                        | .       | .                        |
| PROD954Q*TC | 0.321412920 B  | 1.34                     | 0.1830  | 0.23972752               |
|             | 0.000000000 B  | .                        | .       | .                        |

### Exhibit C-6. PRODUCTS test of parallelism.

#### General Linear Models Procedure

Dependent Variable: PROD964Q

| Source          | DF  | Sum of Squares | Mean Square | F Value | Pr > F |
|-----------------|-----|----------------|-------------|---------|--------|
| Model           | 2   | 15.29369099    | 7.64684550  | 6.80    | 0.0017 |
| Error           | 104 | 116.87609865   | 1.12380864  |         |        |
| Corrected Total | 106 | 132.16978964   |             |         |        |

| R-Square | C.V.     | Root MSE  | PROD964Q Mean |
|----------|----------|-----------|---------------|
| 0.115712 | 23.12820 | 1.0600984 | 4.5835742     |

| Source   | DF | Type I SS   | Mean Square | F Value | Pr > F |
|----------|----|-------------|-------------|---------|--------|
| PROD954Q | 1  | 10.85824967 | 10.85824967 | 9.66    | 0.0024 |
| TC       | 1  | 4.43544132  | 4.43544132  | 3.95    | 0.0496 |

| Source   | DF | Type III SS | Mean Square | F Value | Pr > F |
|----------|----|-------------|-------------|---------|--------|
| PROD954Q | 1  | 10.30371220 | 10.30371220 | 9.17    | 0.0031 |
| TC       | 1  | 4.43544132  | 4.43544132  | 3.95    | 0.0496 |

| Parameter | Estimate      | T for H0:<br>Parameter=0 | Pr >  T | Std Error of<br>Estimate |
|-----------|---------------|--------------------------|---------|--------------------------|
| INTERCEPT | 3.296371362 B | 8.41                     | 0.0001  | 0.39201091               |
| PROD954Q  | 0.335452986   | 3.03                     | 0.0031  | 0.11078501               |
| TC        | 0.421141499 B | 1.99                     | 0.0496  | 0.21198533               |
|           | 2             | 0.000000000 B            | .       | .                        |

### Exhibit C-7. STREVE test of non-parallelism.

#### General Linear Models Procedure

Dependent Variable: STR964Q

| Source          | DF  | Sum of Squares | Mean Square  | F Value | Pr > F |
|-----------------|-----|----------------|--------------|---------|--------|
| Model           | 3   | 466.06860836   | 155.35620279 | 9.61    | 0.0001 |
| Error           | 103 | 1664.45007863  | 16.15970950  |         |        |
| Corrected Total | 106 | 2130.51868699  |              |         |        |

| R-Square | C.V.     | Root MSE  | STR964Q Mean |
|----------|----------|-----------|--------------|
| 0.218758 | 10.68454 | 4.0199141 | 37.623666    |

| Source     | DF | Type I SS    | Mean Square  | F Value | Pr > F |
|------------|----|--------------|--------------|---------|--------|
| STR954Q    | 1  | 446.54339412 | 446.54339412 | 27.63   | 0.0001 |
| TC         | 1  | 17.92360002  | 17.92360002  | 1.11    | 0.2947 |
| STR954Q*TC | 1  | 1.60161422   | 1.60161422   | 0.10    | 0.7535 |

| Source     | DF | Type III SS  | Mean Square  | F Value | Pr > F |
|------------|----|--------------|--------------|---------|--------|
| STR954Q    | 1  | 340.87483715 | 340.87483715 | 21.09   | 0.0001 |
| TC         | 1  | 0.33678674   | 0.33678674   | 0.02    | 0.8855 |
| STR954Q*TC | 1  | 1.60161422   | 1.60161422   | 0.10    | 0.7535 |

| Parameter  | Estimate      | T for H0:<br>Parameter=0 | Pr >  T | Std Error of<br>Estimate |
|------------|---------------|--------------------------|---------|--------------------------|
| INTERCEPT  | 26.60227100 B | 10.09                    | 0.0001  | 2.63764996               |
| STR954Q    | 0.27567642 B  | 4.01                     | 0.0001  | 0.06871965               |
| TC         | -0.74857905 B | -0.14                    | 0.8855  | 5.18533653               |
|            | 0.00000000 B  | .                        | .       | .                        |
| STR954Q*TC | 0.04057417 B  | 0.31                     | 0.7535  | 0.12888057               |
|            | 0.00000000 B  | .                        | .       | .                        |

### Exhibit C-8. STRREV test of parallelism.

#### General Linear Models Procedure

Dependent Variable: STR964Q

| Source          | DF  | Sum of Squares | Mean Square  | F Value | Pr > F |
|-----------------|-----|----------------|--------------|---------|--------|
| Model           | 2   | 464.46699414   | 232.23349707 | 14.50   | 0.0001 |
| Error           | 104 | 1666.05169285  | 16.01972782  |         |        |
| Corrected Total | 106 | 2130.51868699  |              |         |        |

| R-Square | C.V.     | Root MSE  | STR964Q Mean |
|----------|----------|-----------|--------------|
| 0.218007 | 10.63816 | 4.0024652 | 37.623666    |

| Source  | DF | Type I SS    | Mean Square  | F Value | Pr > F |
|---------|----|--------------|--------------|---------|--------|
| STR954Q | 1  | 446.54339412 | 446.54339412 | 27.87   | 0.0001 |
| TC      | 1  | 17.92360002  | 17.92360002  | 1.12    | 0.2926 |

| Source  | DF | Type III SS  | Mean Square  | F Value | Pr > F |
|---------|----|--------------|--------------|---------|--------|
| STR954Q | 1  | 394.41152751 | 394.41152751 | 24.62   | 0.0001 |
| TC      | 1  | 17.92360002  | 17.92360002  | 1.12    | 0.2926 |

| Parameter | Estimate      | T for H0:<br>Parameter=0 | Pr >  T | Std Error of<br>Estimate |
|-----------|---------------|--------------------------|---------|--------------------------|
| INTERCEPT | 26.16724897 B | 11.70                    | 0.0001  | 2.23697698               |
| STR954Q   | 0.28721193    | 4.96                     | 0.0001  | 0.05788356               |
| TC        | 1             | 0.86333920 B             | 1.06    | 0.81619965               |
|           | 2             | 0.00000000 B             | .       | .                        |

**Exhibit C-9. STRREV equivalent data patterns.**

General Linear Models Procedure

Number of observations in data set = 107

Dependent Variable: STR964Q

| Source          | DF  | Sum of Squares | Mean Square  | F Value | Pr > F |
|-----------------|-----|----------------|--------------|---------|--------|
| Model           | 1   | 446.54339412   | 446.54339412 | 27.84   | 0.0001 |
| Error           | 105 | 1683.97529287  | 16.03785993  |         |        |
| Corrected Total | 106 | 2130.51868699  |              |         |        |

| R-Square | C.V.     | Root MSE  | STR964Q Mean |
|----------|----------|-----------|--------------|
| 0.209594 | 10.64418 | 4.0047297 | 37.623666    |

| Source  | DF | Type I SS    | Mean Square  | F Value | Pr > F |
|---------|----|--------------|--------------|---------|--------|
| STR954Q | 1  | 446.54339412 | 446.54339412 | 27.84   | 0.0001 |

| Source  | DF | Type III SS  | Mean Square  | F Value | Pr > F |
|---------|----|--------------|--------------|---------|--------|
| STR954Q | 1  | 446.54339412 | 446.54339412 | 27.84   | 0.0001 |

| Parameter | Estimate    | T for H0:<br>Parameter=0 | Pr >  T | Std Error of<br>Estimate |
|-----------|-------------|--------------------------|---------|--------------------------|
| INTERCEPT | 26.01583262 | 11.65                    | 0.0001  | 2.23365511               |
| STR954Q   | 0.29944368  | 5.28                     | 0.0001  | 0.05674878               |

## **Appendix D**

### **Figures**

Figure D-1. ACL test of non-parallelism

Figure D-2. ACL test of parallelism

Figure D-3. PRODUCTS test of non-parallelism

Figure D-4. STRREV test of non-parallelism

Figure D-5. STRREV test of parallelism

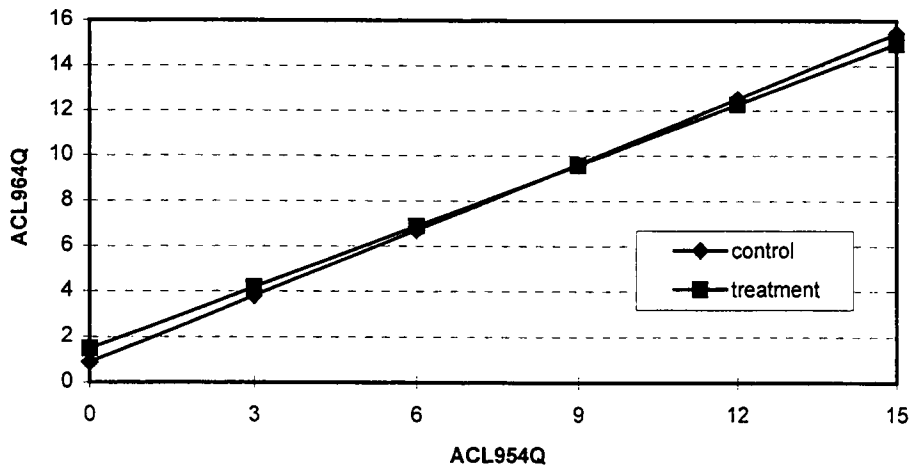


Figure D-1. ACL test of non-parallelism.

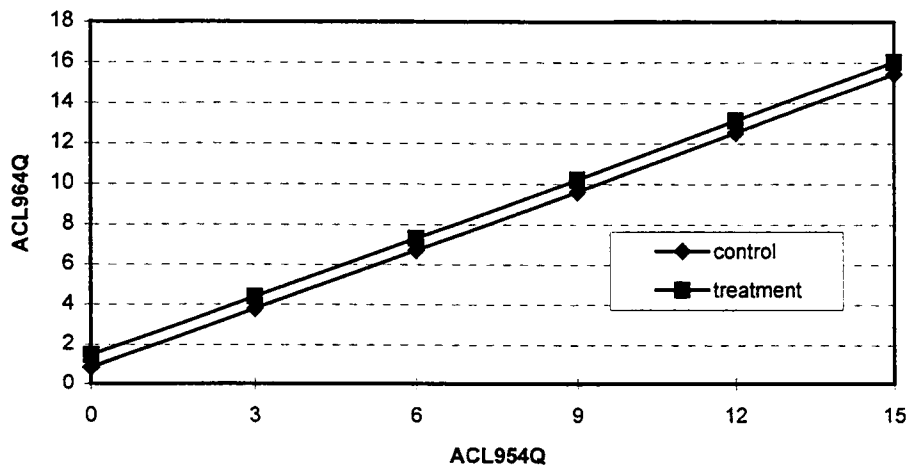
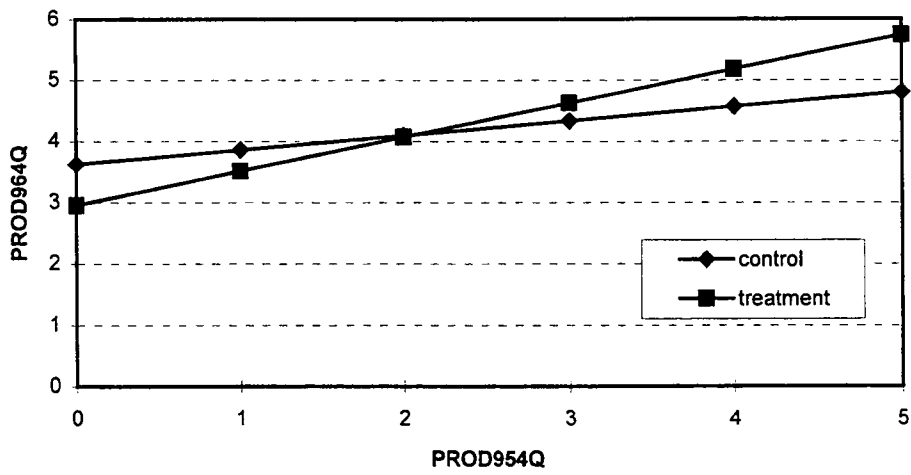


Figure D-2. ACL test of parallelism.



**Figure D-3. PRODUCTS test of non-parallelism.**

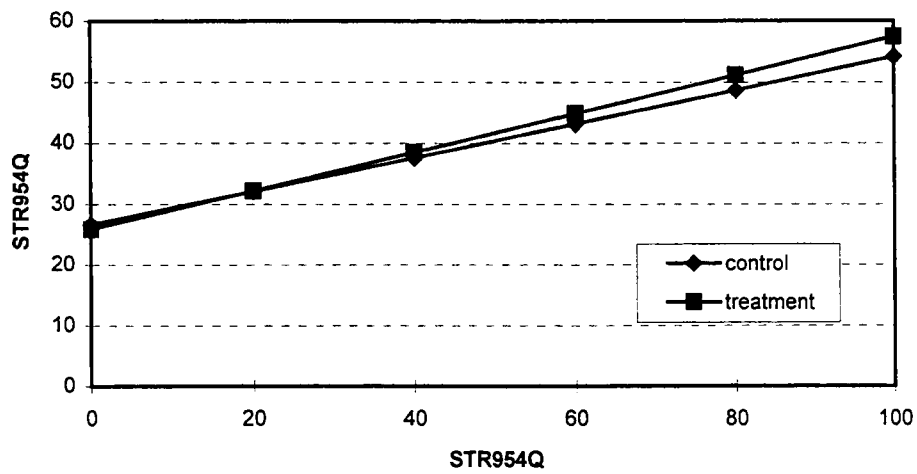


Figure D-4. STRREV test of non-parallelism.

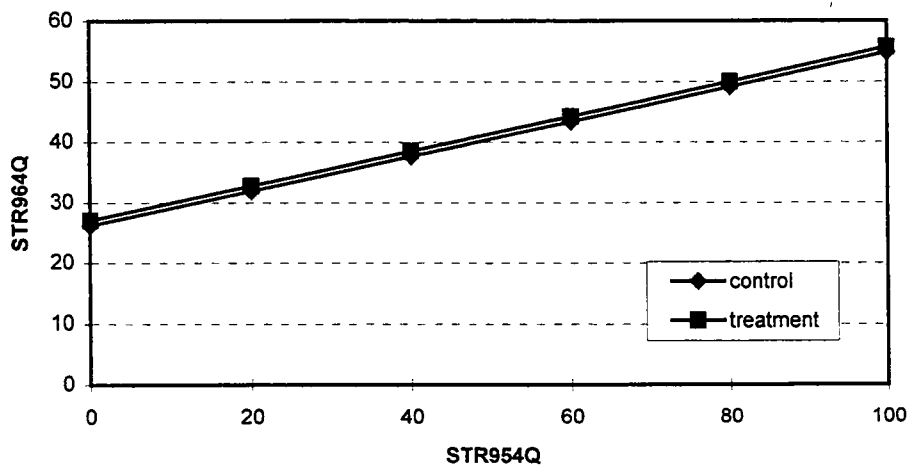


Figure D-5. STRREV test of parallelism.

## **Appendix E**

### **Survey Instruments**

E-1. Work Attitudes Survey

E-2. Changes in Work Roles Survey

## E-1. Work Attitudes Survey.

To: *Telecomm* RSSC Sales Consultants

As part of a research project at the University of Tennessee, I am asking you to complete the attached survey. The purpose of the survey is to measure your opinions and attitudes as you move through the TBO process. By measuring your opinions now, and again at a later date, I hope to be able to evaluate changes in employee attitudes over time.

Your participation in this survey project is voluntary -- you are not required to fill out the survey. However, I hope you will provide me with help on this project. The usefulness of the data depends on getting as many people as possible to respond.

There is no risk to you in completing this survey -- your responses will be anonymous, and all individual responses to this survey will be kept strictly confidential. The completed survey instruments will be kept at the University of Tennessee, where the survey data will be processed by computer and summarized in statistical form. The summarized results will be communicated to *Telecomm* management and to RSSC employees at the conclusion of this project.

Please answer each question as best as you can by circling a response to the right of the question. There are no right or wrong answers. If a question does not seem applicable to you or if you would rather not answer it, leave it blank and go on to the next question. At the end of the survey, you will be asked to supply some demographic data, including the first 5 letters of your mother's maiden name. I am asking for this information so that I can statistically compare your answers on this survey with your answers on a second survey that you will be given next year.

If you have any questions about this survey, please contact me at the following address or phone number:

Priscilla Wisner  
637 Stokely Management Center  
University of Tennessee  
Knoxville, TN 37996  
(423) 974-2551

If you prefer to return the survey instrument directly, please send it to the above address.

**Thank you very much for your cooperation in this research project.**

Required informed consent statement: By completing and returning this survey instrument, you are agreeing to let me use your responses in my research analysis. Again, all survey responses are anonymous, and will be kept confidential by the researchers at the University of Tennessee.

### **Work Attitudes Survey Items:**

I have a lot of variety in my job.<sup>1</sup>

I feel as though my work is something which is not trivial, but is really worthwhile.<sup>1</sup>

I am satisfied with the amount of responsibility I am given.<sup>1</sup>

I am recognized for doing good work.<sup>1</sup>

The feedback I receive about my job performance helps me to do a better job.<sup>1</sup>

**E-1. Work Attitude Survey, continued.**

- I have a lot of opportunities to use my abilities.<sup>1</sup>
- Attention is paid to suggestions I make.<sup>1</sup>
- I am free to choose my own method of working.<sup>1</sup>
- I am willing to put in a great deal of effort beyond that normally expected in order to help *Telecomm* succeed.
- The goals and objectives for my job are clear.
- It often seems like I have too much work for one person to do.
- I am given an opportunity to offer my input in decisions that affect my job.
- I talk up *Telecomm* to my friends as a great organization to work for.
- I am certain about what my job responsibilities are.
- There is free and informal communication between coaches and employees in the RSSC.
- The performance standards for my job are too high.
- I am satisfied with the amount of job security that I have.
- I feel that I am really part of a team.<sup>3</sup>
- I find that my values and RSSC values are very similar.
- I know exactly what is expected of me on my job.
- Generally speaking, I am very satisfied with my job.<sup>2</sup>
- My input is solicited regarding issues which affect my job.
- I am satisfied with the amount of personal growth and development I get in my job.
- I am generally satisfied with the kind of work I do in my job.
- I am not given enough time to do what is expected of me on my job.
- Managers keep employees informed about plans for the future.
- I am satisfied with the amount of independent thought and action I can exercise in my job.
- The evaluation of my performance on the team is fair and accurate.
- I make innovative suggestions to improve my team's work.
- I orient or train new team members even though it isn't required of me.
- I am satisfied with the way my performance on the team is evaluated.
- I am given performance feedback in a timely manner.
- The members of my team get along well together.<sup>3</sup>
- The members of my team will readily defend each other from criticism by outsiders.<sup>3</sup>
- I look forward to being with the members of my team each day.<sup>3</sup>
- I find that I generally do not get along with the other members of my team.<sup>3</sup>
- I enjoy belonging to this team because I am friends with many group members.<sup>3</sup>
- The team which I belong to is a close one.<sup>3</sup>
- All in all, I am satisfied with my job.<sup>2</sup>

**Demographic Information:**

Gender (Male, Female): \_\_\_\_\_  
First 5 letters of mother's maiden name: \_\_\_\_\_  
Length of service with *Telecomm*: \_\_\_\_\_ years, \_\_\_\_\_ months  
Length of service as a sales consultant: \_\_\_\_\_ years, \_\_\_\_\_ months

- 1 - Warr, Cook, and Wall subscale.
- 2 - Self-report sub-scale.
- 3 - Dobbins and Zaccaro subscale.

## **Appendix E-2. Changes in Work Roles Survey.**

### **Since I began working on my TBO team at *Telecomm* ....**

- ....I have a better understanding of how to increase customer satisfaction.
- ....I am held more accountable for my productivity.
- ....I receive less recognition for the work I do.
- ....I am responsible for maintaining team productivity levels.
- ....I am responsible for backing-up by teammates in their TBO roles.
- ....I enjoy my work more now.
- ....The members of my TBO team cooperate better to get the job done.
- ....I have a clear understanding of my TBO team role.
- ....I am more involved in decisions that effect my work.
- ....I feel more encouraged to come up with new and better ways of doing things.
- ....I am more willing to put forth extra effort toward my job.
- ....I am more confused about my job duties.
- ....Interactions with my coach are more adult-to-adult.
- ....The team coach helps my TBO team to meet team goals.
- ....I am better able to handle my work load.
- ....My TBO team role helps me to be a better sales consultant.
- ....I feel more empowered to achieve team goals.
- ....I feel less satisfied with my job.

## VITA

Priscilla Wisner Linderman was born on October 23, 1956 in Baltimore, Maryland. She attended schools in the Baltimore County Public School system, and graduated from Randallstown High School in 1974. In 1978, Ms. Linderman received her B.A. in International Economics from The George Washington University in Washington, DC. She then worked for the next 12 years in the fields of business management and consulting. In 1990 Ms. Linderman enrolled at Cornell University in Ithaca, NY., where she received her Master of Business Administration degree in May 1992. After working as a systems consultant for a year, she enrolled at the University of Tennessee-Knoxville to pursue a Doctor of Philosophy degree in Business Administration. At the University of Tennessee she has concentrated in Management Accounting, with Industrial Engineering as a supporting area. The doctoral degree was received August 1997. Ms. Linderman is a member of the American Accounting Association, the Institute of Management Accountants, the American Society for Quality Control, and Phi Kappa Phi.

Ms. Linderman married Jim Linderman of Knoxville, Tennessee in March 1997.