A Longitudinal Analysis of the Impact of Service Changes on Customer Attitudes

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ABSTRACT

This study develops a longitudinal model of the effect of a service change on customer attitudes about service quality. The model is estimated with data from a field experiment with three survey waves. Service changes are found to strongly influence customer evaluations of service quality through their effect on customer perceptions of current performance and disconfirmation. The effect of disconfirmation is larger, and the effect of prior attitudes is smaller, directly after the service change compared with a subsequent time period.

In recent years, many large companies have implemented quality measurement programs that attempt to relate customer evaluations of quality to product / service attributes (Hauser and Clausing 1988). In service industries, companies frequently employ surveys that elicit customer evaluations of the service offering, plus information about customers' recent service experiences (e.g., Andrews et al. 1987). This information is used to identify potential service improvements and predict their effect on customer satisfaction and/or attitudes, as well as to evaluate the organizational units providing the service.

The purpose of this paper is to investigate how customers' evaluations of service quality are influenced by changes in service offerings. It examines questions such as the following: How can a company assess the effect of a potential service improvement on customer attitudes? How do customers' perceptions of changes in current service performance affect their evaluations of service quality? To what extent do prior customer attitudes carryover during a period of service change? In this study, these questions are addressed with a field experiment, in which a significant service change was implemented and a customer panel was repeatedly surveyed.

Unlike earlier research, this study focuses on temporal changes in individual attitudes. Prior research has typically focused on measuring perceived service quality and its underlying dimensions utilizing cross-sectional data (Parasuraman, Zeithaml and Berry 1985; 1988). Since the factors that explain differences among customers' attitudes at a given time may not be the same as the factors that cause change in a given customer's attitudes over time, these studies have not explored how perceived service quality is affected by changes in service offerings. Based on the customer satisfaction literature (Anderson 1973; Cardozo 1965; Churchill and Surprenant 1981; Oliver 1980a; Olshavsky and Miller 1972; Swan and Combs 1976), this paper develops a theoretical model of attitude change for service offerings. The model is operationalized with panel data from an experiment with three survey waves. The results are used to analyze the effects of a service change on customer attitudes about service quality.

The following section develops a theoretical model of attitude change for services. The next section describes how the model can be formulated as a statistical model, operationalized, and estimated with generalized least squares (GLS). Then, the field experiment and longitudinal survey data are described. The remaining sections discuss the results.

A MODEL OF ATTITUDE CHANGE FOR SERVICES

Researchers distinguish between two constructs: customer satisfaction and attitude. Customer satisfaction refers to a customer's evaluation of a specific transaction. In contrast, a customer's attitude corresponds to a global evaluation of the product/service, rather than to an evaluation of a specific transaction (Olshavsky 1985; Holbrook and Corfman 1985). Consequently, Oliver (1981) argues that satisfaction eventually becomes an input to a less dynamic attitude. However, the distinction between customer satisfaction and attitude becomes rather blurred for frequently or continuously provided services (e.g., utilities services), particularly when changes in the service offering are subtle (Bolton and Drew 1988; 1989). This section develops a general model of satisfaction and attitudes towards services, and discusses the appropriate model specification for a continuously provided service, namely local telephone service.

Modeling Customer Satisfaction and Attitude Change

Customer Satisfaction. Satisfaction is a customer's post-purchase evaluation of a product/service offering (Hunt 1977). A customer is satisfied when an offering performs better than expected, and dissatisfied when expectations exceed performance. Customer satisfaction / dissatisfaction (CS/D) is typically modeled as a function of disconfirmation, arising from discrepancies between prior expectations and actual performance (Cardozo 1965; Oliver 1980a; Olshavsky and Miller 1972; Olson and Dover 1976). Thus, a simple model of the antecedents of customer satisfaction with a service offering can be expressed algebraically as follows.

(1) $$CS/D_t = f\ (\ DISCONFIRM_t, PERFORM_t, EXPECT_{t-1}\ )\ .$$

In words, a customer's satisfaction / dissatisfaction with a service offering at time t (CS/D_t) depends on his current perceptions of performance ($PERFORM_t$), prior expectations about performance ($EXPECT_{t-1}$), and perceptions of the discrepancy between these two constructs ($DISCONFIRM_t$).

Customer Attitudes. Attitude is the customer's global evaluation of a product/service offering. Recent research in services marketing has focused on customers' evaluations of the overall excellence or superiority of a service -- that is, evaluations of service quality (Parasuraman, Zeithaml and Berry 1985; 1988; Zeithaml 1988) -- but there is little research concerning temporal changes in attitudes towards services. Adaptation level theory provides a useful framework for explaining these changes (Oliver 1980b; 1981). It postulates that prior experience with a phenomenon provides an anchor for subsequent judgments, and that exposure to stimuli above / below the adaptation level modifies these judgments

(Helson 1964). Thus, a simple model of a customer's attitude concerning a service can be expressed algebraically as follows.

(2) $$\text{ATTITUDE}_t = g\ (\text{CS/D}_t, \text{ATTITUDE}_{t-1})\ .$$

In words, a customer's attitude about a service offering at time t (ATTITUDE_t) depends on his prior attitude (ATTITUDE_{t-1}), mediated by his satisfaction / dissatisfaction with current service (CS/D_t).

Equation (2) is consistent with the revised Howard and Sheth model (Howard 1974; Howard and Sheth 1969), in which a customer's satisfaction with a brand forms a feedback loop to subsequent attitudes and purchase intentions. For example, in their longitudinal study of consecutive purchase behavior in five product classes, LaBarbera and Mazursky (1983) modeled repeat purchase intentions as a function of prior intentions and customer satisfaction. It is also consistent with a Bayesian framework in which the customer makes a posterior probability assessment concerning service based on current information and a prior.

General Model. Substituting equation (1) into equation (2),

(3) $$\text{ATTITUDE}_t = h\ (\text{DISCONFIRM}_t, \text{PERFORM}_t, \text{EXPECT}_{t-1}, \text{ATTITUDE}_{t-1}).$$

In words, a customer's attitude about a service depends on his prior attitude, modified by his perceptions of current performance, his prior expectations about performance, and the discrepancy between his expectations and subsequent perceptions. A traditional practice is to treat the simple difference in attitude (e.g. ATTITUDE_2 - ATTITUDE_1) as the dependent variable (i.e., requiring that the coefficient of ATTITUDE_{t-1} equal one). However, there is no compelling reason for this restriction.

Modeling Attitude Change for Local Telephone Service

Recent research demonstrates that disconfirmation, expectations, and actual performance levels have independent effects on customer satisfaction -- and the effects are different for different products. For example, Churchill and Surprenant (1982) find that CS/D with a non-durable good is a function of expectations, performance evaluations and disconfirmation; whereas CS/D with a durable good is only a function of performance evaluations. In his discussion of modes of satisfaction, Oliver (1989) proposes that customer responses concerning continuously provided services or long lasting durables are characterized by passive expectations, and that disconfirmation will not operate unless service changes occur that are outside the range of experience based norms. Since telephone service is a continuing service, these notions suggest that customer responses concerning telephone service should only be affected by performance evaluations. The following paragraphs discuss whether expectations, performance evaluations and disconfirmation should have independent, additive effects on customer satisfaction and attitudes about local telephone service quality.

Disconfirmation. Local telephone service is different from many other products/services because it is usually regulated, so that prices are not free to fluctuate, and the service has no direct competitor in franchised areas. Since it has a long history as a stable, well-established, near-universal service, most customers have a very clear idea -- based on prior experience -- of what constitutes traditional telephone service. Customers' evaluations of services which they perceive to have clear and distinct attributes may decrease when an attribute deteriorates. For example, customers' satisfaction with local telephone service may suffer when the company drops free telephone repair (as occurred during deregulation) or when the customer moves from one local franchise to another. Consequently, a customer's satisfaction towards local telephone service should depend on (favorable or unfavorable) disconfirmation of anticipated performance levels only when a service change occurs that is outside the range of experience based norms.

Performance. Since telephone service provision and usage is continuous, a customer can easily form an assessment of performance, and it is readily available for incorporation into an evaluation of satisfaction. Hence, current performance levels should have a direct effect on customer satisfaction, as well as an indirect effect via disconfirmation.

Expectations. In the CS/D paradigm, expectations are typically defined as anticipated or predicted levels of product/service performance formed by advertising, word-of-mouth, or past experience (e.g., Miller 1977; Swan and Trawick 1980; Barbeau 1985). Exploratory research concerning customer expectations about telephone service confirmed Oliver's (1989) notion that expectations about a continuing service are not actively processed. Specifically, concurrent verbal protocols collected during in-depth interviews with 50 telephone company customers yielded many speech segments about their perceptions of current performance, but not about their expectations. Perhaps customers do not explicitly conceptualize expectations about service because telephone service is characterized by its stability. Hence, this model postulates that a customer's satisfaction with local telephone service will not be directly affected by expectations (but only indirectly through disconfirmation).

Telephone Service Model. This study models customer attitudes about telephone service quality after a change that is outside the range of their prior experience. Accordingly, disconfirmation may operate (when the service change is observed), but expectations should be passive (because customers cannot anticipate the change). Hence, a customer's attitude about telephone service is hypothesized to depend on his prior attitude, modified by perceptions of current performance and disconfirmation. Excluding expectations from equation (3),

$$\text{ATTITUDE}_t = k\,(\,\text{DISCONFIRM}_t, \text{PERFORM}_t, \text{ATTITUDE}_{t-1}\,)\ . \tag{4}$$

Equation (4) is a reduced form model that characterizes attitude change for local telephone service.

AN EXPERIMENTAL MANIPULATION OF SERVICE ATTRIBUTES

Panel data are required to estimate the attitude change model for local telephone service that was developed in the preceding section. Furthermore, it is desirable to obtain experimentally generated data because customer attitudes tend to exhibit little variability over time in naturally occurring situations (where service offerings are stable). Unlike prior longitudinal studies of customer satisfaction, this study utilizes panel data from a field experiment rather than a laboratory experiment. The data are from a field experiment conducted as part of GTE's customer satisfaction program. This section describes the program, the field experiment, and the operationalization of the model.

GTE's Customer Satisfaction Program

GTE, like most franchised suppliers of local telephone service, regularly surveys its customers to identify potential service enhancements, to evaluate the effect of enhancements, and to meet public utilities commission requirements. In these surveys, the customer's recent telephone experiences are probed, his/her ratings of various service process attributes are reported, and overall service quality and value assessments are obtained. Analyses of these data indicated that voice transmission quality (i.e., lack of noise) was the key determinant of customer satisfaction and attitude. Network monitoring devices indicated that crackling static was associated with aged transmission equipment, particularly in rural areas. Hence, company management systematically implemented a program of network upgrades to decrease telephone line noise and increase customer ratings of local telephone service.

The Field Experiment

A field experiment was devised to test of the effect of a network upgrade program on residential customers' ratings. The program entailed specifying standards for residential loops (lying between the telephone company's central office and the customer's premises), and then making engineering and operational changes (e.g., replacing deficient cable, monitoring systems) to meet these standards. Since customers could not be randomly assigned to treatment groups, a quasi-experimental design was employed. The test took place at four small sites served by the same central office. Two test and two control sites were matched to be similar with respect to their physical plant. The network upgrade program was implemented at the (slightly smaller) test sites, and the control sites were given the usual levels of service.

The network upgrade program involved construction activities that were visible to each household in the two test sites. A flyer was delivered to each household on the day that construction activities began at the residence. Since the experimental program included changes to physical plant (i.e., construction activities) over a somewhat lengthy implementation period, customers could observe temporary disruptions in service during the change period, as well as long term improvements in voice transmission quality. Customers at all four sites were surveyed by telephone at three different points in time: approximately six months before the beginning of the network upgrade activities, approximately one month after the end of the network upgrade activities, and six months after that time. For the first wave, the interviewing firm attempted to contact every household. At subsequent waves, the firm attempted to re-interview the same person. This design avoids the high inter-person variability historically found in these types of surveys.

The interviewing firm contacted 216 households during the first wave of interviews. During the second wave, it was able to contact *the same person* in 140 (65%) of the households. During the third wave, it was able to contact *the same person* in 120 (56%) of the 216 households. (If the interviewing firm had not been required to contact the same person for all three waves, the drop out rate between waves would have been much lower.) Since one individual refused to complete the interview, this procedure yielded 119 respondents that completed the interview for all three waves. Cooperation rates were roughly equivalent at the control and test sites. The same interview questionnaire was used during each wave.

Model Operationalization

In the longitudinal survey, the customer's attitude about service quality was measured by his evaluation of the overall quality of *all* services provided by the local telephone company ($QUALITY_t$). Local telephone services include billing, repair, directory and toll assistance, and service order (i.e., service installation or change) processing, as well as the quality of local calls. The question was phrased in the following way: "How would you rate the overall quality of services provided by your local telephone company? Would you say (1) Poor, . . ., (5) Excellent?"

The customer's overall perception of current performance was measured by the customer's rating of local calls ($LOCAL_t$) -- that is, call connection and voice transmission services. Since disconfirmation should be closely tied to customers' prior experiences with local telephone service, it was measured with two questions that elicit comparisons of current and past service: a comparison of the customer's current service with service six months ago ($CHANGE_t$), and the customer's self-report of whether he has ever lived in a non-GTE serving area (GTE-ONLY). Perceptions of improved service compared with six months ago (i.e., favorable disconfirmation) should be associated with more positive attitudes. Customers that have experienced service from a non-GTE provider may perceive a GTE service to be better, worse or the same. However, if customers *systematically* perceive that the service provided by GTE is better (or worse) than the service provided in non-GTE areas, then their prior experience is an additional source of favorable (or unfavorable) disconfirmation, and it will have an effect on their attitudes about overall telephone service.

Operationalizing equation (4), an algebraic expression for the customer's attitude concerning local telephone service is the following (for t=2, 3).

(5) $$QUALITY_t = b_0 + d_1\, QUALITY_{t-1} + b_1\, CHANGE_t + b_2\, \text{GTE-ONLY} + b_3\, LOCAL_t + e_{1t} \;.$$

The $QUALITY_2$ equation describes customers' attitudes directly after the implementation of the network upgrades and associated service disruptions. The $QUALITY_3$ equation describes customers' attitudes under stable "improved service conditions," six months later.

A second equation was specified to establish an explicit linkage between the service change (i.e., the network upgrades to substantially reduce local telephone line noise or $STATIC_t$) and customers' assessments of current performance ($LOCAL_t$) and overall service quality ($QUALITY_t$). In the tradition of multi-attribute models, it was hypothesized that a customer's rating of local calls would depend on his perceptions of the presence/absence of trouble with voice transmission (STATIC), dial tone provision (DIAL), call connection (CONNECT) and call completion (CUTOFF). These constructs were measured by indicator variables that take on the value "one" when the customer reported trouble in the past 30 days.

(6) $$LOCAL_t = c_0 + c_1\, STATIC_t + c_2\, DIAL_t + c_3\, CONNECT_t + c_4\, CUTOFF_t + e_{2t} \;.$$

Equations (5) and (6) do not explicitly include a variable that indicates whether the customer resides in a treated area (i.e., where network upgrades took place). However, $CHANGE_t$ and the determinants of $LOCAL_t$ are a function of the network upgrade activities (i.e., the treatment variable), so an explicit treatment indicator is not necessary.

PRELIMINARY ANALYSES

Seventy-five customers at the control sites and 44 customers at the test sites responded to all three waves of the survey. Descriptive statistics are displayed in Table 1. A correlation matrix is displayed in Table 2. Average ratings at the test site were relatively stable, but they showed a common pattern across waves. Perceived static ($STATIC_t$) increased in the treated areas from the first to second wave, and then decreased from the second to the third wave. Performance ratings ($LOCAL_t$) decreased in the treated areas from the first to second wave, and then increased from the second to the third wave. $QUALITY_t$ ratings almost exactly parallel this movement.

Tables 1 and 2 here

Individual customer ratings exhibited considerable variability across waves. Twenty-five to 55% of the respondents changed their ratings from one wave to the next -- at both the test ***and*** control sites. The turnover in customer ratings of $CHANGE_t$ was higher at the test sites than at the control sites. The percentage of respondents noting an improvement at the test sites is 27% for the second wave (i.e., post construction) versus 16% for the first wave, whereas the percentages at the control sites were roughly equal (10%) for both waves.

To investigate customers' perceptions of static, the following model was estimated: $STAT_t = a + b\ STAT_{t-1} + c\ TEST$, where: TEST is a dummy variable that takes on the value one when the customer lives at a test site. For t=2, the coefficient "c" in this equation was positive and statistically significant ($p < 0.15$), indicating that the percentage of respondents perceiving static during the second wave significantly ***increased*** at the test sites relative to the control sites after controlling for initial static levels ($p < 0.15$). For t=3 (six months later), the percentage of customers perceiving static ***decreased*** at both the test and control sites. The decrease in the percentage reporting static is larger at the test site than the control site, but it is not statistically significant ($p > 0.15$). Hence, customers at the test sites perceived greater increases in static directly after the network upgrades and all customers perceived decreases in static six months later.

In contrast, average customer ratings of $CHANGE_t$ increased across the three waves -- and the magnitude of the increase was larger at the test sites. To investigate customers' perceptions of change, the following model was estimated: $CHANGE_t = a + b\ CHANGE_{t-1} + c\ TEST$. For t=2, the $CHANGE_t$ rating *increased* at the test sites relative to the control sites after controlling for initial levels ($p < 0.10$). During the third wave, the $CHANGE_t$ rating increased at the test sites relative to the control sites after controlling for initial levels, but this difference between treatment groups is not statistically significant ($p > 0.15$). In summary, more customers at the test sites noticed changes in service after the network upgrades.

In summary, the service change did not simply increase respondents' ratings at the test sites while ratings stayed constant at the control sites. The measures of disconfirmation experiences ($CHANGE_t$) and perceptions of current performance ($LOCAL_t$ and $STATIC_t$) were most sensitive to the effects of the service change. The preliminary analyses indicated that the network upgrades at the test sites affected the percentage of customers reporting static ($STATIC_t$) and the reported levels of disconfirmation ($CHANGE_t$). Hence, it can be inferred that the experimental manipulation succeeded. Furthermore, GTE's internal monitoring indicated that construction activities affected voice transmission quality.

MODEL ESTIMATION AND RESULTS

This section investigates the long run effect of the service change on customer satisfaction and attitudes. It describes the model estimation and results for the 119 customers that responded to all three waves of the survey. The results for equations (5) and (6) at t=2 and t=3 are substantively the same if the model estimation and results include those customers who did not respond to all three waves.

Estimation

There are four equations: equation (5) for t=2 and t=3, and equation (6) for t=2 and t=3. The appropriate estimation procedure depends upon the error structure of these equations. It seems likely that the measurement error associated with an individual customer's attitudes about service quality will be correlated across waves. Hence, instrumental variables were formed for the lagged variables, $QUALITY_{t-1}$, in equation (5). Since $QUALITY_t$ and $LOCAL_t$ are measured on different scales, it is assumed that their measurement errors are uncorrelated for a given time period. However, the results reported in this paper would not change substantively if this assumption was relaxed and an instrumental variable created for $LOCAL_t$ as well. The attitude models for t=2 and t=3 (i.e., equation (5)) were estimated with GLS and the performance models for t=2 and t=3 (i.e., equation (6)) were estimated with OLS (Johnston 1972).

The models fit the data reasonably well, and the hypothesis that each vector of coefficients was equal to zero was rejected at $p < 0.005$. The estimated coefficients are displayed in Table 3. In general, the coefficients are statistically significant ($p < 0.05$) and their signs are consistent with prior theory. The hypothesis that the vectors of coefficients for waves two and three are equal was rejected ($p < 0.10$). This result implies that customers' attitude formation process is affected by the service change.

Table 3 here

Results

Disconfirmation. In the $QUALITY_2$ equation, the estimated coefficient of $CHANGE_2$ is statistically significant ($p < 0.05$). This result supports the hypothesis that a favorable disconfirmation experience (i.e., perceived improvement in telephone service) has a positive effect on customer attitudes. In addition, it was hypothesized that there would be systematic differences in the attitudes of subscribers who had lived in non-GTE serving areas compared with those who had not, due to differences in their disconfirmation experiences. However, the estimated coefficient of GTE-ONLY (t=2) is not significant ($p > 0.15$). One possible explanation for this finding is that subscribers who have experienced service from other providers do not have systematically different disconfirmation experiences.

In the $QUALITY_3$ equation, the effects of the two disconfirmation variables ($CHANGE_3$ and GTE-ONLY) on attitude are not statistically significant ($p > 0.15$). (Note, however, that the coefficient of $CHANGE_2$ and $CHANGE_3$ are similar in sign and magnitude.) Apparently, the impact of disconfirmation on customer satisfaction and attitude is effective during the time period during which the service changes took place (between the first and second waves), and not subsequently. This result is particularly interesting; it indicates that the effect of disconfirmation (via satisfaction) on attitude decays with the passage of time.

Performance. In both $QUALITY_t$ equations (t=2, 3), the largest coefficient estimates belong to the performance rating item ($LOCAL_t$). Thus, customer perceptions of current performance seem to have the largest impact on customer satisfaction and attitude. In particular, the effects of current performance are much larger than the effects of disconfirmation. This finding is not surprising because customers' perceptions of current performance are based on their experience with continuously provided local dial service. It is also consistent with Churchill and Surprenant's (1981) finding for a durable good.

In the $LOCAL_t$ equations, customers' perceptions of performance are modeled as a function of their perceptions of service attributes. Both equations (t=2, 3) indicate that customers' perceptions of performance are dominated by their perceptions of noisy voice transmission ($STATIC_t$). Customer perceptions of performance are also influenced by connection and cut-off problems ($CONNECT_t$ and $CUTOFF_t$), but the effects of these variables are smaller. The virtual elimination of cutoff problems in the treated areas after construction may account for the drop in $CUTOFF_t$ coefficients from t=2 to t=3. Obtaining a dial tone is a very reliable event in U.S. systems, so the small coefficients of $DIAL_t$ are not surprising.

Prior Attitudes. In both $QUALITY_t$ equations (t=2, 3), the coefficient estimate for the lagged $QUALITY_t$ variable is significantly different from zero ($p < 0.005$). This result supports the hypothesis that current attitudes are influenced by prior attitudes. Since the coefficient of the lagged quality variable is less than one, customers seem to be less influenced by the prior attitudes than a simple difference model (that restricts the coefficient of the lagged $QUALITY_t$ variable to be equal to one) would postulate. Consistent with this notion, this coefficient is smaller at t=2 than at t=3, implying that the impact of prior attitudes is smaller during the interval in which the service change took place (between the first and second waves).

Construction activities. Customers could observe temporary disruptions in service (i.e., construction activities) during the change period, as well as decreased static and improvements in voice transmission quality (i.e., favorable disconfirmation). The hypothesis that the disruption, as well as the reduction in static, affected customers' attitudes can be tested by adding a dummy variable that represents the treatment (i.e., the network upgrade at the test site) to equation (5) for t=2. The coefficient of this variable represents the effect of the treatment on customer attitude *beyond* the effects of disconfirmation and perceived performance captured by the coefficients of $CHANGE_t$ and $LOCAL_t$. When this model is estimated, the coefficient of the dummy variable is not statistically significant ($p > 0.15$). This result implies that the construction activities did not directly affect customers' attitudes.

CONCLUSIONS

Prior research has been based on cross-sectional surveys of customers for whom service is quite stable. In contrast, our longitudinal model provides useful insights about how customers perceptions of changes in service performance affect their global evaluations of service quality. These findings should generalize to other continuously provided services (e.g., cable television, utilities, banking, transportation services).

One of the key implications of this study is that changes over time in *individual* customer's ratings of the *components* of service quality are sensitive to the effects of a service change. In contrast, average ratings of perceived service quality are very stable and change slowly so that the effects of a service change will only become visible in the long run. At GTE, management has an increased awareness that customer attitudes have a large carryover component, and that service changes will not result in *immediate* improvements in the customers' global evaluations of our service offerings. Consequently, models of the effect of the service change on individual customer's ratings must be used to predict the *long run* effects of the service change on average ratings of overall quality.

As expected, attitudes are strongly affected by current performance ratings and, to a lesser extent, by disconfirmation. In contrast with prior research, the field experiment indicates that the effect of disconfirmation is relatively transitory. Furthermore, customers' current attitudes depend heavily on their prior attitudes, but the effect of prior attitudes is smaller immediately after the service change than six months later. Hence, attitudes seem to depend more heavily on perceptions of current performance and disconfirmation during the actual service change period than in periods of no change. This surprising finding emphasizes the importance of disentangling short run and long run effects of service changes on customer attitudes.

Service changes can be complicated by long implementation periods during which some service disruptions will inevitably occur. The longitudinal model suggests that these disruptions will affect perceptions and ratings for some time. Since customers' perceptions of current performance and disconfirmation carryover, it is not simple to identify improvements that will unequivocally enhance customer perceptions of service offerings. The experimental implementation of potential service improvements, followed by resurveying of the affected customers, forms a straightforward customer-service provider feedback loop that has the potential to foster continuous service improvements. GTE's use of a field experiment within their customer satisfaction program illustrates this notion of a customer feedback loop.

TABLE 1

Descriptive Statistics

I. Means

Control Sites	Wave One	Wave Two	Wave Three
QUALITY	3.96	4.03	4.01
LOCAL	3.09	3.08	3.21
CHANGE	3.05	3.13	3.20
STATIC	0.40	0.36	0.31
Test Sites			
QUALITY	3.82	3.98	3.80
LOCAL	3.18	3.00	3.14
CHANGE	3.20	3.41	3.89
STATIC	0.43	0.50	0.36

II. Turnover Statistics

Control Sites	Wave One to Wave Two	Wave Two to Wave Three
QUALITY	0.45	0.44
LOCAL	0.55	0.43
CHANGE	0.20	0.29
STATIC	0.25	0.29
Test Sites		
QUALITY	0.50	0.55
LOCAL	0.41	0.52
CHANGE	0.34	0.34
STATIC	0.34	0.32

TABLE 2

Correlation Matrix

	Quality (t=1)	Change (t=2)	GTE-Only	Local (t=2)	Quality (t=2)	Change (t=3)	Local (t=3)	Quality (t=3)
Quality (t=1)	+1.00	-0.07	-0.04	+0.42[a]	+0.52[a]	-0.06	+0.29	+0.42[a]
Change (t=2)		+1.00	+0.07	+0.22[b]	+0.24[a]	+0.45[a]	-0.02	+0.12
GTE-Only			+1.00	-0.03	+0.03	-0.03	-0.23[b]	-0.21[b]
Local (t=2)				+1.00	+0.65[a]	-0.19[b]	+0.29[a]	+0.35[a]
Quality (t=2)					+1.00	-0.05	+0.26[b]	+0.41[a]
Change (t=3)						+1.00	+0.17[c]	+0.18[b]
Local (t=3)							+1.00	+0.59[a]
Quality (t=3)								+1.00

[a] Two tailed test, $p < 0.005$.
[b] Two tailed test, $p < 0.01$.
[c] Two tailed test, $p < 0.05$.

TABLE 3

Estimates of Model Coefficients

QUALITY Equation

	Wave Two	Wave Three
QUALITY$_{t-1}$	0.2912[a]	0.3575[a]
CHANGE$_t$	0.1618[c]	0.1358
GTE-ONLY	0.0769	-0.1749
LOCAL$_t$	0.5555[a]	0.5528[a]
Intercept	0.6110	0.3894
System Weighted R^2	0.42[a]	

LOCAL Equation

	Wave Two	Wave Three
STATIC$_t$	-0.6523[a]	-0.6245[a]
CONNECT$_t$	-0.2235	-0.3348[a]
DIAL$_t$	-0.3114	-0.1501
CUTOFF$_t$	-0.5690[c]	0.3134
Intercept	3.4544[a]	3.4871[a]
F Statistic	14.33[a]	13.80[a]
R^2	0.33	0.32

[a] Two tailed test, $p < 0.005$.

[b] Two tailed test, $p < 0.01$.
[c] Two tailed test, $p < 0.05$.

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