

Human Factors and Behavioral Science:

Designing and Evaluating Standard Instructions for Public Telephones

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Difficulty finding and understanding information on public telephone instructions has led to problems using public telephones. To overcome these problems a new instruction card was designed. In this paper we discuss the information needs of the public telephone user, a conceptual solution to information presentation, a new standard instruction card design, and laboratory and field evaluations of the new design.

I. INTRODUCTION

Many people have reported that placing a call from a public (pay) telephone is a problem. Individuals and consumer groups have complained to their telephone companies and even their public utility commissions. A major reason for this problem is the difficulty of finding and using information on public telephone instruction cards. In this paper we describe a series of studies conducted to develop standard instructions for public telephones that are easier to use.

1.1 The public telephone operating environment

If all public telephones worked the same way, the task of designing

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instructions would be easy. However, there is considerable variation in the operating procedures of public telephones in the Bell System. In addition, new public telephone services are being introduced or will be introduced soon. For example, at some public telephones the user must deposit coins equal to the cost of a local call before dialing any call (coin-first telephones). From the user's perspective, the coins work like a switch to turn on the telephone, and they are returned if no payment is required for the call. At other telephones no coins are needed to turn on the telephone, and a large class of calls, such as collect, credit card, emergency, and operator assistance, can be dialed without depositing any coins (dial-tone-first telephones). On some other telephones coins cannot be used at all (Charge-a-Call telephones). At most telephones, coins are deposited before a local call is dialed, but at some telephones coins are deposited after the person at the other end answers (post-pay telephones). From some telephones you can dial long distance calls; from others the operator must dial for you. From some telephones you can dial in your credit card number; from others you must tell your credit card number to the operator. In some areas you must dial "1" before long distance station-to-station calls; others require no prefix. Furthermore, there are many variations in the numbers for emergency help, directory assistance, and repair service.

Because of these variations, no single instruction card can be used for all public telephones. More importantly, because of these variations, even the most experienced public telephone users must sometimes consult the instructions to place a call correctly.

1.2 The need for standard instructions

Prior to the standard developed from these studies, there was no standard for instruction card design in the Bell System. Various operating telephone companies have used different layouts, word choices, and color schemes to convey the same information. There are also variations within single telephone companies on the format and type of information included. Generally, telephones that operate differently, if only in minor respects, have instructions that vary in many ways that have nothing to do with operational differences. For example, instructions on how to place a long distance call may be different on a telephone where the initial deposit is 10 cents than on one where a 20-cent deposit is required, even though the dialing procedures are identical. There are also tremendous differences in the emphasis (location, color, and type size) placed on particular pieces of information. Finally, information is often provided in "telephonese."

The problem for users is not that all instruction cards are poorly

designed. While instruction cards in some locations may be particularly difficult to read and understand, the biggest problem for users is the inconsistency of design.

The use of a standard instruction card design for all public telephones should significantly reduce the problems of finding and understanding needed information. While identical instructions cannot be placed on all telephones because of differences in operating procedures, consistent language, graphics, and placement of information can be used. The information provided on the standard instruction card should match the information needs of the user. The instructions must be understandable, and the design should be attractive. A good design will help users; and, given a good design, a greater benefit for users will come from the universal application of this design.

1.3 Approach to the problem

The new instruction card design and the studies that supported the development of that design are described in the sections that follow. First, we studied public telephone users to identify their information needs, how they used instructions, and the telephone terminology they used and understood. Based on this information we formed a model of the instruction user. Second, we developed a conceptual solution to the problem. Third, we presented this solution (along with detailed information about public telephone operating procedures) to graphic designers at Henry Dreyfuss Associates, who created designs for the instruction cards. Fourth, we evaluated and refined the designs in several phases. First we used our own and the designer's judgment, and then conducted a laboratory test, and, finally, a field test. During all phases of the project we consulted with the AT&T Public Services Marketing organization.

II. THE INFORMATION USER

Before any attempts were made to design new instruction cards, we analyzed the information needs of the public telephone user.

2.1 Interview study

A total of 500 users were interviewed in Arizona, Florida, and New Jersey. The individuals interviewed were approached following the completion of a call from a public telephone. They were asked to participate in a study of public telephone service. The individuals who agreed to participate were asked a series of questions about instruction use, such as: "Did you read the instruction card?" "Did you look at the instruction card?" "What information did you need?" "Did you find the information you needed?" They also were asked if they had

any difficulty finding or understanding information, and were asked to define several telephone terms, such as "collect call" and "dial-tone-first telephone."

Few of the people interviewed (about 10 percent) reported that they read the instruction cards. These individuals looked for procedural information necessary to place a specific call. This information included the cost of the initial deposit, when to deposit money, how to dial local calls and various types of long distance calls, and specific numbers, such as directory assistance or repair service.

Some respondents reported that they were unable to find information that they needed on the cards. In almost all of these cases, the individual was looking for more specific information than could ever be placed on the instruction card, such as the area code for Los Angeles, or the cost of a particular long distance call, or the telephone number of the local veterinarian.

Our interviews showed that people generally approach the instructions with particular questions in mind, and that the questions have two general forms. The first form is one in which a specific fact or procedure is needed. Examples are "How much does a local call cost?" or "How do I place a collect call?" The second form of question is asked by the more sophisticated telephone user who is already familiar with alternative operating procedures. This user might ask, "I know there are two kinds of telephones, one where I can dial long distance calls myself, and one where the operator dials all long distance calls; which type of telephone is this one?"

A few people look at the instructions without needing any specific information. These users may also be characterized, however, as having a question in mind before reading (looking at) the instructions, which can be phrased as, "Is there anything (new) here that I need to know about?"

Interview questions about terminology showed that telephone users generally understand terms referring to types of calls, such as collect, credit card, person-to-person, and station-to-station. However, language on instruction cards referring to the type of telephone, such as "dial-tone-first" telephone, was not understood.

III. THE CONCEPTUAL SOLUTION

Most people do not read instructions on telephones; in fact, there are few circumstances in which anyone reads any instructions at all. (See Ref. 1 for a discussion of this issue.) Our goal was not to induce more people to read the instructions, but rather to make the instructions easier and more effective when they were read.

Our conceptual solution to instruction card design had several

components to simplify searching and understanding. The design should:

1. Provide the information that people need in words they understand.

2. Always place information about a particular aspect of a telephone's operating procedure in the same spatial location on the card. The card is thus like a form, with fields for each type of information. If there is no relevant information to be placed in the field, it should be left blank and not used for some other information.

3. Place frequently needed information on the upper card and detailed procedural information on the lower card.

4. Divide detailed information into related categories. Use the category labels to construct an index.

5. Provide visually obvious cues that are redundant with the text, e.g., colors, pictograms, and other symbols. This information should be visible at a glance and allow knowledgeable telephone users to answer the question "What type of telephone is this?" without reading the text. By systematically varying the visual characteristics of the instruction cards, telephones that have different operating procedures will have instructions that *look* different. Instruction cards on all telephones that operate the same way will look the same. Thus, information obtained at a glance can be informative. If the card "looks" different from cards the user is familiar with, then the instructions should be read.

6. As a final goal provide as much information as possible in a language-independent form to make the cards more usable by people who either do not read English or do so with difficulty.

IV. THE NEW STANDARD DESIGN

Figures 1 to 3 show examples of the new instruction cards, designed according to the principles described in the section above, and revised based on the results of the study described in the following sections. (Space constraints prohibit illustration of the cards through all the design iterations.) Figure 1 is an instruction card for a telephone that requires a coin deposit before any calls can be dialed, and from which operator assistance is required for all long distance calls. Figure 2 is for a telephone from which credit card, collect, emergency, and other "free" calls can be made without depositing any coins; long distance calls can be dialed by the caller. Figure 3 shows an instruction card from a "Charge-a-Call" telephone, from which no coin-paid calls can be made.

4.1 Design features

The instructions shown in Figs. 1 through 3 are for telephones that



**Coin
needed for
all calls**



Local calls Deposit 10¢ before dialing
Long Distance Dial 0
Operator will handle all Long Distance calls

SOS dial 0 for Emergency help

KEENE, N. H. EXP 5

Charge and Person-to-Person	Credit Card, Collect & Person-to-Person calls Operator
Station-to-Station calls	Local numbers beginning with: 239, 242, 352, 363, 399, 446, 563, 585, 756, 827, 835, 847, 876 Number All other numbers Operator
Free calls	Directory Assistance Operator Toll Free 800 Numbers Operator

AREA TYPE 2-EXP -5

Operator assisted rates apply to all toll calls from this telephone.

Fig. 1—Instruction card set for a telephone that requires a coin deposit before any call can be dialed, and from which the operator dials all long distance calls. Colored areas are tan.

differ considerably in operation; however, the common organization of the instructions is easily observed. Differences in visual appearance are also readily apparent. The features of the design are listed below:

1. Color: All instructions are printed on a white background; detailed instructions are in black type and emergency information is in red. Other colored sections—including the band across the top of the upper card, the “0+” and “1+” symbols, index headings and rules on the lower card—are color coded based on the basic operational procedure of the telephone. Telephones that require a coin deposit before any call can be dialed (coin-first) have tan instruction card coloring; telephones that do not require a coin for initial activation (dial-tone-first, including post-pay and Charge-a-Call) have blue instruction card coloring.

2. Upper-left symbols: Coin-first telephones have a white handset in a tan disk (coin); dial-tone-first telephones have a blue handset on a white background. The handset on the Charge-a-Call telephone has



No coin needed
for Charge,
SOS & Free calls.



Local calls Deposit 20¢ before dialing
Long Distance Dial all calls directly
 needed for Charge & Person-to-Person calls
 needed for Station-to-Station and Free calls

SOS dial 0 for Emergency help
SOS marque 0 para Emergencia

TSPS/DTF UPPER-EXP - 11

**Charge and
Person-to-Person calls**

Credit Card, Collect & Person-to-Person
 Within this Area Code Number
 Outside this Area Code Area Code + Number

Station-to-Station calls

Within this Area Code Number
 Outside this Area Code Area Code + Number

Free calls

Directory Assistance
 Local 411
 Within this Area Code 555-1212
 Outside this Area Code Area Code + 555-1212
Repair Service 611
Toll Free 800 Numbers 800 + Number

TSPS/DTF STERLING LOWER-EXP - 11 Operator assisted rates apply to all toll calls from this telephone.

Fig. 2—Instruction card set for a telephone from which credit card, collect, emergency, and other “free” calls can be made without depositing any coins, and from which long distance calls can be dialed by the caller.

a broken horizontal stripe, representing credit card and speed. The functional meaning of these symbols is explained in the text immediately to the right of the symbol.

3. Dial tone/deposit sequence pictograms: The pictograms in the upper right corner illustrate the sequence for listening for dial tone (depicted as a handset with waveform) and coin deposit. Numbers, as well as spatial position, show the sequence. The post-pay instruction card (not shown) has the additional modifier “Deposit only after answer” between the handset and the coin deposit. The disk representing the coin also contains the initial deposit rate (cost of a local call).

4. Summary instructions: Summary instructions for placing local and long distance calls are located directly below the colored band (for the two-card design). In the long distance case, these instructions are intended to be sufficient for the knowledgeable user to identify the



**Charge, SOS
& Free calls
only.**

**No coin
calls.**

Outgoing calls only

Charge calls	Credit Card & Collect Within this Area Code 0+ Number Outside this Area Code 0+ Area Code + Number Operator assisted rates apply to all calls
Free calls	Directory Assistance Local (Queens) 411 Within this Area Code 555-1212 Outside this Area Code Area Code + 555-1212 Repair Service 526-9942 Toll Free 800 Numbers 800 + Number SOS dial 911 for Emergency help

CAC EXP 14

Fig. 3—Instruction card from a “Charge-a-Call” telephone.

general procedure. The “0+” and “1+” represent the prefixes required before dialing certain types of calls, when needed. The colored word “Operator” indicates that long distance calls cannot be dialed by the caller. Experienced users should be able to recognize the symbols at a glance, and identify the procedure without reading the instructions.

5. Emergency: “SOS” is the internationally recognized emergency symbol, and it is used to identify the number to dial for emergency assistance. Its red color makes it very salient. The use of a unique identifying color makes possible useful public relations messages in non-English-speaking communities. For example, the Chinese press in New York could carry a message stating (in Chinese) “If you need emergency help, dial the red number.” Where dual language instructions are required by regulation, the SOS instruction can be repeated in the second language. Where separate numbers for fire, police, and ambulance are required, the SOS is supplemented with specific symbols (flames, a shield, and a cross) paired with each number.

6. Local instructions: The space directly under the dial tone/deposit symbols is reserved for locally varying instructions. Operating companies may use this space for special instructions or to publicize a new service.

7. Lower card: Specific dialing instructions and service numbers are listed on the lower instruction card. The major sections are divided by a colored rule, and each section has an index heading to simplify searching.

4.2 Preliminary design differences

The instructions shown in Figs. 1 to 3 differ in several respects from the instructions used in the laboratory evaluation. Changes were made

based on the findings of that study, as we discuss in Section V. Briefly, the earlier designs differed from the new designs as follows: (1) There was no summary instruction for local calls; (2) the word "Operator" was not in color on the upper card for operator-dialed long distance calls; (3) all operator-dialed calls were combined into a category called "All other calls" on the lower instruction card; and (4) the local directory assistance number was listed in the same line as the heading "Directory Assistance" when that number was different from the "Within this area code" number. In addition, the handset with dial-tone pictogram and Charge-a-Call symbol were modified between the laboratory test phase and the field test.

V. LABORATORY EVALUATION

5.1 Study goals

The instruction cards were designed to satisfy two major goals. First, users should be able to search successfully and efficiently for the information they need. Second, knowledgeable users should be able to tell at a glance what services and procedures are available on a given telephone. The major purpose of the laboratory evaluation was to determine whether these design goals were met. We used an information search task to assess the new designs and identify needed improvements. The following questions were addressed:

1. Could users find the answers to questions about telephone operation?
2. Did users understand the information provided?
3. Were users able to find information quickly after some experience using standard instructions?
4. Did users understand the symbols and pictograms used on the instructions?
5. Did users infer the meaning of the redundant visual codes (e.g., color) that would allow them to get information at a glance?

In addition, several different formats were evaluated.

5.2 Method

5.2.1 Materials

Three formats for the upper instruction card and two formats for the lower card were used. The same content and design elements described in the preceding section were used in each format. The only differences between the formats were in the arrangement of the information. The formats of the three upper cards were:

1. Horizontal: the design illustrated in Figs. 1 through 3.
2. Two-panel: the information contained in the stripe on the horizontal design was placed in a square patch on the left third of the

card; the other information was listed on the remaining two thirds of the card.

3. Three-panel: the left third was the same as in the two-panel design; the remaining space was divided into two equal sections by a blue or tan vertical bar. The center section contained long distance dialing and local information, and the right-hand section contained emergency information.

The formats of the two lower cards were:

1. Ruled: illustrated in Figs. 1 through 3.
2. Unruled: the colored lines separating categories were removed, the colored headings were placed directly above the listings for that category, and the listings were centered on the card.

Instructions for eight different telephones were created. The operating procedures and available services varied on the eight telephones. Three of the telephones had coin-first service, two had dial-tone-first, one had dial-tone-first/post-pay, and two had Charge-a-Call. Other operating differences, such as initial deposit rate, long distance dialing procedures, emergency numbers, directory assistance numbers (local and long distance), and repair numbers were systematically varied across the eight telephones. Only combinations of services and procedures that actually exist in the operating telephone environment were used. A set of instruction cards was constructed in each of the formats described above for each of the eight telephones. (For this study, upper and lower housing cards were designed for Charge-a-Call.)

5.2.2 Experimental groups

Seventy-two people (six groups of 12) participated in the study. Six conditions were formed by combining each set of upper instruction cards with each set of lower cards. Each group of participants saw cards from only one condition.

5.2.3 Participants

Participants were recruited from the Holmdel, New Jersey, vicinity. The 67 female and five male participants had a median age of 34 years, and a median education of one year of college. They were paid to participate.

5.2.4 Procedure

An information search task was used. Participants in the study were asked to answer many questions about the operating procedures of telephones, based on information obtained from the instructions. Errors in responding to questions indicated that information was not

found or understood. Response times to questions were measured to assess the efficiency of information search.

After the series of main questions were answered, participants were asked to answer a second set of questions. The instruction cards shown in this series had all text removed. Thus, the second set of questions measured incidental learning of the meaning of colors, symbols, and pictograms that occurred in the first part of the experiment. Finally, participants were asked to complete a questionnaire about overall ease of use and appearance of the instructions, as well as further questions about the colors, symbols, and pictograms.

The participants sat at a table that contained a response panel and a 50-cm-square rear projection screen. The viewing distance was two feet, approximately the viewing distance when reading instructions on a public telephone. The response panel contained four buttons, labeled "Ready," "Yes," "No," and "Don't Know." Participants were instructed to place their index fingers on the "Yes" and "No" buttons, and a thumb on "Ready." They were told to imagine that they were traveling, and that they would need to make numerous telephone calls from public telephones. Since telephones have different operating procedures, they would need to use the instructions on the telephones to answer questions before placing the calls.

Each trial began with the presentation of a slide containing a question, such as "Does a local call cost 20 cents?" The participants were told to study the question until they understood and remembered it, and then push the "Ready" button. Pushing the button started a sequence that turned off the question slide, and turned on a slide containing a picture of a telephone with instruction cards on it. The pictured telephone and instruction cards were shown at actual size. Participants were told to look for the answer to the question they had just seen on the instructions, and answer either "Yes" or "No." They were told that all answers were available in the instructions, but if they could not find it to answer "Don't Know."

The experiment was run under computer control; responses and response times were recorded. Response times were measured in milliseconds from the time the picture appeared on the screen until the response button was pressed. There were 96 trials separated by a 2-second intertrial interval, with a 1-minute break between blocks of 24 trials.

5.2.5 Structure of the question series

The questions came from eleven categories: cost of local calls, dial tone/deposit sequence, types of calls that require coin deposit, emergency numbers, long distance calls, calls requiring a "1" prefix, dialing of credit card numbers, possibility of coin use, directory assistance

numbers, repair service numbers, and the address of the telephone (provided on the experimental instruction cards). The 96 trial series contained eight questions from each category except emergency numbers and dial tone/deposit sequence, from which there were 12 questions. For half of the questions the correct answer was "Yes." Questions from each category were paired with each of the eight telephones, except where inappropriate (e.g., no questions about the dial tone/deposit sequence were asked about Charge-a-Call telephones). Question order and left-right position of the "Yes" and "No" buttons were counterbalanced.

Following the 96 questions, 16 questions were presented using the cards with text removed. Participants were told to try to figure out the answers based on the information remaining. Questions were from four categories, emergency numbers, types of calls requiring coin deposit, long distance dialing, and possibility of coin use.

5.3 Results

5.3.1 Main question series

Mean response times were computed for each question category within each trial block (24 questions). An analysis of variance was done on these mean response times. Factors in the analysis were Upper Card Format, Lower Card Format, Trial Block, and Question Category.

No statistically significant ($p < 0.05$) differences in response times were observed between formats. The main effect of Trial Block was statistically significant ($p < 0.001$). Mean response times for trial blocks 1, 2, 3, and 4 were 13.4, 7.9, 6.3, and 5.8 seconds, respectively. Post hoc comparisons of the means showed that block 1 > block 2 = block 3 = block 4. Thus, participants responded more quickly to later questions, which indicates that they could find information more quickly once they had some experience using the cards.

The main effect of Question Category and the Question Category by Trial Block interaction were also statistically significant ($p < 0.001$). Mean response times differed widely across the different question categories. Slow response times, especially later in the question series, are an indication that users may be having difficulty finding or understanding information. In trial blocks 2 through 4, mean response times were relatively short (less than 6 seconds) for emergency numbers, possibility of coin use, repair numbers, cost of local call, and address; response times were slower (8 to 11 seconds) for "1" prefix for long distance, calls requiring coins, long distance dialing, dial tone/deposit sequence, directory assistance, and availability of credit card number dialing. Possible sources of difficulty will be discussed below.

The total number of errors in each trial block and in each question

category was computed for every subject. Both incorrect and "Don't Know" responses were counted as errors. The overall error percentage was 11.4 percent.

An Upper Card Format by Lower Card Format by Trial Block analysis of variance was done on the error data. Only the main effect of Trial Block was statistically significant. There were more errors in the first trial block (15.4 percent) than in the last three trial blocks (9.8 percent). The decrease shows the same facilitative effect of experience that was seen in the response time data.

An Upper Card Format by Lower Card Format by Question Category analysis of variance again showed only the main effect of Question Category statistically significant ($p < 0.001$). The pattern of errors is similar to the pattern of response times. The correlation between mean error rates and mean response times in the 11 categories was high, $r = 0.77$. High error rates are also an indication that users are having difficulty finding or understanding information on the instruction cards.

5.3.2 Incidental learning question series

The instruction cards used in this question series contained only the information that appears in color on the instruction cards. The purpose of this question series was to determine whether subjects had learned the meaning of this information during the main question series. All of the questions could be answered with the information available.

The total number of errors and mean response times were computed for each of the four question categories for every subject. An Upper Card Format by Lower Card Format by Question Category analysis of variance was done on the error data and on the response time data. In both analyses only the main effect of Question Category reached statistical significance. No differences between card formats were observed.

The questions on long distance calling ("Can you dial your own long distance calls?" or "Does the operator dial all long distance calls?") caused the most difficulty. The percentage of errors (58 percent) does not differ from the performance expected from guessing. The long distance category also elicited the highest percentage of "Don't Know" responses (7 percent). Clearly, the participants did not learn that the presence of the "0+" and sometimes "1+" symbols on the upper card indicated that long distance calls could be dialed, and that the absence of "0+" meant that the operator dials all long distance calls.

Performance on the other question categories was substantially better than what would be obtained by guessing, showing that some incidental learning had occurred. However, questions on the types of

calls that required coin deposit did have a fairly high (15 percent) error rate. The answers to these questions could be inferred from either the color of the card (blue or tan) or from the dial tone/deposit sequence.

The "SOS" emergency symbol was well understood. Responses were fast and few errors were made.

5.3.3 Questionnaire results

The questionnaire contained four rating-scale items. The instructions were rated on the ease of finding needed information, the ease of understanding the words in the instructions, the overall ease of understanding the instructions, and the attractiveness of the instructions. The responses were scored from 0 to 5, where 5 was the most positive response. An Upper Card Format by Lower Card Format analysis of variance was done on the ratings for each item. No statistically significant differences between formats were found for any item. Overall, participants rated the ease of finding needed information between "somewhat easy" and "easy" (mean rating 3.6), the ease of understanding words between "easy" and "very easy" (4.3), the overall ease of understanding between "somewhat easy" and "easy" (3.7), and the attractiveness between "somewhat attractive" and "attractive" (3.6).

When asked if any information seemed to be missing from the instructions, the majority of participants responded negatively (67 percent). Of the people responding affirmatively, most of the comments were about the lack of information on placing local calls or about the dial tone/deposit sequence. A few general comments were made, such as "Instructions too wordy," or "Instructions not detailed enough." Similarly, the majority of participants did not report any specific problems understanding the instructions in response to an open-ended probe. The problems that were reported were also about the lack of information on local calls, and confusion about when to deposit coins. In addition, some people were confused about the "0+" and "1+" symbols.

The majority of participants gave no suggestions for improving the instructions. Some general suggestions were made, such as "Make the instructions simpler," or "Make the instructions easier to understand." A few participants commented on the small size of the print. Most suggestions, however, concerned the variety of procedures described on the instructions. The most frequent comment was "Make the instructions the same on all telephones." The nature of the comments made by these participants implied that some thought the operating procedures were determined by the instructions, rather than the reverse.

In the last section of the questionnaire the participants were asked to explain the meaning of the colors and symbols. Most of the participants did not learn the meaning of the blue and tan colors but did learn the meaning of the Charge-a-Call symbol. Ninety-six percent of the participants correctly explained the meaning of "SOS," and most of these recalled that the "SOS" symbol was red.

The "0+" and "1+" on the upper instruction card were generally explained as "Dial 0 (1) and then the number." However, a third of the participants said that "0+" meant "Dial the operator" or "Operator dials long distance." A number of the participants who said that "1+" was for direct-dialed long distance also stated that "0+" was for operator-dialed long distance. Certainly these participants had not learned the distinction between 0+ and 1+ dialing.

The symbol sequence for the dial tone/dial/deposit coin sequence was confusing in some cases. The symbol sequence for coin-first operation was understood by 79 percent of the participants. In contrast, there was some confusion about the meaning of the dial-tone-first symbols. Fifty-four percent of the respondents correctly answered either "Dial tone first" or "No coins needed for dial tone." However, a third of the participants confused the typical dial-tone-first case (deposit coins before dialing local calls) with the post-pay procedure. This pattern of responses is consistent with the general confusion over the dial tone/coin deposit/dialing procedures observed in the experiment.

5.4 Discussion of problems and recommendations for improvement

The major findings in this study relate to the content of the instructions, not the formats.

The highest overall error rate in the main question series occurred on questions about directory assistance numbers. There were two major sources of difficulty. First, the listing for local directory assistance appeared in the same line as the heading, and was hard to find. Since no separate listing for "Local" was made on some of the instructions, the participants tended to infer that the number for "Within this Area Code" was always the local number. This problem was subsequently remedied by adding a separate line for "Local" on the lower instruction card. The other confusion has no obvious solution. The participants expressed confusion over the need for separate listings for "Local" and "Within this Area Code." The confusion may stem in part from the fact that all participants were from New Jersey, where only a single number is used for directory assistance within an area code.

The dial tone/deposit sequence questions contained two subsets of

questions. One subset contained questions about the temporal sequence of hearing the dial tone and depositing a coin, the other about the temporal sequence of depositing a coin and dialing a call. The problems occurred in the latter subset. Forty-eight percent of the participants responded that coins were deposited after answer for the typical (pre-pay) dial-tone-first case. Some people appeared to equate the pre-pay and post-pay dial-tone-first telephones. The post-pay telephone is uncommon (except in a few areas outside of New Jersey), so participants may have been confused about the two types of telephones. The cards tested in this experiment contained no written instructions on how to place local calls. Based on the difficulty seen in this area, some statement about when to deposit coins on local calls appeared warranted.

The same confusion appeared to affect the results in the category of calls requiring coin deposit. Most of the errors occurred on the question "Do you need to deposit any coins to make a local call?" Thirty-eight percent said "No." The additional written instruction described above should also help this problem.

The questions about long distance calling can also be divided into two subsets, one about whether customers can dial their own long distance calls, and the other about the specific digits to dial for long distance calls. Most errors occurred in the latter category, on telephones from which long distance calls were dialed by the operator. These instructions had no specific instructions for long distance on the lower card, just a listing for "All other calls" (Dial the Operator). Some improvement should be obtained if these instructions contained all categories, even though the instruction in every case is "Dial the Operator."

On the incidental learning question series, participants were asked whether long distance calls could be dialed. The answers to these questions had to be inferred from the "0+" and "1+" symbols. If these symbols were present, then long distance calls could be dialed; the absence of a symbol implied that the operator dialed the calls. The problem may have occurred because this upper card information was never used in the main question series. However, the problem may have occurred because of the lack of a positive indicator for operator-dialed long distance. The subsequent addition of such a cue should make the information on the upper card clearer.

Errors were made on 19 percent of the questions about the need for a 1 prefix on direct-dialed station-to-station long distance calls. These errors are hard to interpret since the prefix is not used in New Jersey. The other category that caused some confusion was about customer-dialed credit card numbers. As in the case of the 1 prefix, this information was explicitly stated on the lower instruction card when

appropriate; however, the new procedure was not familiar to New Jersey residents.

In summary, the improvements recommended were:

1. Add a separate line for "Local" directory assistance.
2. Add a written instruction on when to deposit coins for local calls on the upper card; the heading should be "Local calls" and be placed above "Long distance calls."
3. Add a symbol for "Operator dialed long distance" to contrast with the "0+" and "1+" symbols in the long distance section of the upper card.
4. Remove the heading "All other calls" from the lower card and replace it with the same headings used on the other cards "Charge and Person-to-person calls" and "Station-to-station calls."

These changes were incorporated into the instructions used in the subsequent field evaluation. The choice of format (horizontal and ruled) used in the final design was made by AT&T Public Services Marketing and the designer.

VI. FIELD EVALUATION

The major purpose of the field study was to assure that the instruction card design, modified based on laboratory results, was acceptable to telephone users, and that telephone users could use the instructions to find needed information. Because the overall success of the new instructions depends on the use of standard instructions throughout the Bell System, we could not expect to show all the advantages of the new instructions.

6.1 *Field trial sites*

The field trial of the proposed standard instruction cards was conducted in Illinois Bell Telephone (IBT) Company and New York Telephone (NYT) Company at three sites in each company: a major city airport, a large suburban shopping center, and a small, self-contained city. The sites were selected so that a variety of public telephone users would be exposed to the trial instructions: travelers, local residents, local callers, long distance callers, credit card callers, etc. In addition, a second shopping center was selected in each company. The new cards were not installed at the second shopping center.

A broad range of services and procedures was available at these sites. Among the variations in operating procedures were telephones requiring an initial deposit for all calls, telephones requiring a deposit only for coin-paid calls, and Charge-a-Call telephones. At some locations callers could dial their own long distance calls, at others operator assistance was required. At some locations a "1" prefix was required on calls to other area codes; on others it was not required.

6.2 Instruction card content

The information on the trial cards was the same as the information on the instructions they replaced, although some changes were made to conform to the new standards. The changes mainly involved the removal of specific place names. For example, on the existing instructions at Roosevelt Field shopping center in NYT, long distance dialing instructions were given for "Nassau and Suffolk" and "All other places." These specific names were replaced by the general, but equivalent, instructions for "Within this Area Code" and "Outside this Area Code."

6.3 Interview study

Interviews were conducted at selected public telephones in December 1979 (three months after card installation in New York, two months after installation in Illinois). People who had just used a public telephone were interviewed face-to-face by professional interviewers. The interviewer asked a series of questions about the call just made and the use of the instructions, then showed instruction cards identical to the ones on the telephone just used and asked a series of questions about how to place various types of calls. The interviews addressed the following areas:

- Did people look at the cards?
- What information was needed?
- Was the information easy to find?
- Was the information easy to understand?
- Could people find and report dialing instructions correctly for various types of calls?
- What was the overall judgment of the appearance of the card?
- Could people understand the pictograms used on the cards?
- Did people understand the meaning of "SOS?"

A total of 650 interviews were conducted at trial locations, 100 at each of the trial sites, plus an additional 50 interviews at Charge-a-Call telephones at O'Hare International airport. Two hundred additional interviews were conducted at the two shopping centers where the original instruction cards had been left in place. The locations provided a comparison of telephone users' acceptance of and problems using the trial cards. Since the advantage of the new cards depends upon their use in all locations, and since the old cards were familiar to the users, this comparison is not intended to be the proof that the new cards are better.

6.4 Interview results

For the following discussion, the normal approximation to the

difference between two observed and independent proportions was used to test the significance of the differences between results from the trial and nontrial shopping centers.

Less than 25 percent of the people interviewed reported looking at or reading the instructions cards at any location except at the Charge-a-Call telephones, where 63 percent of those interviewed reported reading the instructions. Charge-a-Call telephones look different from regular coin telephones; 88 percent of the Charge-a-Call users who read the instructions reported doing so to find out how to use the telephone, or because the telephone looked new or different. No significant differences were found between the number of interviewees who looked at or read the instructions at the trial and nontrial shopping centers.

The people interviewed reported needing a variety of types of information. The types of information requested were: how to use the telephone; how much money to deposit; how to make collect, credit card, or person-to-person calls; how to dial long distance; and what numbers to dial for service calls. Ninety percent of those interviewed who reported reading the instructions said that the information they needed was easy to find; 94 percent reported that the information was easy to understand. No significant differences were found between the trial and nontrial shopping centers.

Interviewees were asked to use a set of instructions cards identical to the cards on the telephone they had just used to find and report dialing instructions for the following types of calls: police emergency, local directory assistance, collect, and coin-paid station-to-station long distance calls. In all cases, most of those interviewed were able to correctly report the dialing procedures. Most of the errors occurred when the interviewee reported a dialing procedure that would be correct in other settings, for example, reporting "911" as the police emergency number at a location where "0" was the correct response. This type of error was made in both trial and nontrial locations. No significant problems in finding or understanding dialing instructions were identified with the new instructions. The interviewees had no trouble in finding the emergency information associated with the "SOS" symbol.

Pictograms were used on the upper instruction card to represent the dial tone/deposit sequence. The numerals "1." and "2." were used to indicate the sequence.* A coin-like disk indicated both the action of depositing and the amount of the local call deposit. A handset with an

* A separate study conducted by M. L. Viets reported that sequential steps should be indicated by numbers followed by a dot. Omitting the dot led people to interpret 1 and 2 as magnitudes rather than as ordinal steps in a sequence.

expanding waveform indicated the concept "listen for dial tone." Overall, a high percentage of interviewees (88 percent) were able to provide a correct or partially correct meaning for the dial tone/deposit pictograms. Thirty-nine percent gave correct responses that included the correct meaning of both pictograms and the correct action sequence. The remainder gave responses that included correct meanings for some of the elements.

Interviewees were asked to rate the overall appearance of the instruction cards on a six-point scale ranging from very attractive (a rating of 1) to very unattractive (a rating of 6). Overall, the trial cards were rated attractive; the median response was 2 at all locations except the New York shopping center, where the median response was 3 (somewhat attractive). The median rating of the cards at the Illinois nontrial location was 3; at the New York nontrial location the median response was 2.

Interviewees were also asked an open-ended question about their overall reaction to the instruction cards. Most of the comments were positive; however, about 20 percent of the respondents had some criticism of the instructions. The most common complaints were that the print was too small, the appearance of the card was cluttered, and the color unattractive. Overall, 9 percent of the trial location respondents complained about the print size (10-point type). In Illinois, the nontrial cards were dual-language cards. All instructions were printed in both English and Spanish. This required the use of smaller print (8-point type) than on a single-language card. Thirteen percent of the respondents at the Illinois nontrial location complained about the size of the print, and 13 percent more complained about the use of Spanish, indicating that it made the instructions harder to read. Overall, 6 percent of the trial location respondents complained that the cards were cluttered (too much information); however, less than 1 percent of the airport respondents had this complaint, compared to 11 percent in the small cities and shopping centers. Generally, public telephone users in the cities and shopping centers made local calls, and had little need for most of the information on the instruction cards. Seven percent of those who saw tan cards complained about the color of the cards; less than 1 percent disliked the blue cards.

6.5 Field trial conclusions

The proposed standard public telephone instruction cards were acceptable to users. They were rated as easy to use. Telephone users were able to use the trial instructions at least as well as the nontrial instructions, and no major problems were detected. The new card establishes a standard that satisfies users' needs.

VII. CONCLUSIONS

Based on the results of the laboratory evaluation and on the reception of the new instructions cards in the field, AT&T Public Services recommended to all Bell Operating Companies (BOCs) that the new instruction cards be used on all public telephones. The new cards have been introduced in most BOCs. In addition, the new design was made available to the Independent Telephone Companies for use in preparing their instruction cards. We anticipate that the widespread use of the new standard instructions will make public telephones easier to use.

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