FACTORS INFLUENCING CUSTOMERS' ASSESSMENTS OF SERVICE QUALITY AND THEIR INVOCATION OF A SERVICE WARRANTY

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ABSTRACT

This study makes a first effort to understand the factors affecting customers' decisions to invoke warranties, and to distinguish this behavior from the factors affecting customer perceptions of service quality. The study context is GTE's introduction of a warranty program as part of a telecommunications repair service for small business customers. The results suggest that customer perceptions of the service and the decision to invoke the service warranty depend on customers' attributions about the service failure and their perceived control of the service process -- as represented by specific service attributes.

For repair service, the customer's decision to invoke the warranty is strongly influenced by the severity of the service failure, the amount of time that elapsed between when the failure was reported and when it was resolved, and his/her causal attributions about the failure. Although these variables do not have a similar effect on the overall perceived quality of repair service, they are related to two underlying dimensions of service quality: reliability and responsiveness. For example, customer perceptions of responsiveness are influenced by the amount of time between when the problem was reported and when the first repair attempt was made. More extreme service attributes are required to result in warranty invocation rather than more negative perceptions of the service.

EXECUTIVE SUMMARY

Increasingly, companies in a variety of industries are offering warranties on their products. A warranty is a promise by the firm to correct a product failure that takes place during a specified time period. It is also a competitive marketing tool. Warranties can be used to communicate information about the underlying quality of a product offering, and to differentiate a firm's offering from competitive offerings. In markets where customers cannot distinguish between high and low quality offerings, companies can use warranties as a pre-purchase signal of quality. Prior research has confirmed that warranties are accurate signals of the reliability of goods, and that warranties influence customer perceptions of goods. This paper examines customers' response to service warranties.

A customer's invocation of a warranty implies a failure by the firm to deliver an acceptable quality level in its service offering. The invocation of a warranty is a form of customer complaining behavior -- that is, a behavioral response triggered by a dissatisfactory purchase episode. However, a warranty makes an explicit promise about the nature of the seller's efforts at redress that may affect customers' expectations and assessments of service quality. Hence, the factors influencing the invocation of a warranty may be different than the factors affecting other forms of complaining behavior. In particular, warranty invocation seems likely to depend on certain mediating variables, such as customers' attributions about an unexpected service failure and their perceived control over the service process.

This study investigates the factors affecting customers' decisions to invoke service warranties, and distinguishes them from the factors affecting customer perceptions of services. The study context is GTE's pilot of a warranty program for a telecommunications repair service for small business customers in Beaverton, Oregon. The warranty expressly promised that GTE

would repair any defect in GTE Intralata Network Services or Contracted Premises equipment or the small business customer would receive credit for one month's GTE service charges, up to $500, for each trouble.

The results suggest that customer perceptions of a service and the decision to invoke a service warranty depend on customers' attributions about the service failure and their perceived control of the service process -- as represented by specific service attributes. For repair service, the customer's decision to invoke the warranty is strongly influenced by the severity of the problem, the amount of time that elapsed between when the problem was reported and when it was resolved, and his/her causal attributions about the service failure. Although these variables do not have a similar effect on the overall perceived quality of repair service, they are related to two underlying dimensions of service quality: reliability and responsiveness. For example, customer perceptions of responsiveness are influenced by the amount of time between when the problem was reported and when the first repair attempt was made. Customers' specific repair perceptions -- rather than their assessment of overall service quality -- are influenced by the same service attributes as warranty invocation, and more extreme service attributes are required to result in warranty invocation rather than more negative perceptions of the service.

From a managerial standpoint, the trial was successful because GTE obtained useful information about whether to introduce the warranty program nationwide. The warranty program was actually less costly than anticipated because (1) a smaller percentage of customers invoked the warranty than anticipated and (2) the average amount of the refund was less than expected ($191.55/customer). In 1993, the warranty program was introduced nationwide.

INTRODUCTION

Increasingly, companies in a variety of industries are offering warranties on their products. A warranty is a promise by the firm to correct a product failure that takes place during a specified time period. It is also a competitive marketing tool. Warranties can be used to communicate information about the underlying quality of a product, and to differentiate a firm's offering from competitive offerings (Menezes and Quelch 1990). According to economic signaling theory, in markets where customers cannot distinguish between high and low quality offerings, companies can use warranties as a pre-purchase signal of quality (Akerlof 1970; Grossman 1981; Nelson 1970; Spence 1974). To be credible, warranties must have a "bonding" component -- that is, a company forfeits wealth, investment or reputation if it falsely signals high quality (Ippolito 1990).

Although there are other explanations for the purpose of warranties (Kelley 1988), marketers have been particularly interested in warranties as signals of quality. Weiner (1985) has shown that warranties are accurate signals of reliability for appliances and motor vehicles. Several experiments have confirmed that warranties influence customer perceptions of products. Shimp and Bearden (1982) have shown that warranties can act as a mechanism for reducing customers' perceptions of financial risk. Innis and Unnava's (1991) results indicate that warranties affect customers' evaluations of new brands more strongly than established brands. Boulding and Kirmani (1993) have shown that -- when bond credibility is high -- warranty length and scope affect customer assessments of breakdown likelihood, performance, overall quality and purchase intentions.

This paper investigates the factors affecting customers' decision to invoke a service

warranty. A customer's invocation of a warranty implies a failure by the firm to deliver an acceptable quality level in its service offering. Hence, this paper also investigates the factors affecting customers' assessments of quality of the same service. The study context is the introduction of a warranty program as part of a telecommunications repair service for small business customers.

PERSPECTIVE ON WARRANTIES AND SERVICE QUALITY

The invocation of a warranty is a form of customer complaining behavior -- that is, a behavioral response triggered by a dissatisfactory purchase episode (Bearden and Teel 1983; Oliver 1980; Olshavsky and Miller 1972; Singh 1988). A vast literature on voiced complaints has examined the dual questions of which customers complain and why (c.f., Andreason 1988). A warranty makes an explicit promise about the nature of the seller's efforts at redress that may affect customers' expectations and assessments of service quality. Hence, the factors influencing the invocation of a warranty may be different than the factors affecting other forms of complaining behavior.

Customers' invocation of a warranty implies customer dissatisfaction due to the failure of the firm to deliver an acceptable quality level in its service offering. There are a substantial number of studies that describe the antecedents of customer satisfaction (Holbrook and Corfman 1985; Olshavsky 1985) and perceived service quality (Bolton and Drew 1991; Parasuraman, Zeithaml and Berry 1985), as well as the relationship between the two construct (e.g., Anderson and Sullivan 1992; Cronin and Taylor 1992). However, both customer satisfaction and service quality are considered to depend upon disconfirmation -- that is, the gap or discrepancy between prior expectations and performance. Unfavorable disconfirmation occurs when performance fails

to meet expectations -- and this event may lead to the invocation of the service warranty.

Customers may experience unfavorable disconfirmation, but not invoke the warranty. Warranty invocation seems likely to depend on certain mediating variables, such as customers' attributions about an unexpected service attribute failure (e.g., Bitner 1990; Folkes 1984a; 1984b), their perceived control over the process (Hui and Bateson 1991), their perceptions about the fairness (i.e., equity) of the exchange process (e.g., Hupertz, Arenson and Evans 1978; Oliver and DeSarbo 1988; Oliver and Swan 1989), mood or affect (e.g., Westbrook 1987) and usage frequency and situation (Ram and Jung 1991). Cognitive variables, in turn, will be influenced by service attributes. For example, Hui and Bateson (1991) show that customers' perceived control of the service experience decreases as the density of customers increases.

FIGURE 1 ABOUT HERE

Figure 1 shows a simplified diagram of the antecedents of customers' perceived service quality and their invocation of a warranty. Service attributes (e.g., waiting time) affect cognitive variables such as attributions, perceived control and equity. These variables, in turn,, affect customers' perceived service quality and their invocation of a warranty. (The diagram represents only some of the potential antecedents of these two constructs.) In this study, we examine how service attributes are related to warranty invocation and service quality. However, we do not examine the relationship between warranty invocation and service quality.

THE STUDY CONTEXT

GTE is a franchised supplier of local telephone service to business and residential customers. Local telephone service is actually a bundle of services including local call provision, long distance access, operator services, customer services (e.g., repair, installation and changes),

and billing services. GTE also competes against other companies in the unregulated parts of the telecommunications industry. In particular, it is also a seller of repair services in the competitive marketplace -- that is, the company will make repairs to a customer's equipment -- located at his/her premises -- and so forth for a fee.

Large businesses tend to employ managers that specialize in telecommunications decisions. However, managers in small businesses may have difficulty distinguishing between high and low quality telephone repair service. In 1991, GTE was considering the nationwide introduction of a new warranty program for small business customers. As a reputable, well-established firm in the telecommunications industry, the provision of a warranty could provide a credible signal of repair service quality. In addition, a warranty program could provide GTE with an opportunity to identify itself as a high quality, telecommunications provider. In focus groups, customers responded to the notion of a repair service guarantee with comments such as "Shows commitment to quality service," "They place value on your time" and "It's a promise of a new level of service."

In early 1992, the warranty program was piloted by GTE in Beaverton, Oregon. The warranty expressly promised that GTE would repair any defect in GTE Intralata Network Services or Contracted Premises equipment or the small business customer would receive credit for one month's GTE service charges, up to $500, for each trouble. (For example, customers could potentially invoke the warranty if repairs to centranet provided custom calling services, such as remote call forwarding or personal secretary, or repairs to cables or on-site equipment were unsatisfactory.) GTE service charges included charges for local service, line service, centranet service, and WATS service. The warranty itself was free, and invocation of the

warranty did not imply that the service provider-customer relationship was severed. Awareness of the warranty program was created using bill inserts, direct mail and telemarketing.

The Data Base

After the introduction of the warranty program, GTE assembled a data base from three sources. GTE provided 4872 business customers with repair services during the trial period, and all customers were eligible to invoke the warranty. Repair service records were extracted for each small business customer requesting a repair during January-May 1992. These records included information about the type of problem (including service status), how it was resolved (e.g., repair to wall jack), the duration of each repair, and the time margin by which any commitment time is (or is not) met. Second, a list was generated of all customers who invoked the warranty between January and May, including the date of the invocation.[i] Third, a random sample of 384 customers with repair experiences between February and May were surveyed about their repair experiences. The questionnaire elicited ratings of general and specific (e.g., "How would you rate . . . on meeting repair deadlines?") repair items.

DESCRIPTIVE STATISTICS

Most repairs were "cleared" -- that is, logged as completed in company records -- within 24 hours of notification. Forty customers (0.8%) invoked the warranty. When customers invoked the warranty, they were asked for a reason. Reasons included: GTE employee error (8), missed commitment (12), repair took too long (18) and dissatisfied (2). Since the number of invocations is so small, only a limited number of factors can be incorporated into a model of the invocation decision.

Thirty one percent of the surveyed customers rated the overall quality of

telecommunications excellent, and 43% rated the repair service as excellent. Unfortunately, only one of the 384 surveyed customers had invoked the warranty. Thus, the random sampling procedure (used to administer the survey) lead to the existence of two disjoint data sets. For all 4872 customers, we have repair service records and information about warranty invocation. For the 384 surveyed customers, we have repair service records and survey data -- but virtually no variation on our key dependent variable: warranty invocation. This feature of the data arises from the low incidence of invocation and the fact that there is no way to know -- a priori -- which customers will invoke the warranty.

Forty three percent of the surveyed customers said they were aware that GTE offered a business repair service guarantee. (Clearly, awareness of the warranty program is a necessary, but not sufficient, condition for its invocation.) Respondents reported that they had heard about the warranty program from the following source: a customer service representative (53%), direct mail (35%), co-worker (6%), newspaper (1%) and television (1%). There was some evidence that awareness increased slightly over the trial period. Interestingly, awareness of the warranty program was not statistically related to higher ratings of repair service. However, prior research has suggested that it is difficult to detect the effect of a service change on quality ratings without panel data (e.g., Bolton and Drew 1991).

FACTORS AFFECTING THE INVOCATION OF A WARRANTY

In this section, we develop a model of the factors affecting the customer's decision to invoke the warranty (INVOKE). Specifically, we postulate that customers invoke the warranty when perceived service quality falls below a certain threshold. In earlier work studying residential customers (Bolton and Drew 1994), we had determined that the perceived quality of

telephone repair service is heavily dependent on the customer's degree of control over the repair process and his/her attributions about the repair problem.[ii] Hence, we hypothesized that small business customers' decisions to invoke the service warranty would be affected by similar factors. Both constructs can be related to underlying characteristics of the repair process as described below.

Control

In this study, perceived control of the repair process is considered to decrease as the company's clearing time increases -- that is, as the amount of time that elapses between when the problem is reported and when it is resolved increases. Furthermore, the effect of clearing time was expected to vary depending on the nature of the problem. For example, perceived control is likely to be low when the telephone is "out-of-service" (because the customer cannot make calls from his/her premises) and clearing times are slow. Since the survey does not measure cognitive variables, the customer's perceived control is represented by two variables describing service attributes: a dummy variable that indicates that the telephone was out-of-service (i.e., OOS) and an interaction term. The interaction term was created by multiplying OOS by the actual clearing time -- that is, the time that elapsed between when the OOS problem was reported and when it was resolved (i.e., OOS*TIME). Thus, it is hypothesized that invocation of the warranty is more likely when OOS equals one and as OOS*TIME increases.

Attributions

Customer satisfaction has been shown to depend on attributions about the locus of responsibility for the problem, whether the cause was perceived to be within the company's control, and whether the cause is likely to recur (Bitner 1990). In a repair context, customers are

likely to consider that the company is responsible for certain types of highly visible service failures. Customer station wire defects (CSW) are readily observable by the customer because they occur on the customer's premises. Similarly, physical equipment defects (PHYSICAL), such as a cut drop wire, and plant defects (PLANT), such as damage or aging of telephone company equipment, may be readily observable by the customer -- and customers are likely to consider that the cause was within the control of the telephone company. Thus, attributions are represented by dummy variables representing these three repair causes. It is hypothesized that invocation will be more likely for these causes than for other causes.

Model Estimation

In summary, we model the customer's decision to invoke the warranty as follows:

INVOKE = f (OOS, OOS*TIME, CSW, PHYSICAL, PLANT) . (1)

The dependent variable is nominally scaled; it takes the value one when the customer invokes the warranty and zero otherwise. The functional form of equation was specified to be linear additive. Then, the model was estimated by applying logistic regression procedures to the 4872 observations. The model coefficients are statistically significant. However, rather than display the coefficients, we show selected cross-tabulations of the data (which are more readily interpretable).

Results

Customers are twice as likely to invoke the warranty for out-of-service problems (0.82%) than not out-of-service problems (0.32%). Hence, whether the line is out-of-service or not out-of-service significantly affects whether the repair guarantee is invoked. Furthermore, clearing time is associated with the likelihood of invocation, and the effect is different depending on the

customer's service status. In Table 1, the 4872 repair service observations have been categorized by repair durations and by out-of-service and not out-of-service problems. The cells in the table gives invocation percentages for each combination of repair durations and problems. (Note that the percentages do not sum to one because they are independent observations.) For OOS problems, the likelihood of a guarantee invocation increases as the clearing time increases, abruptly jumping when the time exceeds 24 hours. This effect is statistically significant, and apparently important. Business customers are relatively likely to use the service guarantee as a recourse when their telephones are out-of-service for 24 hours or more. Altogether, these data suggest that customers' invocation of the service warranty is influenced by their perceived control over the repair service.[iii]

TABLE 1 ABOUT HERE

There is statistical evidence customers with CSW troubles are somewhat more likely to invoke the guarantee than those with other types of problem dispositions. However, the relatively high likelihood (3.85%) is based on only two invocations, so the statistical significance is very dependent on the assumed probability models. Similarly, there is some evidence that the invocation likelihood is higher (0.99%) for customers whose problems are physical rather than network-associated. Further, problems with the plant are somewhat more likely (0.72%) to generate an invocation than other problem causes. Both of these observations are based on only two or three invocations, so no strong statements can be made. However, these results together suggest that customers' invocation of the service warranty is influenced by their attributions about the cause of the repair problem.

FACTORS AFFECTING SERVICE QUALITY

In this section, we investigate the factors affecting the business customer's perceived quality of repair service. This construct was measured by the survey item: "Overall, how would you rate the repair service provided . . .? Would you say excellent, . . . poor?" Specifically, we hypothesized that customers' perceived quality (QUALITY) would depend on the same constructs as INVOKE and specified a similar model (i.e., equation (1)). QUALITY was treated as nominally scaled, where the variable is assigned the value one when the rating given is excellent and zero otherwise. The model is postulated to be linear additive and estimated by applying logistic regression procedures to the 384 observations.

Surprisingly, QUALITY is not statistically related to perceived control (as measured by OOS or OOS*TIME). Apparently, since nearly every repair is cleared within 24 hours, there is no fall-off in customer opinion within this set of time intervals. Similarly, QUALITY is not statistically related to attributions (as measured by CSW, PHYSICAL, PLANT and so forth). This finding is perplexing; it implies that customers' assessments of service quality depend on different factors than customers' decisions to invoke the warranty. However, just as invocation of the warranty need not be a manifestation of a general attitude toward repair service, its analog from the satisfaction survey may be more specific than QUALITY. Hence, in the following paragraphs, we examine how attributions and control -- as represented by service attributes -- are related to factors underlying repair service quality dimensions. In particular, we focus on how service attributes are related to "excellent" or "good" ratings of two key service quality dimensions: responsiveness and reliability. Again, the data base is the 384 surveyed customers.

Control

Although QUALITY was not affected by perceived control variables, customer

perceptions of responsiveness were affected by the underlying service attributes. Table 2 shows customers' response to the survey question: "How would you rate . . . on responding quickly to repair requests?" versus clearing time, and versus the time between the repair request and the first repair attempt. The percentage of customers rating "responding quickly" as excellent tends to be higher when repairs are cleared within 24 hours. However, the monotone decrease in "excellent" ratings as attempt time increases suggests that customers are more sensitive to the time from trouble report to first repair attempt than they are to the official clearing time. This interval, then, constitutes responsiveness to the customer, and company records would be somewhat misleading were they to focus exclusively on official clearing times.

TABLE 2 ABOUT HERE

There is also an association between "How would you rate . . . on meeting repair deadlines?" and clearing time. In fact, there are fewer "good" or "excellent" responses to this item as repair durations exceed eight hours (a working day, perhaps) suggest that the repair deadlines business customers consider are those imposed by their own businesses, and not that of the telephone company. Note, then, that this perception becomes dramatically more negative at an earlier point in the repair process than the point at which a warranty invocation abruptly becomes more likely. One might expect this relative positioning in the repair service process because lowered perceptions are less extreme responses than warranty invocation, but also because the loss of control associated with long repair times should first lead to the voicing of displeasure.

Attributions

Although QUALITY was not affected by customer attribution variables, customer

perceptions of reliability were affected by the underlying service attributes. The survey elicits a rating of reliability with the question: "How would you rate the reliability of ... services?" As shown in Table 3, perceptions of service reliability suffer when customers themselves are identified as the problem cause. Rather than agreeing with the company's assessment, the customer views the exchange process as inequitable; he/she may argue that the equipment is too delicately designed for business use. However, customer caused troubles do not generate warranty invocations; perceived equipment fragility is apparently too weakly attributable to company performance to justify use of the guarantee. Similarly, when the cause is designated excluded or tested okay by the company, customers rate reliability lower (as measured by the total of "good" and "excellent" percentages) because the company cannot find a cause for what the customer sees as a real problem.

The customer's ratings on "correcting the problem the first time" are also strongly affected by service attributes associated with causal attributions. In fact, customers' "excellent" ratings show a similar pattern to their ratings of reliability. Failure to correct a problem the first time may be seen as a failure of the reliability of the company's service, rather than as a fault of a specific repair person.

TABLE 3 ABOUT HERE

DISCUSSION

This study makes a first effort to understand the factors affecting customers' decisions to invoke warranties, and to distinguish this behavior from the factors affecting customer perceptions of services. The data suggest that customer perceptions of a service and the decision to invoke a service warranty depend on customers' attributions about the service failure and their

perceived control of the service process -- as represented by specific service attributes. For repair service, the customer's decision to invoke the warranty is strongly influenced by the severity of the problem and the amount of time that elapsed between when the problem was reported and when it was resolved.

Surprisingly, these variables do not have a similar effect on the overall perceived quality of repair service. However, they are related to two underlying dimensions of service quality: reliability and responsiveness. For example, customer perceptions of responsiveness are influenced by the amount of time between when the problem was reported and when the first repair attempt was made. In addition, causal attributions seem to operate differently for warranty invocation than for perceived service quality. It appears, then, that certain specific repair perceptions, and not a general evaluation, are analogous to warranty invocation, and more extreme service attributes are required for warranty invocation than for more negative perceptions of the service. These results imply that -- although many of the same factors may affect invocation of the warranty and perceived quality -- the relative magnitudes of the effects of these factors may be substantially different.

From a managerial standpoint, the trial was successful because GTE obtained useful information about whether to introduce the warranty program nationwide. The warranty program was actually less costly than anticipated because (1) a smaller percentage of customers invoked the warranty than anticipated and (2) the average amount of the refund was less than expected ($191.55/customer). Furthermore, since analysis showed no association between the customer's overall repair evaluation and the company's formal meeting of its commitment deadline, managers inferred that the repair deadlines business customers consider are those imposed by

their own businesses, and not that of the telephone company. It therefore made sense to let the warranty be unconditional, and independent of any formal time commitment the company might give verbally. This decision was implemented in subsequent introductions of the warranty program. After conducting two more pilots of the warranty program to confirm these results, the warranty program was introduced nationwide in 1993. Efforts are underway to introduce similar warranty programs to other customer groups.

CONCLUDING REMARKS

To date, little information has been discovered about the factors contributing to customers' decisions to invoke warranties. This study makes a first attempt to identify these factors. In general, our findings suggest that researchers and managers should be cautious about extrapolating findings about the factors affecting perceived service quality or customer satisfaction to make inferences about customer behavior, such as warranty invocation. In this study, the relative importance of the antecedents of perceived quality and warranty invocation are clearly different; customers' invocation of a warranty is influenced by extreme values of service attributes. It is also possible that additional antecedents influence warranty invocation. For example, customers may be reluctant to invoke a warranty -- despite poor perceived service quality -- due to their perceptions of monetary and non-monetary switching costs and risk. Future research could further investigate how customer assessments (e.g., perceived service quality, satisfaction) differ from customer behavior, and the nature of any intervening factors.

In this study, the percentage of customers invoking the warranty was very low, so that surveying a random sample of customers failed to provide sufficient data for this group. Another study could attempt to survey (retrospectively, if necessary) customers who invoked the warranty,

so that their responses can be compared with customers who did not invoke the warranty. With this design, it would be possible to empirically test whether factors affecting warranty invocation are the same as the factors affecting perceived service quality (by testing whether the vectors of coefficients from the two equations are equal).

A limitation of this study is that the survey did not directly measure cognitive variables such as perceived control and attributions. Instead, these variables were operationalized by surrogate measures of service process attributes (OOS*TIME etc.). As a result, there may be constructs other than perceived control and attributions that explain the relationships between service process attributes and perceived service quality and warranty invocation. For example, these service process attributes may be closely related to business customers' financial outcomes. Hence, a useful extension of this study would investigate the statistical relationships between service process attributes, cognitive variables, customer assessments (e.g., perceived service quality) and customer behavior (e.g., warranty invocation).

There are many other issues concerning warranties that remain to be investigated. For example, in this study, 14 of the 40 customers who invoked the warranty had a re-occurrence of the same trouble. Hence, it could be useful to investigate whether higher levels of perceived quality (as measured by customer survey data) are associated with savings to the company because of decreases in re-work (i.e., repeated visits to the customer premises) and decreases in customers' invocations of the warranty. It would also be crucial to understand how the nature of the warranty, customer assessments of service and customer invocation of the warranty combine to produce either loyalty or exit behavior by individual customers.

This paper has investigated individual customers' responses to a specific service change --

the initiation of a new service guarantee program. However, it does not examine how the introduction of a warranty program influenced aggregate customer purchase behavior, loyalty or defection rates. This issue could be addressed in a cross-sectional study that compares organizational units that offer a warranty program with organizational units that do not.

TABLE 1

Factors Affecting Invocation of A Warranty*

	Invocation Percentage				
Clearing Time Factor	≤ 4 hours	5-8 hours	9-16 hours	17-24 hours	> 24 hours
Out-of-Service	0.37%	1.94%	1.56%	1.18%	7.32%
Not Out-of-Service	0.40%	0.00%	0.00%	0.00%	0.90%

* This table shows the percentage of customers invoking the warranty, classified by clearing time and whether or not service was out.

TABLE 2

Factors Affecting Perceptions of Responsiveness**

Percentage of Respondents Rating "Responding Quickly" as "Excellent"

Time	<4 hours	5-8 hours	9-16 hours	17-24 hours	25-48 hours	> 48 hours
Repair Clearing	50.3%	41.4%	33.3%	44.2%	40.0%	20.0%
Repair Attempt	49.2%	46.7%	40.7%	40.0%	33.3%	0.0%

*Based on less than 5 subjects.

**Total number of observations = 384.

TABLE 3

Factors Affecting Perceptions of Reliability

Service Attribute	Central Office	Customer Premise Equipt	Customer Station Wire	Customer Caused	Excluded	Network Switch	Outside Plant	Tested OK
Percentage Reporting:								
"Excellent" Reliability	27.0	34.1	64.3	31.8	21.3	34.2	26.2	47.1
"Good" Reliability	46.0	50.0	35.7	22.8	52.5	42.1	50.0	23.5
"Excellent" Correcting First	41.9	43.6	81.8	31.8	28.9	46.9	39.5	47.1
"Good" Correcting First	41.9	28.2	10.1	22.8	35.6	28.1	42.1	17.6

** Total number of observations = 384.

REFERENCES

Akerlof, George A. (1970), "The Market for Lemons; Qualitative Uncertainty and the Market Mechanism," Quarterly Journal of Economics, 84, 488-500

Anderson, E. W. and M. Sullivan (1992), " The Antecedents and Consequences of Customer Satisfaction for Firms," Marketing Science, 12 (2), 125-43.

Andreason, Alan R. (1988), "Consumer Complaints and Redress: What We Know and What We Don't Know," in The Frontier of Research in the Consumer Interest, E. Scott Maynes et al, eds., Columbia, MO: American Council on Consumer Interests, 675-722.

Bearden, William O. and Jesse E. Teel (1983), "Selected Determinants of Consumer Satisfaction and Complaint Reports," Journal of Marketing Research, 20 (February), 21-8.

Bitner, M. J. (1990), "Evaluating Service Encounters: The Effects of Physical Surrounding and Employee Responses," Journal of Marketing, 54 (2), 69-82.

Bolton, Ruth N. and James H. Drew (1991), "A Longitudinal Analysis of the Impact of Service Changes on Customer Attitudes," Journal of Marketing, 55 (1), 1-9.

_____ and _____ (1994), "Linking Customer Satisfaction to Service Operations and Outcomes,"in Service Quality: New Directions in Theory and Practice, Roland T. Rust and Richard L. Oliver, eds., Thousand Oaks, CA: Sage Publications, 173-200.

Boulding, William and Amna Kirmani (1993), "A Consumer-Side Experimental Examination of Signaling Theory: Do Consumers Perceive Warranties as Signals of Quality?" Journal of Consumer Research, 20 (June), 111-123.

Cronin, Jr., J. J., and S. A. Taylor (1992), "Measuring Service Quality: A Reexamination and Extension," Journal of Marketing, 56 (3), 55-68.

Folkes, Valerie S. (1984a), "An Attributional Approach to Postpurchase Conflict Between Buyers and Sellers," in Advances in Consumer Research, 11, Thomas C. Kinnear, ed. Ann Arbor, MI: Association for Consumer Research, 500-503.

_____ (1984b), "Consumer Reactions to Product Failure: An Attributional Approach," Journal of Consumer Research, 10 (4), 398-409.

Grossman, Sanford J. (1981), "The Informational Role of Warranties and Private Disclosure About Product Quality," Journal of Law and Economics, 24 (December), 461-483.

Holbrook, M. B. and K. P. Corfman (1985), "Quality and Value in the Consumption Experience: Phaedrus Rides Again," in Perceived Quality, J. Jacoby and J. Olson eds., Lexington, MA: Lexington Books, 31-57.

Hui, M. K. and J. E. G. Bateson (1991), "Perceived Control and the Effects of Crowding and Consumer Choice on the Service Experience," Journal of Consumer Research, 18, 174-184.

Hupertz, J. W., S. J. Arenson and R. H. Evans (1978), " An Application of Equity Theory to Buyer-Seller Exchange Situations," Journal of Marketing Research, 15, 250-60.

Innis, Daniel E. and H. Rao Unnava (1991), "The Usefulness of Product Warranties for Reputable and New Brands," in Advances in Consumer Research, 18, Rebecca H. Holman and Michael R. Solomon eds., Provo, UT: Association for Consumer Research, 317-322.

Ippolito, Pauline M. (1991), "Bonding and Nonbonding Signals of Product Quality," Journal of Business, 63 (1), 41-60.

Kelley, Craig A. (1988), "An Investigation of Consumer Product Warranties as Market Signals

of Product Reliability," Journal of the Academy of Marketing Science, 16 (2), 72-78.

Menezes, Melvyn A. J. and John A. Quelch (1990), "Leverage Your Warranty Program," Sloan Management Review, 31 (Summer), 69-81.

Nelson, Philip (1970), "Information and Consumer Behavior," Journal of Political Economy, 78 (March-April), 311-329.

Oliver, Richard (1980), "A Cognitive Model of the Antecedents and Consequences of Satisfaction Decisions," Journal of Marketing Research," 17, 460-9.

_____ and W. S. DeSarbo (1988), "Response Determinants in Satisfaction Judgments," Journal of Consumer Research, 14, 495-507.

Oliver, R. L. and J. E. Swan (1989), "Equity and Disconfirmation Perceptions as Influences on Merchant and Product Satisfaction," Journal of Consumer Research, 16, 372-383.

Olshavsky, Richard and John A. Miller (1972), "Consumer Expectations, Product Performance and Perceived Product Quality," Journal of Marketing Research 9, 19-21.

Parasuraman, A., V. A. Zeithaml and L. L. Berry (1985), "A Conceptual Model of Service Quality and Its Implications for Future Research," Journal of Marketing, 49 (4), 41-50.

Ram, S. and H. S. Jung (1991), "How Product Usage Influences Customer Satisfaction," Marketing Letters, 2, 403-11.

Shimp, Terence A. and William O. Bearden (1982), "Warranty and Other Extrinsic Cue Effects on Consumers' Risk Perceptions, Journal of Consumer Research, 9 (June), 38-46.

Singh, Jagdip (1988), "Consumer Complaint Intentions and Behavior: Definitional and Taxonomical Issues," Journal of Marketing, 52 (January), 93-107.

Spence, Michael (1974), Market Signaling, Cambridge, MA: Harvard University Press.

Weiner, Johsua Lyle (1985), "Are Warranties Accurate Signals of Product Reliability," Journal of Consumer Research, 12 (September), 245-50.

Westbrook, R. A. (1987), "Product/Consumption-Based Affective Responses and Postpurchase Processes," Journal of Marketing Research, 24, 258-70.

NOTES

i. The dates cited for the invocation database are important to note because they were used to link the invocation with specific records in the internal repair database. In the latter database, a sizable proportion (16.8%) of customers have more than one call to the repair center, and the above date is one way to link a single internal repair record with the other databases. To match survey records to internal repair files, those internal records were chosen which were closest in time to the survey date. For invocation records with no repair or invocation data given, the latest repair record was used.

ii. The transaction cost of invoking the warranty is low (relative to the potential benefits) because the business customer simply calls the repair service representative. Hence, transaction costs do not enter the model. However, this assumption might not be appropriate for residential customers.

iii. A different measure of duration is the number of hours by which the clearing time differs from the commitment time. Although one might expect that meeting or missing commitments would have an important effect on guarantee invocation, the effect is highly correlated with the clearing time effect above, and the clearing time actually shows the greater effect. Further, meeting commitments does nothing to explain the difference between out-of-service problems and not out-of-service problems, for all not out-of-service problems resulting in invocation had their commitments met.