THE BELL SYSTEM TECHNICAL JOURNAL
Vol. 61, No. 7, September 1982
Printed in U.S.A.

Stored Program Controlled Network:

Calling Card Service—Human Factors Studies

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(Manuscript received October 21, 1981)

Many new telephone services involve more customer-system interaction than ever before, and making these services easy to use and error-free is a major development goal. Properly designed dialing plans, announcements, timing, tones, and instructions increase customer acceptance and minimize errors. These new services are designed from systematic analyses of present services, interviews with customers, laboratory studies of user-system interactions, field trials, and product follow-ups. Calling Card Service automates credit card service and allows the customer to bill a call to a special billing number, without an operator, from Touch-Tone dialing phones. Based on a series of studies, the market need for Calling Card Service was established and the customer-machine interface was designed. An analysis of operator-assisted credit card service indicated that credit card calls could be automated. Interviews with customers verified an interest in, and a need for, Calling Card Service. Moreover, laboratory studies indicated that customers could use the Calling Card Service successfully. In turn, these studies led to the design of a field trial, which combined and extended earlier studies and verified Calling Card Service performance and acceptance by customers.*

I. INTRODUCTION

The introduction of Calling Card Service is in response to the Bell System's goals of providing improved services, stabilizing the operator work force near current levels, and minimizing increases in operating costs. Calling Card Service is automated and replaces current credit

* Registered service mark of AT&T.

card service, which requires operator assistance.* The automated service is a preferred alternative for some collect and third-number calls.

Calling Card Service allows a customer at a *Touch-Tone*† dialing station to bill a long-distance call to a telephone number other than the one from which the call originates, without an operator—just as direct distance dialing allows billing of a long-distance call to the originating telephone without an operator. This is accomplished when the customer dials a billing number in addition to the called number—Calling Card Service. Such a service is expected to control costs and help serve the growing volume of credit card and other specially billed calls. Customers at unequipped *Touch-Tone* stations or at rotary stations will receive operator-assisted Calling Card Service.

Companion papers in this issue of *The Bell System Technical Journal* discuss in more detail the rationale for developing Calling Card Service.[1,2] This paper focuses primarily on a coordinated series of studies to measure customer reaction to Calling Card Service and to refine the customer-system protocol. Each study is discussed. Section II discusses the initial analyses of credit card calling, customer interviews, and laboratory studies. The field trial was by far the largest of the studies and is the principal subject of this paper (see Section III). Section IV describes the recommended protocol and discusses briefly the follow-up study of actual service.

II. EARLY STUDIES‡

2.1 Characteristics of operator-handled credit card calls

More than 80 percent of Bell System credit card calls are now handled by operators using Traffic Service Position System (TSPS). Operators enter the credit card number, given verbally by the customer, into the TSPS console. In automating credit card calls, it is useful to understand operator handling of credit card calls.

2.1.1 Operator work time on credit card calls

To assess the potential for automating credit card calls (Calling Card Service) the service observer records of 1538 credit card calls were analyzed.§ These calls were sampled from 25 representative TSPSs.

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* Where the automated Calling Card Service cannot be used, such as at rotary dial phones, operator assistance will still be available.

† Registered service mark of AT&T.

‡ Early in the planning for these studies, AT&T conducted interviews to test the concept of Calling Card Service. This study indicated that customers agreed with the utility of the Calling Card Service concept.

§ Service observers use a paper form (or computerized equivalent) to describe operator and customer actions during the initial phase of a call. As soon as the call completes, both the operator and the service observer leave the connection. Service observing is done on a very small sample of calls to verify that high-quality service is being maintained.

Each call record was examined for circumstances that would have made automating that call difficult. For example, person-to-person calls require an operator to assure reaching the proper party.

Figure 1 shows the operator work-time distribution, taken from the service observing records, and indicates which calls were considered automatable. The average time to handle a credit card call was about 20 seconds, but work time was highly variable. In contrast, those calls considered to be automatable averaged about 15 seconds work time, with low variability. The remainder, considered nonautomatable, averaged over 50 seconds work time, with very high variability. The general nature of this last finding was anticipated since operator assistance was often required in these cases. Person-to-person calls accounted for about one-half the nonautomatable calls, and their average work time was about 70 seconds.

The work-time analysis indicated that, if Calling Card Service were used on all possible calls, 15 percent of present credit card calls would still require operator assistance and 36 percent of present call-handling work time would still be used. Some additional saving might be expected if customers continue to migrate from collect and third-number calls, both of which require more operator time to handle than credit card calls.

2.1.2 Originating stations

Knowing what proportion of credit card calls originated at *Touch-Tone* dialing stations is another key determinant of the work-time savings, since the Calling Card Service would be available only at *Touch-Tone* dialing stations. A representative sample of credit card

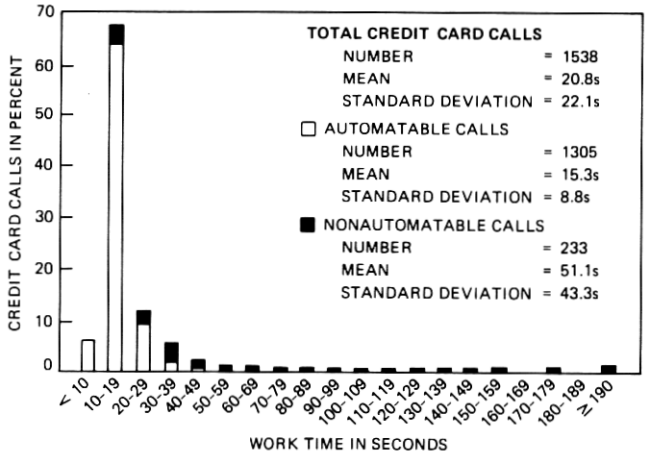

Fig. 1—Traffic Service Position System operator work times for credit card calls.

calls was traced to the types of stations from which the calls were made. Then, using the fraction of person-to-person calls and the fraction of nonautomatable calls mentioned earlier, the approximate fraction of automatable calls by originating station type was estimated. The results strongly supported the introduction of Calling Card Service at *Touch-Tone* dialing stations.

2.1.3 Distribution of calls among callers

The estimated potential for Calling Card Service has thus far been based on the premise that callers are willing and able to use the service. The degree of caller success and acceptance might be expected to depend on (*i*) how frequently users place calls, (*ii*) why they place calling card calls, (*iii*) where they originate calls, and (*iv*) how available the service is.

The success and acceptance of Calling Card Service is expected to grow with practice. Distribution of credit card calls is concentrated among a small number of credit card users. This leads us to expect rapidly increasing success rates initially (because of continuing user experience), slowing with time until an equilibrium success rate is reached. This equilibrium will reflect a balance between failures, attributed to less experienced users, and successes, attributed to more experienced users.

2.2 Opinions on potential Calling Card Service

So far we have discussed potential Calling Card Service users only in aggregate terms. To obtain additional detailed information and user opinions, frequent users of operator-handled credit card service were interviewed in two Bell Operating Company areas. When asked why they use credit card service, the most frequent answers were

(*i*) for accounting purposes, allowing the call to be billed to the appropriate bill payer,

(*ii*) for the ease and convenience of credit card service, and

(*iii*) because credit card service is preferable to paying with coins (at coin stations).

In fact, about one third of the respondents indicated that they would not have made their most recent credit card call had they not had the convenience of a telephone credit card.

Even though nearly 90 percent rated operator-assisted credit card service as good or excellent on a four-point scale (excellent, good, fair, poor), most customers preferred to dial the credit card number (Calling Card Service) rather than to use operator-assisted service. Most customers also indicated that they made several credit card calls in succession, at least "some of the time"—a finding which led to the

development of a protocol for placing sequences of calls, billed to the same calling card account, without having to reenter the calling card number for each new call. (See Section 2.3 below.)

2.3 Laboratory studies of Calling Card Service protocols

2.3.1 Placing a single calling card call

To obtain "hands-on" experience with a proposed Calling Card Service protocol, a laboratory minicomputer was programmed to control special-purpose hardware to simulate the service. Using the simulator, the proposed protocol timing and wording of announcements were adjusted and appropriate user instructions were developed. Then tests were run in which Bell Laboratories employees placed simulated calls. Calling Card Service procedures were systematically varied. These tests produced two important results:

(*i*) It was important to give users a tone to indicate when they could begin dialing their calling card numbers. Otherwise, even practiced callers frequently dialed too soon. That is, they dialed while simulated call control was being passed from the local office to the TSPS. During this switching interval, digits cannot be received. Without the tone, even experienced customers would have to listen for an announcement before dialing or risk having the attempt fail, resulting in slower service.

(*ii*) Overall, the procedure was acceptable and the brief instructions, designed to be printed on the calling card itself or on the public telephone instruction card, were adequate.

2.3.2 Placing a sequence of calls

Since many credit card users indicated during interviews that they sometimes place several credit card calls in succession, a procedure was devised to allow a sequence of calls to be placed without reentering the calling card number for each new call. In late 1979 and early 1980, simulation of this multiple call procedure was prepared on the laboratory minicomputer. Several conclusions about placing calls in sequence were reached on the basis of tests with this simulation:

(*i*) Callers were able to make a sequence of simulated calls, each beginning with the *Touch-Tone* telephone dial "#". Since successive calls may follow a call attempt terminating in ringing or busy, it is important to demonstrate that the presence of these network tones does not disturb users, nor strongly affect their success. Test callers, all Bell Laboratories employees, recovered quickly and naturally when network tones occasionally blocked initiation of the next call.

(*ii*) Callers were able to comprehend and follow the brief dialing

instructions, suitable for printing on the calling card itself or on public telephone instruction cards.

(*iii*) Callers followed the calling procedures correctly on about 90 percent of attempts, and they recovered from about 20 percent of their errors, yielding an overall success rate of more than 92 percent.

Figure 2 shows the resulting recommended protocol. Briefly, callers initiate a new call by dialing # either when the called party goes on-hook, or when they reach a busy or nonanswering line. If no digits are received or an error is detected, an error announcement requests a second attempt which, if unsuccessful, results in TSPS dropping the call after a suitable announcement.

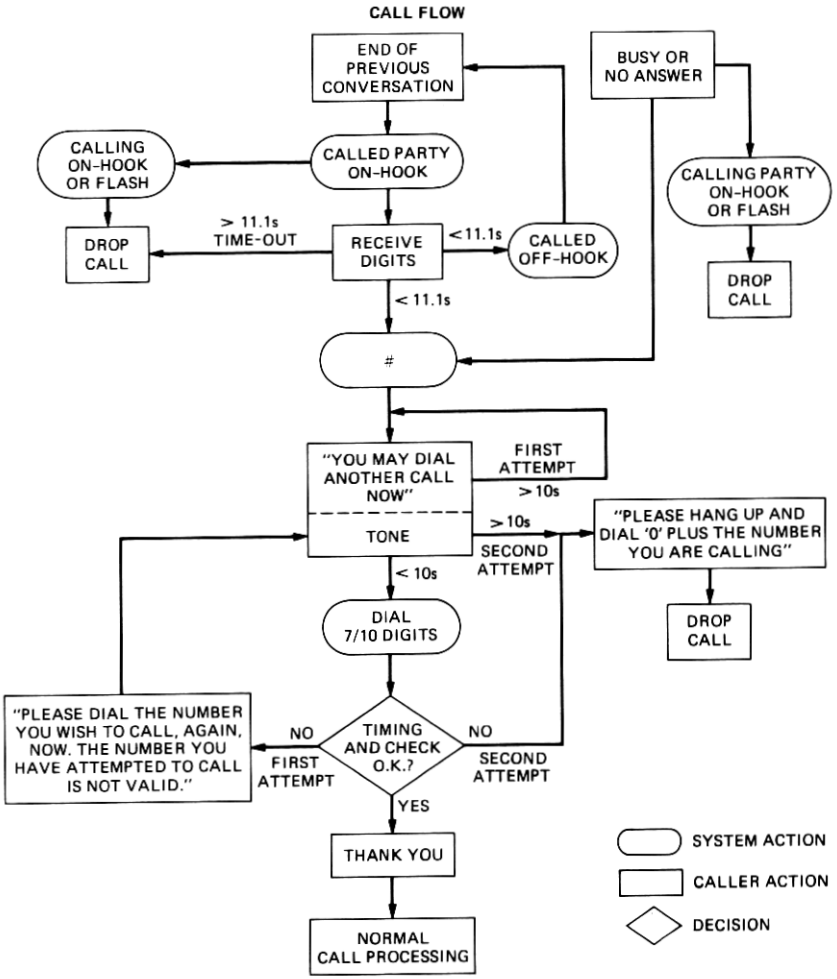

Fig. 2—Proposed sequenced calling protocol.

III. FIELD TRIAL

3.1 Trial overview

The Calling Card Service field trial was conducted in Milwaukee, Wisconsin, from November 1977 to June 1978.[3] Permission to conduct the trial was obtained from the Wisconsin Public Utility Commission prior to its start. Customers making the most credit card, collect, and third-number calls and responding to a mailed brochure describing Calling Card Service, were invited to participate in the trial. Four hundred twenty-five business and residential customers participated. Each customer received a unique 14-digit calling card number. In addition, regular telephone credit card numbers could also be dialed and they, in fact, provided most of the trial calls.

Calling card numbers or regular credit card numbers could be used to place automated calls from about 3000 noncoin phones in the Milwaukee area, and from 70 coin phones at Milwaukee's airport (General Mitchell Field), two downtown hotels, and a few local restaurants. Bell Operating Company marketing representatives distributed brochures giving instructions on how to use the service. Also, customers received additional instructions on special Calling Card Service cards. At some coin phones, placards were placed instructing customers on how to use the automated credit card calling service with the Bell System credit card. Moreover, operators were trained to assist callers and to answer questions.

To use the simulated Calling Card Service, customers first dialed zero, plus the number. Special programs in the TSPS routed these incoming 0+ calls from trial stations to a small team of specially trained operators who helped simulate Calling Card Service. In addition to a TSPS console, each operator had a terminal linked to a minicomputer (see Fig. 3).

When a call arrived from a trial station (see Fig. 4), a trial operator, using the console, notified the minicomputer. The minicomputer then delivered a tone to prompt the customer to dial a calling card number. (Calls from unequipped stations were handled by operators as usual.) Detectors received the dialed digits and sent them over a data link to the minicomputer for verification. Calls with valid calling card or credit card numbers proceeded and were billed appropriately.

Depending on the version of the protocol being tested, the minicomputer displayed appropriate step-by-step instructions on the terminal screen to guide the operator in handling each call. For example, to encourage customers to redial after making errors, the minicomputer might display to the operator: "Please hang up and dial zero, plus the number you are calling." The operator, in turn, read the message to the customer. By making simple changes in the minicomputer program, the operator's treatment of calls could be altered, often without

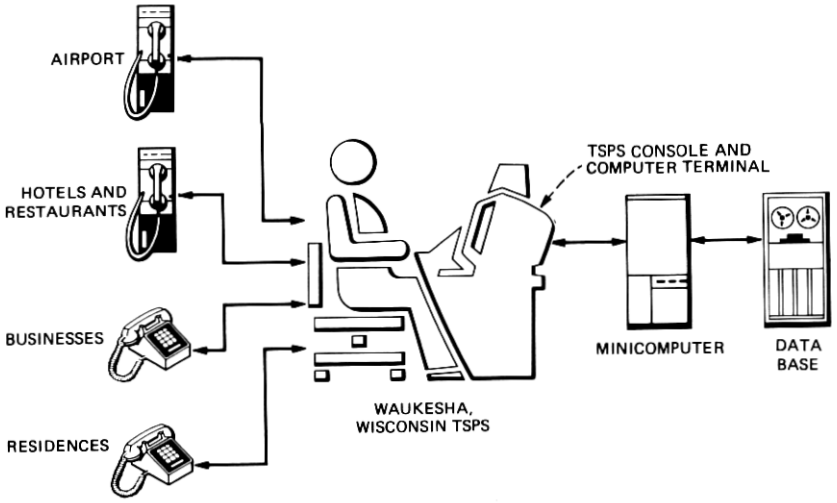

Fig. 3—Trial setup.

additional training. This flexible arrangement allowed for easy testing of many protocol variants and rapid changes among them.

As noted, operators simulated recorded announcements by relaying them orally to the customer. This method of communication was chosen not only because it was flexible, but also because a previous study indicated that customers strongly preferred natural-sounding announcements.[4] In a trial environment, operators were able to provide high-quality, flexible announcements.*

The minicomputer recorded the time and details of each call. These records were analyzed rapidly to determine how the protocol could be improved. Throughout the trial, protocols were varied by changing announcements, timing, access to operators, error-correction procedures, etc. In all, 24 variations of the protocol were tested at trial coin phones and 14 were tested at noncoin phones. Each variation was run long enough to establish its salient performance characteristics.

3.2 General trial results

Customers used the service successfully, repeatedly, and indicated that they liked it. Quality of service was also maintained for those who

* For trial purposes only, operators simulated the Calling Card Service to evaluate user behavior, reaction, and acceptance of automated Calling Card Service. During actual automated service, no operator is connected.

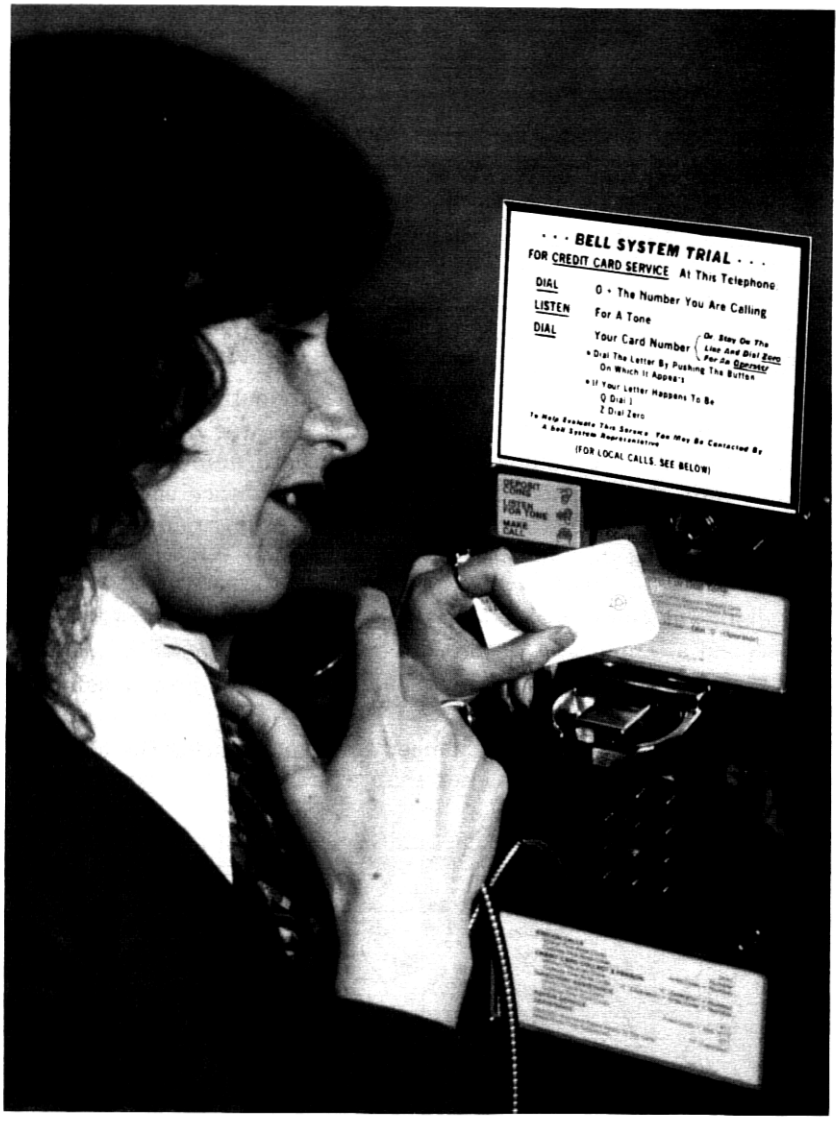

Fig. 4—Trial coin station placard.

did not wish to use the automated Calling Card Service. Different protocols were tested to determine the effects of varying operator accessibility, wording of announcements, and written instructions. The overall goals in testing the different protocols were to increase customer performance, usage, and satisfaction. Customer dialing performance and customer satisfaction are discussed in Sections 3.2.1 and 3.2.2, respectively. Section 3.3 gives an analysis of the effects of Calling

Card Service on other users. Also, specific service manipulations and findings are related in Section 3.4, and Section 3.5 gives some supporting information on sequenced calling.

3.2.1 Customer dialing performance

3.2.1.1 Frequency of customer dialing attempts. Customer-dialed credit card calls reached 60 to 70 percent of all credit card calls at trial coin phones for the most successful protocols. Customers were more apt to dial when an announcement requesting the caller to dial the card number followed an alerting tone. When only the alerting tone was transmitted, 40 to 50 percent dialed.

Results were similar at noncoin phones: Nearly 80 percent of credit card calls were customer dialed when the announcement was given; about 70 percent were dialed when only the tone was given. In addition to dialing their own calling card or credit card numbers, customers could obtain operator assistance. Operator assistance was also given on calls from nontrial stations, during heavy calling periods, or when customers dialed zero instead of the card number.

3.2.1.2 Frequency of customer dialing success. Eighty-five percent of first dialing attempts succeeded. An additional 5 percent succeeded on the second attempt; and 1.5 percent succeeded on the third attempt. However, as Fig. 5 shows, these averages do not give a complete picture of successful dialing.

First of all, protocols were changed frequently during the course of the trial. Some produced higher than average success rates, others,

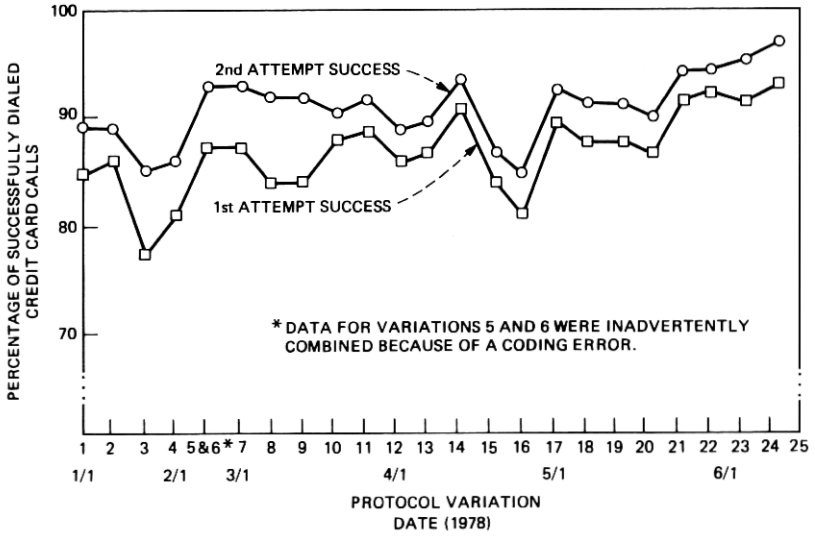

Fig. 5—Customer dialing success rate.

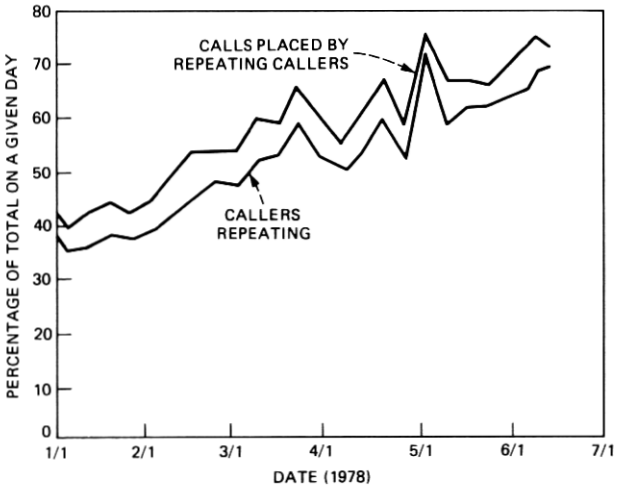

Fig. 6—Customer and call repeat rate.

lower than average. Second, protocols used late in the trial were generally better, because of continuing analyses and protocol refinements. However, the trend toward greater success is undoubtedly due in part to increased proficiency of repeating users. Separating these effects is difficult because callers could not be identified on calls where errors were not corrected. On balance, the best protocols might be expected, with time, to produce success rates in excess of 90 percent.

When customers erred on the first attempt, 45 percent attempted to dial again and 55 percent abandoned. Of those who made a second attempt, 65 percent succeeded. Of the customers who erred, 70 percent did so because they dialed too few digits before the call timed out.*

3.2.1.3 Frequency of repeated use. The percentage of callers on a given day who had placed calls previously during the trial is shown in Fig. 6. On the average, 46 percent of the customers on any day had used the service previously. Fifty-seven percent of the calls, on the average, were placed by these repeating customers. This indicates that many customers continued to use the service. Overall, more than 10,000 regular credit card customers successfully dialed over 28,000 credit card calls; about 6,000 made only one call from a trial station. One hundred twenty-two Calling Card customers dialed nearly 4,000 calls bringing the total to more than 30,000 customer-dialed calls.

3.2.2 Customer acceptance of Calling Card Service

As mentioned earlier, customers who successfully dialed calling card calls liked the service. On a four-point rating scale, they rated the

* "Time out" is when allocated time elapses and the error sequence is triggered.

quality of their last call as slightly better than good. Customers who dialed unsuccessfully rated the same item lower, as shown in Fig. 7.

As shown in Fig. 8, customers liked dialing Calling Card Service calls. Customers who dialed their numbers generally indicated a strong preference for dialing, rather than having the call assisted by an operator, as we stated earlier. When asked why they preferred dialing to operator assistance, 48 percent indicated it was because of ease, convenience, or speed of dialing. Sixteen percent indicated that dialing eliminated repeating their billing number to the operator, 7 percent thought there would be fewer errors if the card number were dialed, and 6.5 percent mentioned that dialing avoided being overheard and, thereby, ensured greater billing number security.

Some customers said they still preferred operator handling—28 percent stated this was because they liked talking to the operator, and 25 percent stated that dialing the card number was no faster than having an operator handle the call.

Those customers who rated overall quality of service as either poor or fair indicated that it was difficult to locate trial telephones (31

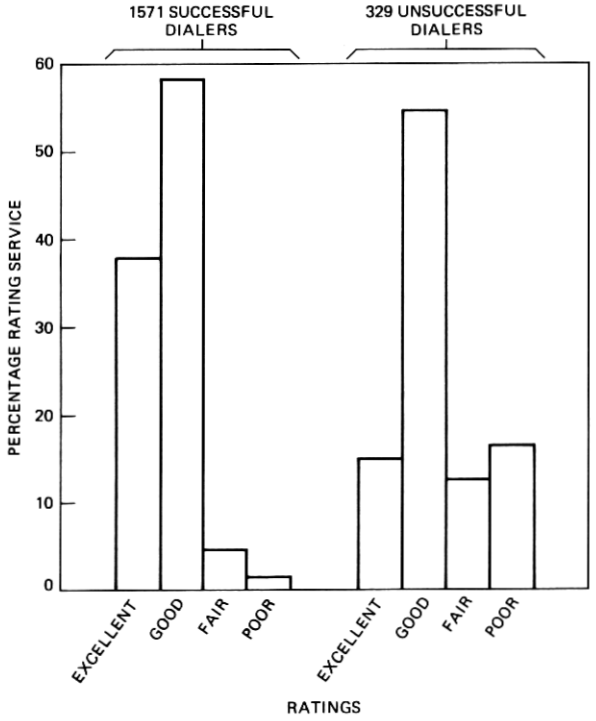

Fig. 7—Dialed credit card call "overall quality" ratings.

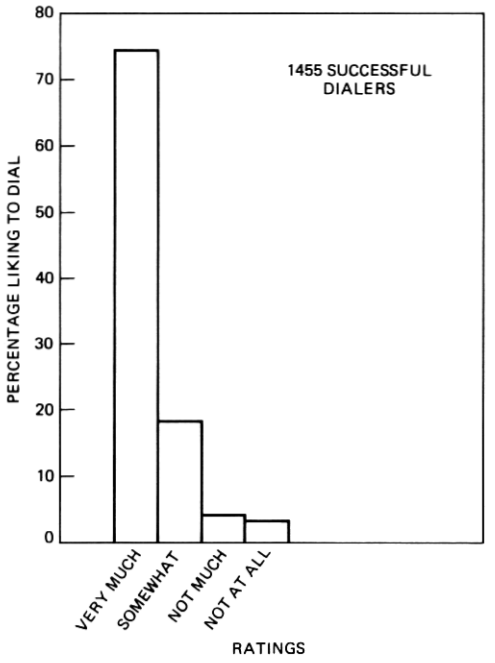

Fig. 8—"Liking to dial" ratings.

percent), and that Calling Card Service did not work correctly (29 percent). Other related reasons for downgrading service were that "the operator kept coming on the line" (10 percent) and that "the operators did not know enough about Calling Card Service" (8 percent).

3.3 Effects of Calling Card Service protocols on other callers

3.3.1 Abandonment

Quality service must also be maintained for callers not making calling card calls. Any caller following the normal TSPS 0+ dialing procedure at a trial phone was given the Calling Card Service protocol. Those who did not dial a billing number were routed to an operator. Some hung up (abandoned) before ringing started or before a busy signal was heard, or even before an operator was connected. The frequency of abandonments was closely related to the amount of time required to complete a service protocol variant. For example, both a tone-and-announcement protocol and a tone-only protocol, which required 23 seconds to complete, produced 24 percent abandonment rates. Abandonments declined with practice and shorter protocols. In the best tone-and-announcement protocol tried, abandonments were 7 percent for an 11-second protocol.

3.3.2 Service ratings by third-number and collect callers

Ratings of overall call quality and speed made by third-number and collect callers, who received the Calling Card Service protocol and were then assisted by the operator, averaged better than good, despite the presence of extraneous (delaying) information and protocols (see Fig. 9). Protocols which included a spoken dialing instruction were rated less confusing than those which presented only a tone. The dialing instruction also shortened the perceived operator answer delay.

3.3.3 Operator assistance

Several protocol variations were tested to determine how best to give callers access to operators, while encouraging the highest possible rate of caller dialing. At various points in the trial, callers could reach operators in one or more of three increasingly difficult ways—by waiting several seconds to time out, by dialing zero (after the tone), or by hanging up and dialing zero. Results indicated that removal of the time-out-to-operator option did not increase caller dialing but greatly increased abandonments. Therefore, we concluded that time-out (i.e., easy) operator access should be available.

In addition, noncalling card callers increased their tendency to dial zero (rather than wait) for operator assistance from about 2 to 25 percent after receiving an appropriate spoken instruction to dial zero. Thus, they demonstrated willingness to dial zero for quicker access to operator assistance.

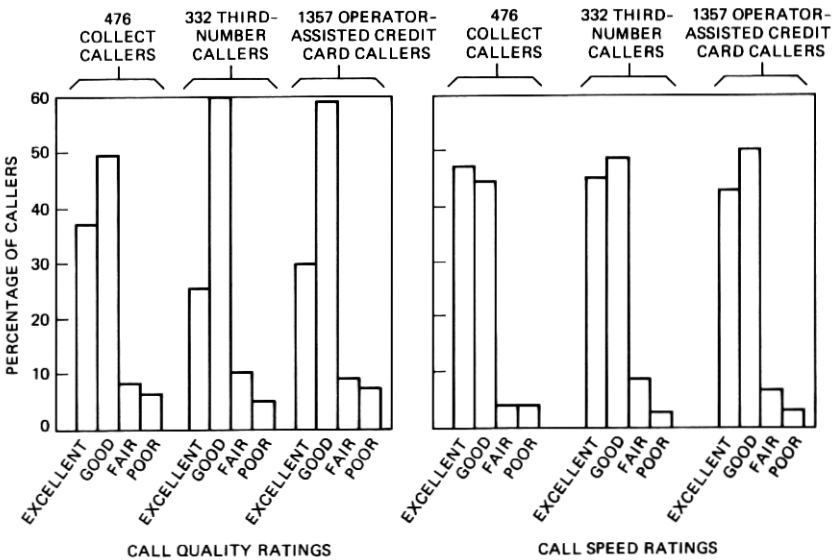

Fig. 9—Overall call quality and speed ratings for operator-assisted calls in the presence of Calling Card Service protocol.

In summary, the evidence suggests that noncalling card callers were not unduly disturbed by Calling Card Service protocols and that a substantial number dialed zero to avoid the additional delay inserted by instructions and time out. More avoided the delay when instructed to do so by the message: "· · · or dial zero for an operator now." This instruction also improved service for calling card callers by increasing dialing and reducing confusion.

3.3.4 Service at unequipped stations

Service ratings were lowest when callers dialed and failed to obtain service. In one series of tests, rotary phone callers were verbally instructed to dial, even though the digits could not be received. (This condition simulated what would happen without the ability to selectively offer the service at *Touch-Tone* dialing stations only.) However, callers who failed when instructed to dial at rotary (unequipped) stations rated service no worse than those who failed for other reasons.

To selectively offer the service at *Touch-Tone* dialing stations, a special verbal instruction to discourage customers from dialing at rotary stations was tested:

> "From pushbutton telephones only, please dial your card number or zero for an operator. (pause) From other telephones, please wait for an operator."

This instruction eliminated 95 percent of rotary station dialing of the calling card number, but it also suppressed dialing of the card number at *Touch-Tone* dialing stations by more than 10 percent. Customers reported being confused by this instruction at roughly the same rate as with other instructions tested. Ratings of overall quality and speed of this simulated Calling Card Service were slightly better than good.

However, the 10-percent suppression of dialing at *Touch-Tone* dialing phones is considered sufficient justification to make certain that prompts are made only at phones that provide the service.

3.4 Service manipulations

3.4.1 Dialing prompt effectiveness

As discussed in Section 2.3.1, laboratory tests indicated that a tone was necessary to signal users when to begin dialing their calling card number. In the field trial, prompting announcements were also systematically varied to study their overall effectiveness, as well as to select detailed wordings.

Several sources of trial data indicate that inexperienced callers are much more likely to dial their calling card number after a prompting

announcement is received rather than when it is not. The data also indicate that experienced callers dial reliably with only a tone signal to proceed.

Calling card and credit card number digits dialed before the tone were ignored. When the delay before the tone was decreased by 1 second, there was a significant decrease in the percentage of customers dialing before the tone. Therefore, it was concluded that the tone should be provided as soon as possible to minimize premature dialing.

At coin telephones with instructional placards, 15 to 20 percent more credit card callers dialed after a prompting announcement was received than when it was not received. This difference decreased slowly with caller experience. At coin phones without instructions, there was a 55-percent increase in credit card dialing because of the prompting announcement. These results suggest that prompting announcements are more effective than printed instructions alone for all but the most experienced callers.

Finally, customers were sensitive to wording of announcements. When the announcement "Dial your card number, please" was used, they appeared to have trouble understanding the directions. When "Please" was placed at the front of the announcement to help alert the customer, understanding increased. However, some customers still did not realize they were interacting with an automated service. Adding "or zero for an operator," after "Please dial your card number," lessened this kind of confusion. Adding "now" to the end of "Please dial your card number or zero for an operator" further reduced confusion between normal 0+ dialing and Calling Card Service dialing procedures. Systematic refinement of wording was found to be worthwhile. This observation was also made during the field trial of the Automated Coin Toll Service.[4]

3.4.2 "Thank-You" announcement effectiveness

A "thank-you" announcement was sometimes provided to callers who dialed correctly. However, when "thank-you" was not given during the trial, callers who had dialed a valid billing number waited in silence for ringing, busy, or other network sounds. As a result, those callers who had received prompting announcements abandoned more often. This may be because of abandonment by inexperienced callers who would not have dialed unless prompted to do so. To reduce these abandonments and provide more courteous service, a thank-you announcement was recommended.

3.4.3 Recovering from dialing errors

The 14-digit format of calling card numbers, combined with a file of valid numbers, virtually eliminates the possibility of billing errors

caused by errors in dialing. Consequently, when a caller misdials a calling card number, validation failure prevents the call from progressing until the error is corrected. In this situation, it is important for customer acceptance to provide an error-correction procedure that maintains billing security.

As shown in Fig. 5 and discussed in Section 3.2.1.2, callers succeeded on 85, 90, and 91.5 percent of attempts with 1, 2, and 3 tries, respectively. When an error was made, the caller received an announcement requesting another attempt. Several error-announcement wordings were tried. Again, wording was critical—some callers interpreted unrefined error announcements as failures to reach nonworking called numbers. This interpretation led to frequent abandonments.

However, when the error announcement immediately requested customers to dial again, e.g., "Please dial your card number again now," successful error recovery increased. A tone and prompting announcement, identical to that used at the start of the protocol, was also effective in stimulating error-recovery attempts. As at the start of the protocol, tones and prompt announcements were immediately truncated by dialing. Further, announcing incorrect digits back to the caller as part of the error announcement did not produce a significant increase in error recoveries.

Automatic operator access after repeated dialing failures was also tested. When operators were provided after repeated errors, no differences in dialing accuracy were detected. A customer who dialed and erred and required operator assistance could always obtain an operator by hanging up and dialing 0+ (or 0−).

3.4.4 Dialing time-out intervals

Calling Card Service dialing time-out intervals affect customer dialing success and acceptance of the service. During the trial, dialing time-outs were systematically adjusted, and the results were used to maximize overall dialing success and service acceptance without unduly increasing equipment holding times.

As mentioned, the calling card number is 14 digits long. It consists of either a 10-digit special billing number or a telephone number (NPA NXX XXXX), followed by a four-digit personal identification number (PIN). Thus, the 14 digits divide into four groups of 3, 3, 4, and 4 digits, respectively. As shown in Fig. 10, the interdigit dialing times depend on serial position. Trial data indicate that an interdigit time-out interval of 5 seconds and an interfield interval of 6 seconds will inappropriately time out less than 1 percent of the call attempts. The interval between fields 3 and 4 is an exception requiring 7 seconds to minimize false time-outs.

Experienced customers dialed faster. Figure 11 plots dialing time as

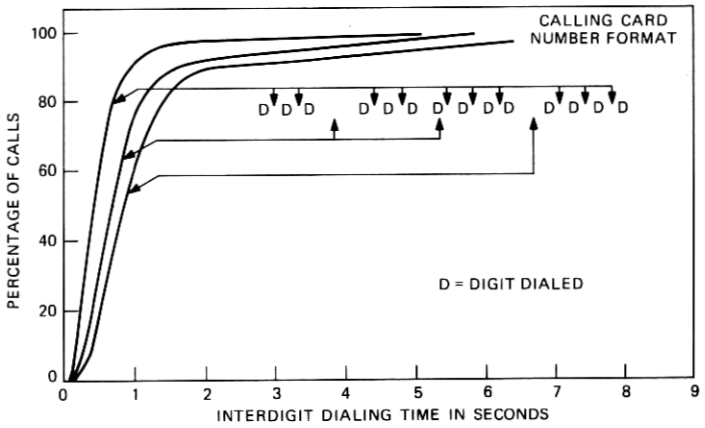

Fig. 10—Cumulative distributions of interdigit and interfield dialing times.

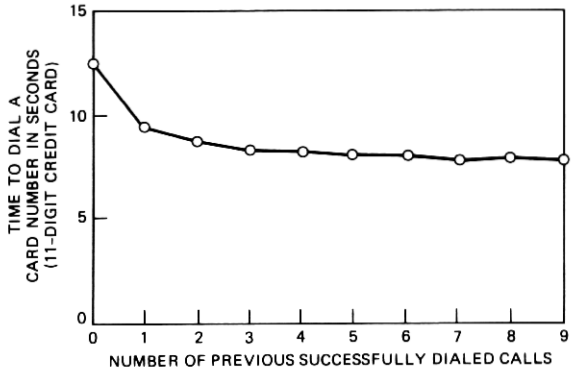

Fig. 11—Dialing time as a function of experience.

a function of experience. Customers reached asymptotic performance after about five successful calls.

3.4.5 Timing

The time between protocol events, such as prompts and operator access, has an important effect upon customer acceptance and performance. The trade-off is between rushing customers who would dial and being unresponsive to customers who require additional prompting or operator assistance. Generally speaking, trial data indicate that customers responded within 7 seconds of any prompt. Detailed timing data were used to make the final protocol recommendations.

3.4.6 Customer dialing instructions

Several types of dialing instructions were available during the trial. The instructional placards (bright orange) on trial coin phones were

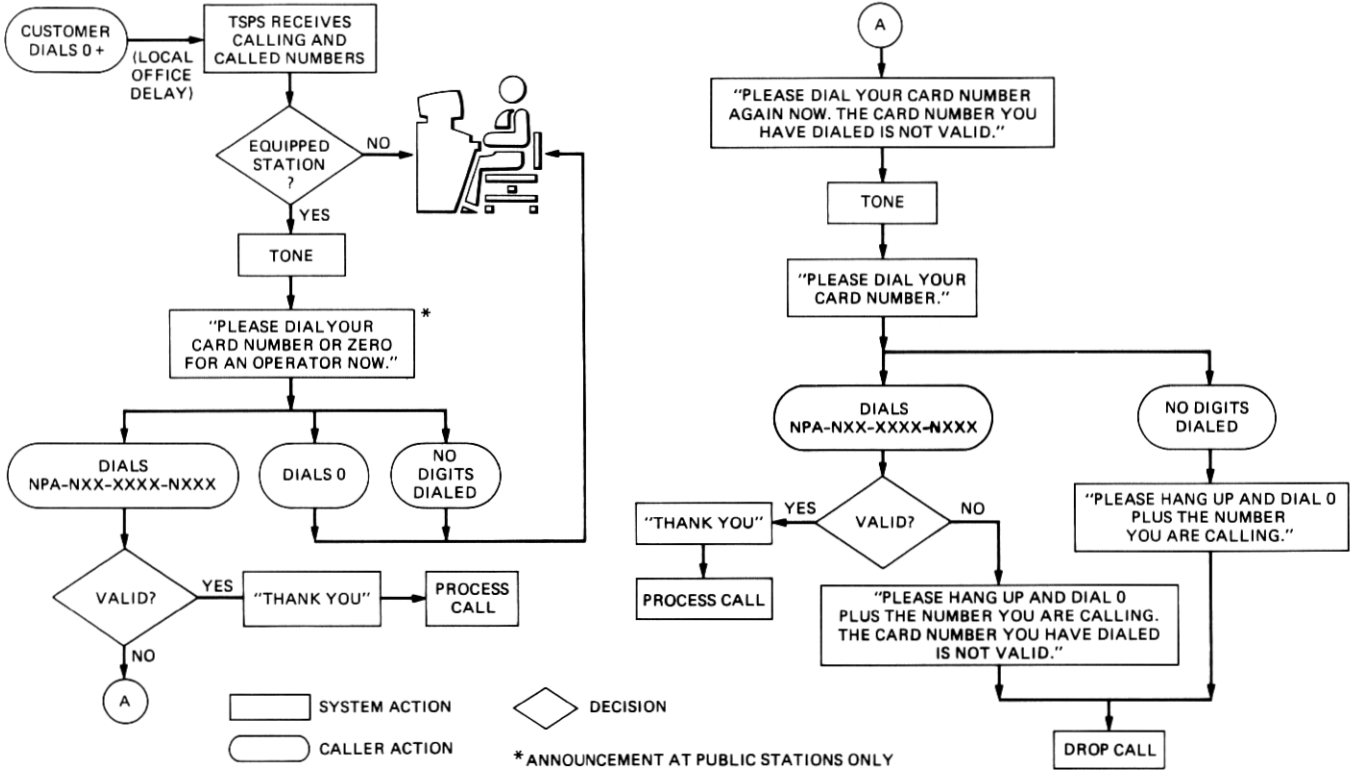

Fig. 12—Recommended Calling Card Service protocol.

surprisingly successful in persuading credit card customers to dial. The placard increased dialing 200 percent above the level at phones without placards. As discussed earlier, the prompting announcement was effective at phones with and without placards. Also, operator instructions produced a 4-percent increase above and beyond other instructional methods.

3.5 Sequenced calling

While sequenced calling was not offered in the field trial, data were gathered which indicated a need for this capability. Twenty percent of the credit card customers at coin stations made more than one call at a time. Some spontaneous comments from customers suggested the need for a sequenced calling capability. When asked, 67 percent of the trial Calling Card Service customers said such a capability would be useful. As indicated earlier, laboratory results were used to refine the sequenced calling protocol (see Section 2.3.2).

IV. RECOMMENDED CALLING CARD SERVICE PROTOCOL

Figure 12 illustrates the recommended protocol for public telephone Calling Card Service. Only public stations provide the prompting announcement. (A few trial customers complained about having the calling card announcement on their phones.) Placards are recommended for public phones initially. To use the Calling Card Service, callers can dial zero, plus the number they are calling. Then, after the prompt, they can dial their calling card number. The more experienced customers can dial immediately after the tone and, thereby, prevent the prompt announcement. Callers requiring operator assistance can dial zero or simply wait for the operator.

The recommended protocol was first implemented at Buffalo, New York, in July 1980. Service evaluation measurements developed for the field trial were installed. This was done to allow a detailed follow-up of the actual service. Preliminary results from follow-up studies have, to a remarkable degree, corresponded to results of the field trial.

V. ACKNOWLEDGMENTS

The studies described required the support of many individuals. M. R. Allyn designed, administered, and analyzed face-to-face interviews for the field study. He also designed and evaluated the coin-phone placards. T. M. Bauer analyzed field-trial data, and he is following up with analyses of early site data. K. Owens conducted the early Calling Card Service laboratory study; administered the telephone interviews; and designed and administered the Business Office procedures for the field study. C. Morris programmed and conducted the sequenced calling laboratory studies (with H. Holinka) and followed up with early

site evaluation interviewing. R. Michelsen, A. J. Sawyer, J. C. Dalby, and R. Welch each played an important role in the design of the field-trial facilities, and J. P. Delatore, E. M. Prell, C. B. Rubinstein, D. W. Heckman, and S. M. Bauman supported the field study. Finally, we especially thank Wisconsin Telephone Company personnel, including J. J. Wyssling for contributions to the success of the Calling Card Service field trial.

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