IN THE CUSTOMER'S HANDS: MAKING THE MOST OF USER FEEDBACK

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Customer feedback about products and services is a critical link in AT&T's quality process. This paper describes various approaches to obtaining and using such feedback. These include laboratory assessments, surveys, task analyses, observational studies, and experimental manipulations during pilot trials. The benefits of the feedback have included correcting product design or realization flaws, guiding future product development, validating independently gathered performance data, and providing quality metrics, all with the goal of increasing customer satisfaction. Examples are drawn from experiences with residential telephones, large business systems, and services support tools.

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Introduction

AT&T has made a commitment to high quality and continuous improvement of its products and services. The judges of our success are our customers, who can tell us whether we are achieving our quality objectives. Those customers may be residential or business users; decision makers such as telecommunications managers; or AT&T employees, such as those in in service organizations, who use internally developed support tools in their work. Throughout AT&T, the skills of the behavioral scientist are used not only to design easier-to-use products and services, but also to measure customer response in a methodologically sound way. With ever-faster design cycles, reliable user feedback is a critical link in the quality process for evaluating existing products and services. It provides information that not only can improve current offerings, but also can be used to prevent future defects.

The purpose of this paper is to describe several different approaches to obtaining and interpreting customer feedback. Our intention is that these methodologies may be useful starting points for others with similar needs. The approaches discussed include in-laboratory assessments, structured and open-ended surveys, task analyses, observational studies, and experimental manipulations during pilot trials. Examples are drawn from experiences with residential

Table I. User Perception Tests

Grouping	Test
The customer's experience shopping for a new phone	1. Comparative Features Test
The installation of the set	2. Owner's Manual Evaluation 3. Installation and Operation Test
The quality of day-to-day use	4. Human Engineering Evaluation 5. Speech Quality Test

telephones, large business terminals and switches, and maintenance support tools.

Initial customer feedback can be obtained as soon as there is a product (or a reasonable simulation) to evaluate. Such feedback is valuable in correcting product problems before large scale production and distribution. Examples of early feedback are given in the sections of this paper on user perception testing and product introduction assessment.

Once the product is in general distribution, feedback is focused on performance and customer satisfaction questions. This feedback has a dual focus: the customer's decisions to continue buying AT&T products, and related AT&T internal decisions about product improvements and support tools. Examples of these data-gathering techniques are discussed in the sections on the large-scale customer satisfaction survey, the in-depth reliability/satisfaction study, and field operations feedback.

User Perception Testing

User perception testing is a method to evaluate new products before they come to market. Begun about five years ago with residence telephone products, it aims to ensure that no major design or execution errors have been made, and that the product will meet the customer's expectations of AT&T quality. User perception testing consists of five major tests in three groupings (see Table I). Although the process has been adapted to

business telephone set evaluation, one of the clearest examples of the full methodology can be drawn from the model HT 5300 cordless telephone.

Comparative Features Test. This test, simulating the shopping experience, makes use of a panel of approximately 1,300 consumers from which sample test groups of 25 participants are drawn. Each AT&T product and its competitors are rated by a test group of 25 consumers on a variety of attributes, including style, apparent quality, and appropriate features. Brand identity is obscured to avoid possible bias. The test group participants examine the products (or cosmetically correct models) and complete the ratings, one attribute at a time. Two types of semantic differential rating scales are employed. Most questions use the "excellent-good-fair-poor-very poor" scale familiar from numerous scaling studies. Others use a balanced scale with a midpoint labeled "about right," with two steps away from that point in either direction. For example, handset weight would be rated either "about right" or "somewhat too heavy (light)" or "much too heavy (light)." Mean ratings are calculated and analyzed with a two-way (subject by treatments) analysis of variance.

Specific questions can be added to this test to check the participants' reactions to design decisions. For example, rather than follow the common industry practice of having a sliding switch labeled *talk* and *standby* for switchhook control, the HT 5300 cordless telephone uses two pushbuttons labeled *phone* and *off*. After seeing demonstrations of all sets in the study, participants were asked to rate each for ease of making and receiving calls. The AT&T product was the clear winner.

When *Consumer Reports* published a report on cordless phones in 1986[1], the HT 5300 was omitted because it had been introduced during the evaluation period. However, with a major industry trade show scheduled for early January 1987, it was essential to know how our product would have been rated. To find out, the Comparative Features test was repeated, using the top-rated competitors from the article as the basis for

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comparison. The results indicated that the AT&T product would be a strong competitor, preferred over the other sets for its compact size, style, ease of use, and features. When communicated to prospective buyers at the trade show, this information provided a powerful marketing tool.

Owner's Manual Evaluation. Customers rarely read an owner's manual systematically—i.e., from front to back—but use it for reference, making use of pictures more than text. Thus, a human factors specialist reviews the manual with the aid of a detailed checklist to determine whether it is complete, accurate, and appropriately designed for the kind of use real customers make of it. Both factual and stylistic errors are identified and corrected.

Though the customer instruction booklet for the HT 5300 cordless telephone was found to be generally satisfactory, the evaluation resulted in corrections of minor problems. For example, brief explanations were needed of how to return to a held call, answer a page, and hold an intercom conversation. The purpose of the handset hook—to hold the handset in place when the set is wall-mounted—and the reason for changing channels—to avoid interference—required further clarification.

Human Engineering Evaluation. The expert evaluator scrutinizes the entire user interface design to evaluate every control, display, label, and operating procedure. An extensive checklist is used, developed from human factors handbooks (e.g., Woodson)[2] and from experience in the particular issues of human factors in telephone set design. Design principles extracted from these evaluations are now being documented in a compendium of guidelines. These guidelines will provide developers and evaluators with a standard reference of recommended approaches and accompanying rationales.

Any problems found are classified into two categories:
- *Failures* that must be corrected before the product can be considered ready for market (for example, a display that is not legible from its primary viewing angle)

- *Minor defects* that should be fixed, but might be tolerated if cost or scheduling constraints prevent such changes, and that often are corrected in the next product of the series.

No outright failures were identified in the HT 5300 cordless telephone, but several minor defects were found. The most important of these was relatively low ringer volume. Fortunately, it was possible to modify the chamber where the ringer transducer was mounted. This change increased the acoustic output by 6 decibels (dB). Furthermore, the test resulted in changing the label for the Touch-Tone/Dial Pulse switch from *Mode* to *Dial Mode*, and modifying the software so pressing the channel change button would cause a feedback "beep" only when the channel actually changed. Previously, the "beep" merely signaled a successful button press, although the channel might not have changed.

Installation and Operation Test. This test simulates the experience of customers when they bring the new set home from the store, and is intended to detect major difficulties with installation and use. Experience has shown that six participants suffice. If two or more of the six people tested have the same problem, it is identified as a significant difficulty.

The consumer test group is brought into the laboratory, given a set and owner's manual, and asked to install it and operate its features. An experimenter tracks their behavior closely, noting their errors and confusions. The tracking tool is derived from behavioral checklists commonly used in other branches of observational psychology (e.g., Herson and Bellack)[3]. This test often leads to changes in the owner's manual; occasionally, changes in the design of the product also are required.

Participants in this test of the HT 5300 cordless telephone consistently had difficulty returning to held calls from an intercom conversation. People pressed *standby* to end the intercom call, accidentally hanging up the held call. The model tested used the labels *talk* and *standby* for off-hook and on-hook, respectively. Thus, the problem seemed to be caused by confusion about the

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Table II. Speech Parity Test Rating Scale

1	2	3	4	5	6	7	8	9
Very Poor		Poor		Fair		Good		Excellent
"Wouldn't use a set this bad"								*"Very clear and natural"*

meaning of the labels on the switchhook control buttons. As a result of this finding, a human factors study was conducted to develop better labels, resulting in the choice of *phone* and *off.* The same change of labels solved another problem identified in this test: people often pressed *talk* rather than *intcm* to answer an intercom page from the base. Changing *talk* to *phone* made a clearer distinction between the two in-use states (phone and intercom) of the handset.

Other findings validated the results of the customer instruction booklet evaluation. For example, participants had difficulty understanding the use of the handset hook, and the reasons for changing channels. Frequently, this test also validates the results of the human engineering evaluation.

Speech Quality Test. The essential characteristic of any telephone is how well it receives and transmits human speech. This quality is rated by a sample of 40 consumer participants in a controlled laboratory setting. Simulations of both good (short loop/quiet room) and poor (long loop/noisy room) telephone environments are provided. Ratings are obtained on a 9-point rating scale of the kind commonly used in transmission quality testing[4,5] (see Table II).

Competitors' products are tested with AT&T's. The standard 2500-type AT&T set is always included to remind the participants what an ordinary telephone sounds like. This standard also provides a benchmark to ensure that the subjects in each study are representative, and not significantly skewed in their preferences. The results are analyzed with a two-way analysis of variance with repeated measures.

When the HT 5300 cordless telephone was tested against the best cordless sets on the market as identified by *Consumer Reports*, the results (see below) showed the HT 5300 cordless telephone to be clearly superior to competitive sets. Although received speech quality and sidetone did not significantly differ between the 2500-type and HT 5300 sets, a statistically significant preference was found for the transmitted speech quality of the HT 5300 cordless telephone. The results of such tests—replicated many times—have been used as the necessary evidence to support advertising claims that the HT series offers speech quality equal to that of our corded telephones. Feedback from satisfied consumers and national account purchasers is giving marketplace confirmation of these results (see Table III).

- *Receive* is the sound quality of a voice received by the test telephone through a simulated network connection, originating from a standard 2500 set, as rated by subjects listening to the test phone.
- *Transmit* is the sound quality of a voice transmitted from the set under test, as rated by subjects listening to a 2500 set at the other end of a simulated telephone connection.
- *Sidetone* is the sound quality of the subjects' own voices while speaking on the test telephone, as rated by each subject.

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Table III. Cordless Set Feedback Results

	Speech Quality Dimensions		
	Receive	Transmit	Sidetone
AT&T HT 5300 cordless phone	7.0	7.5	5.9
Competitor A	6.3	6.8	5.1
Competitor B	5.5	5.7	4.6
Competitor C	6.8	6.5	5.8
Standard 2500 (corded)	7.0	6.6	6.5

Product Introduction Assessments

Once the product moves from laboratory to field, different approaches are needed to gather customer feedback. This is especially true in the case of large and complex systems, such as AT&T's private-branch exchange (PBX) products. Evaluation of product introductions requires feedback not only from telecommunications managers, decision-makers—who recommend or authorize equipment purchases—and users, but also from AT&T's internal organizations—such as Marketing—that support product introductions. Such feedback is obtained through a variety of methods, and the results are analyzed for impact on both current and future products.

Method and Procedure. For each planned introduction of a PBX product, there is a formal evaluation process. Customer product introduction sites agree to give evaluation feedback six to eight weeks following installation. The evaluation team—including developers, human factors specialists, product managers, product marketing personnel, and services personnel—uses structured interviews and written questionnaires as tools.

The customer's system administrator is responsible for choosing the survey respondents and interviewees. The administrator has instructions to randomly select representatives of different job responsibilities (e.g., management, clerical), and users of different terminals and adjunct products (e.g., AT&T's AUDIX voice mail system and messaging server). Ten percent of the users (up to a maximum of 200) at any given customer site receive written surveys. A comparable nonredundant group of users receives interviews. The written surveys are mailed directly to the customer site for distribution to the administrator and users prior to the on-site evaluation. Surveys consist of 5-point semantic differential scales (see Green and Tull)[6] in response to questions such as ease of use, ease of learning, feature operation, and training quality. Satisfaction with the present switch, compared with the customer's previous switch, also is assessed. Structured interviews provide supplementary information, offering an opportunity for additional probing of responses.

The full evaluation consists of two phases:

1. The quality of the support processes is assessed from the perspective of AT&T personnel. Interviews are conducted with the sales and services personnel who supported the product introduction. The assessment probes the specific areas of product marketing and provisioning, installation training and materials, manufacturing and shipping, and services and maintenance.

2. The level of customer satisfaction with the product and support processes is assessed. In-depth interviews are conducted at the customer's site with the system administrator and often with the decision maker who signed off on the purchase. As a critical part of this second stage, system users are interviewed. Written surveys are collected for later analysis.

Results. The data obtained from these interviews and surveys are analyzed and documented in a Rapid Feedback Report circulated to all organizations involved with product support. Upper management in the development organization also receives the results. The report provides statistical analyses of the survey data, lists of product problems, and desired enhancements. Mean satisfaction ratings with confidence intervals, simple correlations between variables, one-way and multivariate analyses of variance with Duncan's multiple range test[7], and regression analyses are performed as appropriate. Within a given site, factors such as terminal type and user job responsibility are analyzed. Between sites, overall differences among locations are of greatest interest. Typically, differences within a location can be attributed to problems with specific hardware, software, or feature operations. Between locations, the source of differences is the influence of cutover smoothness or the customer's prior system and telephone sets.

Customer satisfaction with AT&T PBX products is generally high. Customers prefer the new switches to their prior telephone systems. Users who attend training tend to be more satisfied with the new system than those who do not. From regression analyses, we have determined that the best predictor of user satisfaction with the switch is the type of telephone set in use. Users tend to be more satisfied with higher functionality sets. Their responses are more critical when they perceive a loss of features, compared with their prior set.

The evaluation report also identifies the users' most and least liked features. It helps differentiate between problems requiring immediate attention, and desired enhancements that should be evaluated in light of future product release plans. Thus, customer feedback affects the current product prior to its general availability in large quantities, and the future product in its planning stages. For example, user instruction cards for various digital sets were completely redone based on feedback from such trials, and several features of the voice mail system were revised.

When data collection and analysis is completed for all customers associated with a specific product release, cross-analyses of customers can be made to identify predominant requests and problems. Furthermore, the overall customer satisfaction measurement can be compared with previous product releases. In this way, AT&T can monitor improvements in meeting customer needs over the product life cycle. This methodology has been successfully applied to both PBX products and switch-related adjuncts.

In addition to customer feedback, new approaches are being introduced to obtain product quality field results for the development community. These methods will permit more precise monitoring of product performance, feature usage, and maintenance activity. For example, more rigorous technical criteria for product performance in the field—such as numbers of modification requests, trouble tickets, and alarms—will be used during product introductions as determinants of readiness for general availability. Comparison of these data with those obtained from the written surveys and interviews will provide further insight into measurements of customer satisfaction.

Large-Scale Customer Satisfaction Survey

In addition to linking customer feedback to specific events such as introducing new products, ongoing assessment of satisfaction levels can provide important information about the perceived quality of AT&T's products and services. Since 1987, two annual customer satisfaction telephone surveys have been conducted to measure AT&T customers' expectations and satisfaction with the System 75 and System 85 PBX. Customers were asked detailed questions about their overall system; software and hardware performance; system management; messaging; product features; data switching; telephone terminal maintenance and repair; and documentation and training.

Method. In both studies, a random sample of 500 System 75 and 500 System 85 customer sites was used

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for telephone interviewing. The Telephone Research and Analysis Center (TRAC) in Somerset, New Jersey, conducted the telephone interviews. The first 100 completed calls to telecommunications managers of each system (200 total) were used in each year's study. This sample was sufficient to provide results that could be generalized to the System 75 and System 85 PBX population.

The results provide valuable customer feedback. However, care must be taken to avoid interpreting them for types of questions other than those that were asked. Broad topic areas were addressed that allowed a reliable general assessment of status, but only pointed in the direction of specific areas for further detailed inquiry.

Survey development. The survey was originally developed in 1987 through design reviews with System 75 and 85 PBX systems engineering, development, and marketing personnel. Additional help came from the marketing research and customer satisfaction measurement organizations. Modifications were made in 1988 based on 1987 survey results.

Questions/rating scale. Telecommunications managers were asked to answer about 80 questions, using a 5-point rating scale where 5 was "very satisfied" and 1 was "not at all satisfied." Using this scale, any score below 3.5 was considered to be a trouble area. General questions similar to those asked on other customer satisfaction studies were asked in the beginning of the survey to calibrate and compare the survey results with other findings.

Example of Results. Customers were asked to rate the importance of certain parameters in their decision to purchase a PBX, and to rate their satisfaction with AT&T's specific performance against those same parameters. The importance ratings, satisfaction ratings, and difference between them were analyzed to provide an indication of customer satisfaction on parameters weighing heavily on their PBX buying decision.

For example, customers first were asked to rate the importance of upgrades and expandability in their PBX purchase decision. The respondents were then asked to rate their satisfaction with their system's

upgradability and expandability. The mean importance score was 4.42, and the mean satisfaction score was 4.15. These scores indicate that the ability to upgrade and expand a PBX is important in the purchase decision, and that customers are satisfied with their system for its ability to be upgraded and expanded. Statistical comparison of the importance and satisfaction scores indicates a high positive correlation between customers' perceived need for the attributes and their view of how well AT&T delivers those capabilities.

Follow-on Activities. The survey results were used by the development organizations to focus their work plans on areas that customers said needed improvement. Sales and services organizations also used the survey results for establishing activities aimed at improving customer satisfaction with AT&T PBX products. Customers who authorized follow-up contacts participated in additional interviews about documentation and terminal equipment. The large-scale survey has become an annual quality assessment practice, using new random samples each year.

In-Depth Reliability/Satisfaction Study

One offshoot of the survey described above was an in-depth study of customer satisfaction with AT&T's PBX voice terminals. There is increasing emphasis on cost-effective quality metrics that can provide year-to-year comparisons. Thus, both terminal developers and product managers desired a quick, fairly inexpensive, yet reliable, means to get detailed input about customers' expectations and perceptions of terminal performance. For this reason, highly structured discussions were conducted over the telephone by trained interviewers.

Goals. The overall aims of the study were three:
1. To identify key reasons for satisfaction and dissatisfaction with AT&T PBX voice terminals (telephone sets)
2. To obtain subjective estimates of reliability of specific sets
3. To gather input as to "acceptable" reliability rates. Results would validate or challenge objective perfor-

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mance data on sets.

Specific items in the study included:

- Overall satisfaction as a check against the known rating given on the large-scale survey
- Detailed information about problems with AT&T sets
- Customer definitions of quality and reliability
- How AT&T sets measure up to competitors
- Estimates of trouble rates of various kinds.

We also wanted to learn customers' expectations: were they unrealistically demanding—or too forgiving—when evaluating the performance of our equipment?

Method. Sixty telecommunications managers, 30 from System 75 and 30 from System 85, were interviewed. Half of each system's sample had recently acquired our system, while half had systems installed before 1987. The managers were drawn from among the 400 interviewees in the large-scale surveys performed in the fall of 1987 and 1988. They represented a full range of satisfaction levels regarding our sets. That is, one-third reported low satisfaction, one-third moderate, and one-third high satisfaction. This is in sharp distinction to our actual customer satisfaction data, in which we see very few low-satisfaction customers and a preponderance of responses in the high-satisfaction category. The strong over-representation of lower-satisfaction customers was intentional. It stemmed from a wish to obtain the maximum amount of set-specific trouble data, rather than make precise estimates of trouble incidence.

Individual telephone interviews were conducted to obtain answers based on the telecommunications manager's own experience, free from the persuasive influence of other respondents. This approach was also preferred over in-person interviewing, not only for reasons of cost and timeliness, but also because public opinion research indicates that when customers are engaged in informal telephone discussions, they are more open to providing "off the record" insights than when they are interviewed face-to-face (Jeffries-Fox and Kotsonis)[8].

Data analysis involved identifying and coding customer statements about quality, reliability, and problems with particular sets. Reports of trouble rates were then related to independent variables such as type and age of the system, and reported satisfaction rate.

Results. This sample bore a known relationship to the total customer base. Therefore, the findings were sufficiently projectable to give a basis for action. For example, customers had clear definitions of and expectations for quality. These included elements of equipment design (e.g., perceived sturdiness and ability to take abuse), low trouble rates with good repair and warranty service, excellent speech transmission, ease of use, and good documentation. Customers described their high—but not unrealistic—expectations for AT&T telephone set performance.

Customer perceptions of trouble rates and their satisfaction levels were strongly correlated. The results also provided subjective opinion data that could be compared with objective performance measurement data to highlight—and give the opportunity to resolve—possible lacks of correspondence. Active efforts are underway to improve the quality of trouble-reporting mechanisms and repair data, with projections made from the study's detailed customer feedback offering a validity check for the objective performance data.

Field Operations Feedback

To improve delivery of products and services to external customers, AT&T often must develop support tools and procedures. These tools become products directed at internal customers—such as service personnel—while the procedures may directly impact external customers. To evaluate and improve the tools, feedback is elicited from internal customers in a variety of ways. These include not only interviews and questionnaires, but also task analyses, observational techniques, and pilot trials. To assess external customer satisfaction with service support procedures, call-backs are conducted following a trouble resolution. Since interviews and questionnaires are discussed extensively elsewhere, only the other methods will be described below.

Task Analyses. Task analyses were performed of remote maintenance procedures for many AT&T PBX products. This modeling of technicians' practices led directly to designing an expert system that uses artificial intelligence software to troubleshoot certain problems. Because it can automatically diagnose and resolve certain failures, the new system is more than a computer-based advisor to services' personnel. It permits the human technician to focus on more complex problem-solving activities by successfully handling routine maintenance problems. Currently fully deployed, the expert system tests, on average, over one-half all System 85 switch-generated trouble tickets, and successfully resolves, on average, between one-third and one-half the tickets it handles. (The variability noted here is a function of variable monthly trouble rates and types of troubles generated on any given switch.) The expert system refers the remaining tickets, along with diagnostic information, to maintenance personnel for human intervention. It should be noted that one benefit of using expert system technology is the ease with which the "rule system" or knowledge base can grow. Thus, this tool is evolutionary and can be expected to grow in usefulness over time.

Observational Studies. Observational studies have been employed to help AT&T understand the feedback from field service technicians who maintain its products for customers. In "ride-alongs," developers and managers accompany technicians as they perform support processes. This technique highlights the interaction between the product and the support process tools, and identifies areas where field operations need improvement. Data from these studies have led to changes that not only improved the customer's satisfaction with AT&T products, but also reduced the cost of maintaining them.

For example, through ride-alongs with technicians, a need was identified for an effective method to indicate defects in returned material. Often, additional information regarding defective hardware was written on the request ticket for the new hardware or on the box containing the nonworking part. Such information rarely reached the factory because equipment was separated from packaging material before servicing. Identifying this procedural problem enhanced efforts to develop a universal return tag to accompany all defective material. Information on the tag permitted the technician to identify test procedures and their results. In addition, a database of returned material was developed. It provided a measure of product performance for individual piece-parts. Repair procedures also became more efficient for intermittent problems, because technicians could specify on the tag the precise component that failed in the field (e.g., a particular port).

In another case, a study helped find ways to increase the efficacy and standardization of nationally deployed support tools. One such tool, which maintains historical information about previous problems it has analyzed, was not organized logically. Relevant data was scattered across reports and was not presented to the technician in a useful way. Consequently, services personnel underutilized the history data. In this case, a new software tool was developed to meet the technician's needs and provide accessible and readable reports of prior problems and their resolution for any given external customer.

Pilot Trials. Pilot trials have recently been conducted to identify opportunities for improved performance and cost reduction of maintenance support activities. Hypotheses were generated about the causes of field costs and customer dissatisfaction. Experiments were conducted to test alternative methods of delivery of services support. And both objective data and customer responses were monitored. The results included many recommendations for changes in how products are supported in the field. For example, possible sources of cost—such as extraneous trips to customer locations—were hypothesized. Data were collected on the number of missed opportunities for remote diagnostics (27 percent) and the number of times revisits were required to deliver appropriate equipment (32 percent). Changes

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were instituted in national methods for handling trouble reports, maintenance problems, and materials delivery, and the results were monitored. This approach offers a rational basis for process improvement.

Call-Backs. Finally, a new procedure for "closing the loop" between external customers and field service personnel was begun in the pilot trials. When customer troubles were resolved, a copy of the trouble ticket was forwarded to a headquarters services organization. This organization called the trouble originator (usually a system administrator, but in many cases the actual terminal equipment user) to solicit direct feedback on a given repair problem. The phone interview occurred within 24 hours of the trouble resolution. The customer was simply asked to rate the quality and timeliness of the repair and his or her general satisfaction with AT&T. If the person was still dissatisfied, feedback was given to the management of the service employee who had resolved the trouble. Use of this procedure insured almost immediate feedback of customer satisfaction and prompt action when the customer was not entirely satisfied.

Common Themes in Customer Feedback Studies

This article gives readers an introduction to a variety of potentially useful methodologies in the continuous improvement of products and services, the shared goal of which is increased customer satisfaction. Several common themes emerged throughout the various approaches:

- Customer studies are often viewed as most valuable when paired with some form of independently gathered performance data. Significantly, instances are reported where the precision and "solidity" of objective data can be greatly illuminated by validation against subjective customer data. This is the case whether the customers are external AT&T clients or internal users of our products.
- Although feedback at the end of the development process is no substitute for good up-front design, it provides powerful input for correcting design or

realization flaws, and strong guidance for future products. Most significantly, a disciplined approach to obtaining feedback offers AT&T clear and reliable metrics for continuous improvement of quality, as defined by the customer.

- A major feature of customer feedback is that it gets attention. Unlike decisions reached by internal debate, customer input tends to have high corporate visibility. It provides a clear mandate for action. Thus, especially strong responsibilities are imposed on the designers of customer feedback methodologies. If questions are poorly asked, or are asked of inappropriate respondents, the result is likely to be unclear or misleading "guidance" that will lead the product astray.
- The design of each customer feedback study requires decisions and tradeoffs about cost, scheduling, and the degree of certainty (or level of detail) the study must achieve. This article has described a number of methodologies used to obtain feedback. Each approach was designed to solve a different problem with respect to budget, time frame, and the degree of precision required. Behavioral scientists are often equipped with the training, experience, and tools needed to design and implement customer feedback studies that will demonstrate adequate methodological rigor while meeting such objectives. Their output can be reliable and readily interpretable metrics of quality, helping AT&T provide products and services that are well-aligned with customer needs.

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Biographies (continued)
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