The Impact of Technology and Labor Management Strategies on the Efficiency of Telephone Information Services

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ABSTRACT

The impact of two trends on the operational efficiency of telephone information services provided by public transportation authorities is evaluated: (a) rapid technological advancement, and (b) new strategies in labor management. This paper is based on data acquired from 15 on-site case studies conducted at diverse transit authorities across the country, as well as a background literature search. Three technologies are examined: (a) automated and microfiche data retrieval systems, (b) automatic call-distributor (ACD) equipment with management information system (MIS) capability, and (c) computerized rider information systems (CRIS). Four experiments in labor management strategies are examined: (a) use of part-time agents, (b) use of entry-level clerks instead of former bus drivers as agents, (c) contracting out the service to a private firm, and (d) replacement of most agent positions with prerecorded taped messages. The central finding is that strategies that enhance labor productivity by increasing management's control over work practices and labor standards are effective for improving the efficiency of telephone information. This includes ACD equipment, use of part-time employees, and contracting out the service. Although CRIS also has this potential, its capital cost is high, particularly given the uncertainty of its marketing effectiveness in the United States. Replacement of agents with prerecorded announcements reduces costs and hence improves efficiency, but at an unacceptable cost to service effectiveness. Although automated data retrieval may improve the quality (and hence the effectiveness) of the service, it does not, by itself, improve the efficiency.

The purpose of this paper is to examine the impact of two dynamic trends on the operational efficiency of telephone information services provided by public transportation authorities. These two trends are (a) rapid technological advancement and (b) new strategies in labor management.

For the purpose of this paper, telephone information includes only the provision of information on the services offered by transit authorities, and not complaint-handling and other related functions handled by telephone. Included in this definition are two distinct types of calls: the schedule call--the caller knows the route he wants, but needs some specific information such as schedule or fare, and the itinerary call--the caller needs to know how to get from point A to point B.

Telephone information is considered one marketing strategy for getting information about transit services to the public. Other strategies include media advertising, timetable and map distribution, bus stop signs, on-street video displays, and community relations. Telephone information is distinguished from these other strategies by its simultaneous dependence on technology and labor intensiveness, which are interrelated.

By far the largest component of the cost of telephone information is the salaries of the telephone information agents. These costs can be contained and productivity can be improved either by changing the way in which these agents are managed, or by changing the technology on which they are dependent.

Until the 1970s, telephone information (and marketing in general) was often viewed as an unimportant backwater of public transit management. Telephone agents were frequently former bus drivers who were dumped into this role when they could no longer perform the job for which they were trained. Technology consisted of old-fashioned switchboards. Public complaints about busy signals, long waits on hold, and rude agents were common.

The budget crises of the late 1970s and 1980s have forced transit authorities to attempt to improve productivity in all segments of their operation. In addition, a more business-like approach to transit management has revitalized interest in private-sector marketing strategies. These trends have combined with a technological explosion to make telephone information one of the more dynamic areas in transit management. New technologies include automatic call distributor (ACD) equipment, automated and microfiche data retrieval, and computerized rider information systems (CRIS). These technologies (discussed in detail in a later section), have been made even more available as a result of the coincidental deregulation of the telephone industry. New labor strategies (discussed later) include the use of entry-level clerks, part-time employees, private contractors, and replacement of most agents with prerecorded announcements.

The focus of this paper is on the efficient production of telephone information service. Efficiency relates to the quantity of service produced for a given cost. In considering techniques to make telephone information more efficient, the ultimate effectiveness of telephone information as a marketing strategy has not been ignored. Effectiveness refers

to the end product of an activity. Does it serve any useful purpose? In the case of telephone information, this might be increasing ridership or revenue for the system, providing essential information to citizens, or enhancing the image of the transit system.

Effectiveness can be enhanced by improving the efficiency of production or the quality of the final product (in this case, information). Quality may be improved through efficiency measures, or in opposition to efficiency. For example, the quality of a product can be improved by increasing the per unit cost of production (less efficiency) or by refining production techniques (more efficiency). Similarly, efficiency measures may have positive, negative, or neutral impacts on effectiveness. These impacts may be intended or unintended. Throughout this paper, an attempt is made to relate efficiency and effectiveness. This part of the discussion is, of necessity, mainly theoretical. Although there have been studies relating telephone information in general to effectiveness measures such as transit ridership, the relationship between a specific change in telephone information and an increase in ridership is mainly hypothetical at this time. Only the manufacturers of CRIS technology have claimed such a direct connection.

In the next section the methodology of this study and previous research conducted in the field is discussed. Given the large number of case study sites, transit authorities are referred to throughout this paper by city (or county) name, rather than by transit authority name or acronym. This is done to enhance the readability of the paper, and is not intended to imply that these transit authorities are city (or county) agencies.

METHODOLOGY

This paper is based on 15 case studies conducted at transit authorities across the country and a literature review of existing research in the field.

Case Studies

The data on which the findings of this paper are based were developed by using 15 on-site case studies. Although this represents too small a sample on which to base claims of statistical validity, it does represent a broad range of transit authority characteristics, geographic locations, and approaches to telephone information. Table 1 gives the characteristics of the transit authorities and their telephone information systems. Where hard data are lacking, the perceptions of transit authority officials working in this area have been relied on.

Case study sites ranged in size from Chicago, which has 5,071 revenue vehicles, to South Bend, Indiana, which has 57. The sites ranged from cities with intense transit use and long transit histories, such as Chicago and Milwaukee, to sunbelt cities with neither, such as Orange County, and San Diego, California, and San Antonio, Texas. The sophistication of the telephone information systems ranged from the most advanced automated equipment in Washington, D.C., to a switchboard operated by one agent in South Bend, Indiana, and Allentown, Pennsylvania.

Not all of the case study sites generated data relevant to this particular paper (although they may have generated data relevant to the study as a whole because the complete study concerned a wide range of issues relating to telephone information). Only those sites that did produce data specifically related to the topic of this paper are included in this discussion.

Evaluation Methodology

A literature search was conducted to establish a methodology for evaluating the data to be obtained from the case study sites. This research led to the definition of seven measurements of efficiency for telephone information.

- Percentage of calls that are placed on hold and wait in a queue before being handled by an agent.
- Length of time the average caller spends on hold.
- Percentage of calls that are lost from hold; that is, the caller gets tired of waiting and hangs up.
- Percentage of calls that receive a busy signal and thus cannot get into the system.
- Number of calls serviced (the caller actually gets to talk to someone) per agent per hour.
- Average transaction time (on-line with an agent) of each call.
- Cost per call.

Being placed on hold is a tremendously frustrating experience for the consumer. Many will give up and never call again (and perhaps never ride transit again, either). The literature indicated that in the transit industry, it is not unusual for 80 to 90 percent of calls to be placed on hold, with lost call rates of 11 to 22 percent (1). At the 15 case

TABLE 1 Case Study Characteristics

City	Transit Authority	No. of Reserve Vehicles	Special Characteristics
Chicago	Regional Transit Authority (RTA), Chicago Transit Authority (CTA)	5,071	Private contractor; microfiche
Los Angeles	Southern California Rapid Transit District (SCRTD)	2,905	Automated data, ACD
Washington, D.C.	Washington Metropolitan Area Transit Authority (WMATA)	2,061	Automated data
Seattle	Seattle Metro	1,299	Marketing Philosophy[a]
St. Paul	Metropolitan Transit Commission (MTC)	1,078	Automated data
Portland	Tri-County Metropolitan Transportation District of Oregon (Tri-Met)	660	Reduction of agent staff; microfiche
Miami	Metro Transit Agency	608	ACD (planned)
Milwaukee	Milwaukee County Transit System (MCT)	595	ACD
San Antonio	Via Metropolitan Transit	546	Marketing philosophy, part-time agents
Orange County	Orange County Transit District (OCTD) (Calif.)	497	Microfiche, part-time agents
Louisville	Transit Authority of River City (TARC)	311	Marketing philosophy
San Diego	San Diego Transit Corporation	280	CRIS
Albany (N.Y.)	Capital District Transportation Authority (CDTA)	240	Marketing philosophy
Allentown	Lehigh and Northampton Transportation Authority (LANTA)-(Pa.)	59	Marketing philosophy
South Bend	South Bend Public Trans (TRANSPO) (Ind.)	57	Marketing philosophy

[a] Marketing philosophy refers to a strongly held position of the authority either in favor of, or against, telephone information as an effective marketing tool.

study sites, an average of 58 percent of calls were placed on hold for an average time of almost 2 min. It was also found that 11 percent of these callers hung up (lost calls) before their calls were serviced.

A caller who receives a busy signal cannot access the system. Industries that place a premium on caller access for marketing success, such as the airlines, consider call busy rates in excess of 1 to 3 percent to be unacceptable (2). On the basis of limited data, an average busy rate of 15.7 percent was found.

The efficiency of agents in handling calls is an important determinant of overall system productivity. The literature suggested call handling rates that ranged from 20 to 40 calls per agent per hour (3). An average of 31 was found among the case study sites. Related to the number of calls handled is the amount of time spent on each call (transaction time). Although a few authorities stressed quality time over the quantity of calls handled, most emphasized providing essential information in the minimum amount of time in order to handle the maximum number of calls. An average transaction time of almost 2 min was found among the case study sites.

The average cost per call was $0.50, ranging from almost $1.00 to under $0.20. The main determinant in cost per call was the prevailing wage rate in the area. The remainder of this paper contains an analysis of the impact of new technologies and labor management strategies on improving these measurements of efficiency.

IMPACT OF NEW TECHNOLOGIES

Three technologies were evaluated in the course of this study:

- Automated and microfiche data retrieval,
- Automatic call distributor equipment with management information system (MIS) capability, and
- Computerized rider information systems.

Traditionally, telephone information agents would find information by flipping through well dog-eared timetable and routing books. From this they construct a routing (itinerary) for callers wanting to know how to get from point A to point B. Depending on the size of the transit authority and the skill of the agent, some agents would memorize many answers over time and thus speed up the process.

The first application of a new technology to this function came in the mid-1970s with the use of microfiche readers. These machines work in one of two ways. The most familiar type enables the user to scroll through a microfiche file to locate, by trial and error, a specific item. A more advanced version permits the user to enter a code on a keyboard that will automatically locate a specific item, in this case a route timetable. Five transit authorities (Chicago, Miami, Orange County, Portland, and Washington, D.C.) either currently use microfiche or have used it in the past.

Automated data retrieval systems take the functions of data storage and retrieval from paper and microfiche and place them on a computer. Thus, each agent works at a video display terminal calling up answers from a computer memory. In addition, many of these systems also perform the function of calculating the best available routing by means of a software algorithm. In theory, this added function eliminates the interpretive role of the agent in working out answers to complex itinerary (routing) questions. Two authorities, Washington, D.C., and Los Angeles, have systems that perform all three of these functions (data storage, retrieval, and calculation). In St. Paul the system performs only the data storage and retrieval functions.

Automatic call distributor equipment has its origins in the call sequencers developed for the airlines during the boom years of the 1960s. The basic function of this equipment is to sequence calls on a first-come, first-served basis so that no callers experience random long-holds. It was hypothesized that this feature would reduce the number of calls lost from hold. The newest generation of this equipment includes a complete management information system component. For example, data will be compiled on both live video screens and hard copy printouts on the type of efficiency measurements discussed. This enables the system managers to evaluate the productivity of their operation as a whole and the performance of individual agents. Whereas supervisors previously had to check up on agents by peering around the room or listening in on calls, they can now simply view, in real time, a numeric description of an agent's performance on a video display. The following transit systems have installed this type of ACD equipment: Chicago, Los Angeles, St. Paul, and Milwaukee.

The final technological advance investigated was the computerized rider information system (CRIS). The basic function of a CRIS is to replace agents with a computer-generated voice response. The service area of the authority is divided into a series of route or even service-stop-specific components. Each component receives a unique telephone number that riders may call to receive a computer-generated voice response describing service in their specific service area. These calls can be made from home, or in some cases, from telephones installed at major service stops. The real potential of a CRIS system lies in its ability to be updated on a real-time basis. For example, if weather or traffic has disrupted a vehicle's schedule, this information could be substituted for the standard timetable. Thus riders (particularly those in inclement climates) would not have to run out and wait for a vehicle that was delayed. Theoretically, this would make these riders more likely to use transit. One test of CRIS technology conducted in San Diego was investigated. UMTA is currently sponsoring CRIS tests in Columbus, Ohio, Erie, Pennsylvania, Pittsburgh, and Salt Lake City.

Automated and Microfiche Data Retrieval

Microfiche data retrieval is a technology whose time appears to have passed. There is no evidence that microfiche enhances any of the efficiency measurements. In fact, three problems associated with microfiche appear to be almost universal:

- The machinery tends to break down under heavy use.
- It is expensive and time-consuming to update the data base.
- The system is ineffective for answering itinerary-type questions, particularly those requiring a transfer.

For these reasons, both Washington, D.C., and Miami abandoned microfiche in the late 1970s. Washington automated, and Miami returned to a manual system. Although the three authorities that still use microfiche expressed general satisfaction with its performance, no authority not currently using it expressed any interest in adopting it.

The situation is more complex among automated data retrieval systems. These projects were instituted as highly publicized UMTA capital and research

grants. This is particularly true of the Washington, D.C., project known as Automated Information Directory System (AIDS) and the Los Angeles Computerized Customer Information System project (CCIS). Both have been studied in depth and have developed a strong constituency for the concept in the public sector and in the private software development field.

As mentioned previously, the Washington, D.C., and Los Angeles systems perform the three functions of data storage, retrieval, and calculation. The St. Paul system does not perform calculation. Nevertheless, there are significant differences between the Washington, D.C., and Los Angeles systems:

- AIDS was implemented throughout the entire Washington, D.C., service area whereas CCIS was implemented as an experiment in only a small part of the Los Angeles service area. Los Angeles is now preparing to implement CCIS areawide.
- Washington uses a dedicated minicomputer, whereas Los Angeles' telephone information center shares time with other departments of the transit authority on a mainframe computer.
- Washington's agents were trained in-house and were actively involved in designing the system, whereas this was not the case initially in Los Angeles.

A variety of problems have affected all three systems. Rewiring and upgrading of air conditioning (for the computer) has been expensive and time-consuming. The time-sharing arrangement in Los Angeles resulted in processing slowdowns when other departments did large batch-processing jobs. This problem has been resolved by improved scheduling. On the other hand, Washington, D.C., has encountered processing slowdowns by exceeding the capacity of its minicomputer far more quickly than anticipated. This capacity is now being upgraded. Los Angeles, by initially turning over project design and training to an outside contractor, encountered severe staff resistance.

Despite these divergent experiences, the impact of the equipment has been quite consistent. Contrary to initial expectations at all three authorities, automated data retrieval has not resulted in improved operational efficiency.

This conclusion is demonstrated by the data in Table 2. The three systems that have automated retrieval are near or below average in almost all efficiency measurements. This interpretation is also supported by the telephone information managers who were interviewed. Among the three systems, Washington, D.C., had perhaps the most realistic expectations regarding automated retrieval as an efficiency tool, and the least disappointment.

What automated data retrieval has done, according to system managers, is improve the quality (i.e., effectiveness) of information by providing more accurate, up-to-date, and consistent answers to questions. This is accomplished (in the Washington, D.C., and Los Angeles systems) by providing agents with a single, correct answer to difficult itinerary questions, instead of having each agent figure out his own answers. In addition, updating a computerized data base is significantly easier than either hard copy or microfiche update. Thus, the data base can be more easily kept current and accurate. System managers, particularly in Washington, believe that this improved service quality translates into enhanced marketing effectiveness.

Reasons for the failure of automated retrieval to improve agent efficiency vary. In Washington, D.C., this function always played a secondary role in management's philosophy to improve the quality of information. Thus, agents are instructed to use AIDS only when needed and to answer questions fully rather than quickly. Reflecting this philosophy, Washington, D.C., had the lowest level of calls per agent per hour (20 to 25) of all the authorities studied.

On the other hand, Los Angeles officials have always stressed the efficiency potential of CCIS. Their explanation (supported by St. Paul officials) as to why this potential has not been reached is that this technology by itself cannot solve problems rooted in labor performance. Controlled tests conducted at Los Angeles during the implementation of CCIS found agents capable of handling 28 to 32 calls per hour, whereas they only handled the then standard Los Angeles rate of 20 while actually on-line with CCIS (4). The explanation of Los Angeles officials for this phenomenon is that agents use CCIS to pursue their own, rather than the authority's agenda. Thus, instead of handling more calls per hour, the agents use the enhanced data retrieval capability of CCIS to handle the same number of calls per hour as before, while providing themselves with additional informal downtime. This downtime can take the form of checking answers unnecessarily with the computer, or simply resting between calls. The telephone equipment in use required the agent to request the next call feed.

All three authorities planned to combat this problem by turning to automatic-call-distributor equipment. The impact of this equipment is examined next.

Automatic-Call-Distributor Equipment

Automatic-call-distributor equipment with management information system capability is the one technological development that has statistically demonstrated the capability of improving the efficiency of telephone information.

This capacity is demonstrated by the data in Tables 3 and 4 using two different efficiency measurements. The data in Table 3 display the change in the calls lost from hold rates for the four authorities that installed new ACD equipment. As shown, three of the four authorities (Chicago, Los Angeles, and Milwaukee) documented improvements ranging from 43 to 86 percent in this productivity measure. This means that far fewer callers were hanging up after

TABLE 2 Impact of Automated Data Retrieval on Efficiency

Measurement	Washington, D.C.	Los Angeles[a]	St. Paul	15-City Average
Calls on hold, %	75	75	50	57.5
Time on hold	4:45	4:30	2:30	1:50
Lost from hold, %	8	39	10	11.1
Calls per agent per hour	22.5	27	25	30.9
Transaction time	2:45	2:12	1:38	1:50
Busy signals, %	18	13	NA	15.7
Cost per call, $	0.47	0.83	0.94	0.50

[a]The Los Angeles data represent the period between the installation of CCIS in a test area and the installation of new ACD equipment.

TABLE 3 Improvement in Calls Lost from Hold, ACD

Authority	Previous Calls Lost from Hold (%)	Current Calls Lost from Hold (%)	Improvement (%)
Chicago	35	5	86
Los Angeles	39	11	72
Milwaukee	11.3	6.4	43
St. Paul	10	10	0[a]

[a]Reduction in agent staff is 17 percent.

TABLE 4 Improvement in Agent Efficiency, ACD

Authority	Previous Calls per Agent per Hour	Current Calls per Agent per Hour	Improvement (%)
Milwaukee	22.6	41	81
Chicago	31.5	35	11
Los Angeles	27	30	11
St. Paul	25	25	0

being placed on hold. This could only be due to a reduction in the average amount of time spent on hold. While Chicago instituted a major change in its labor arrangements simultaneously with the installation of AIDs equipment, the situations in Los Angeles and Milwaukee were relatively stable and controlled. Although St. Paul was unable to document a similar improvement, transit officials were able to maintain the same level of performance with a 17 percent reduction in the number of agents employed.

The data in Table 4 indicate a similarly dramatic impact on agent efficiency, ranging from an 11 percent improvement at Chicago and Los Angeles to 81 percent at Milwaukee. Although St. Paul could not document improvement, if fewer agents were handling the same number of calls as before the change, each agent had to be handling more calls per hour. It is reasonable to assume that improvements in lost call rates would coincide with increases in agent call-handling levels.

ACD equipment can, in theory, accomplish the following:

- Improve call sequencing to eliminate the random "long" hold.
- Provide managers with better data to enhance their ability to schedule staff between peak and off-peak periods.
- Provide supervisors with better data to monitor individual agent performance.
- Feed calls automatically to the next available agent, removing the power from the agent to call for a call when ready.

The managers at all four authorities attributed the efficiency improvements primarily to the last two points, the improved ability of supervisors to monitor individual agent performance, and the automatic call feed. For example, Milwaukee's marketing director stated that "the key to agent productivity is availability to answer calls." He went on to point out that an agent should be available (according to their work rules) to answer calls 440 min during the day. With ACD equipment, they now have the means to enforce that standard. In Los Angeles, the installation of new ACD equipment will enable managers to enforce a new, higher standard for calls serviced (actually answered by an agent), and to institute very specific work rules regarding time away from the work station. They believe that this will enable them to take full advantage of the efficiency potential of the automated data retrieval system.

Computerized Rider Information Systems (CRIS)

The impact of a CRIS system was reviewed at San Diego, which had conducted a test financed jointly by the transit authority and a leading CRIS contractor. Two caveats must be expressed regarding the results of this test. First, San Diego is a sunbelt city with the most benevolent climate in North America. The value of the CRIS concept was first demonstrated in Canadian cities where climate made up-to-date bus status reports a highly valued piece of information (5). Second, disagreements between the San Diego transit authority and the contractor resulted in delays and mid-experiment design changes that could also have affected the results.

San Diego officials viewed CRIS as a tool for improving both the effectiveness and efficiency of telephone information. CRIS technology is being aggressively marketed specifically as a device for increasing transit ridership, particularly in off-peak periods (6). The theory is that casual, sporadic off-peak riders will be more likely to use transit if they can obtain real-time status reports on the operation of their route. San Diego, as a classic sunbelt transit authority, had low market penetration, low visibility, and little tradition of transit riding. They were therefore particularly interested in CRIS' potential as a marketing tool.

However, the San Diego Transit Authority also recognized that they had a severe capacity problem on their telephone information system, a situation confirmed by this author's evaluation. Basically, the lack of knowledge about transit among riders induced a high level of calling for information. This phenomenon was observed not only in San Diego, but also in the other sunbelt cities as well. Thus, the hope was that if a significant percentage of calls could be diverted from live agents to CRIS, the efficiency of the "live" system would be improved without the long-term operating costs of hiring more agents.

Five typical routes were chosen as CRIS test routes, and three similar routes were chosen as control routes. The control routes were subjected to traditional direct mail and on-board marketing campaigns. CRIS was heavily marketed on the test routes. The test was to be considered a success if the CRIS routes increased ridership by at least 3 percent more than the control routes. The test lasted for 6 months.

Routes	Ridership Change (%)
CRIS	-2.8
Control	+1.3
Rest of authority	-7.0

As indicated below, while both the control and test routes outperformed all other routes in the authority, the control routes outperformed the CRIS routes by 4.1 percent. The CRIS routes actually experienced a net ridership decrease (although not as severe as the rest of the authority). At least in a sunbelt city such as San Diego, CRIS did not prove to be an appropriate tool for increasing the effectiveness of telephone information as a marketing tool.

Nevertheless, San Diego officials still believe that CRIS has the potential to improve the efficiency of telephone information. For example, they estimate that they lose approximately 5,000 calls per day. If 20 percent of these calls are the schedule-type call (as opposed to an itinerary call) that can be handled by CRIS, this could divert 1,000 calls per day from the live telephone system. (CRIS is not effective for itinerary calls because the caller must first know what route telephone number to call.) To handle these calls would require four additional agents. In the long run, the initial capital investment for CRIS ($500,000 for only five routes) might prove more cost-effective than hiring additional agents and increasing operating costs long into the future.

Thus, the experience of CRIS in San Diego was really the opposite of the automated data retrieval experience in Washington, D.C., and Los Angeles.

AIDS and CCIS, initially perceived as means of increasing efficiency, have proven to be mainly devices for enhancing effectiveness. CRIS, perceived as a device for enhancing effectiveness, was found to have greater potential for improving efficiency. However, its initial capital cost compared with either ACD equipment or automated data retrieval is high. The complete AIDS installation in Washington, D.C., cost about $1,000,000 for all routes. Milwaukee estimated that its ACD equipment cost $500 per month more than its old telephone equipment. Based on efficiency improvements, Milwaukee transit officials estimated a 5-year breakeven point. New ACD equipment in Los Angeles cost $300,000. In San Diego, agents' starting salary was $12,418 per year. Assuming 100 percent overhead, the avoidance of the need for four new agent positions will save almost $100,000 per year. This will result in a 5-year payback for the capital cost ($500,000), without discounting for inflation or considering the operating costs of CRIS. However, this only covers 5 of San Diego's more than 25 routes. Thus, CRIS may be an expensive method of improving efficiency and hard to justify without more certain payback in increased ridership and revenue.

LABOR MANAGEMENT ISSUES

In this section the impact of four trends or experiments in labor relations involving telephone information agents is examined:

- Use of entry-level personnel instead of former bus drivers,
- Use of part-time employees,
- Contracting out of work to a private firm, and
- Elimination of most agents positions in favor of prerecorded announcements.

Use of Entry-Level Personnel

Of the 15 transit authorities included as case studies, only 3 continue to employ significant numbers of former bus drivers as telephone information agents: Milwaukee, St. Paul, and Portland. Both Milwaukee and St. Paul officials hope to phase out this practice. Chicago and Los Angeles eliminated the practice of using former bus drivers in recent years.

Agent productivity in Milwaukee was the best among all the case studies (41 calls per agent per hour) following installation of new ACD equipment. Productivity in St. Paul was relatively poor (25 calls per agent per hour), and officials there conceded that serious problems existed in labor-management relations. Productivity in Portland was just slightly below average (29 calls per agent per hour). Although Portland officials expressed general satisfaction with agent performance, they eliminated most agents in a dramatic cost-cutting move. (See section on Eliminating Agent Positions.)

There are generally two complaints about the use of former bus drivers as telephone information agents. First, although bus drivers may be knowledgeable about the route network, they are poorly suited by temperament and training for the task. Second, they are expensive. They have seniority, and typically maintain their membership in the bus driver's union. Portland had the highest starting salary of the 15 authorities ($11.82/hr), primarily because they had eliminated most of their junior-level employees. Milwaukee had the second highest level ($9.01/hr), whereas St. Paul's starting salary was closer to average. The impact of the use of former bus drivers can be seen in the fact that wage rates in Portland and Milwaukee exceeded those of much larger and more expensive cities such as Chicago, Los Angeles, and Washington, D.C.

Entry-level personnel, in addition to costing less, can be trained from the start of their employment with the transit authority to perform this specific, difficult function. Bad habits do not need to be changed.

Most managers believed that entry-level personnel provided better quality (hence more effective) service once they learned the route network. They also believed that being more responsive to management direction, they provided more efficient service as well, although insufficient data existed to prove this point.

Use of Part-Time Employees

Transit telephone information suffers from the same peak-to-base ratio problems as transit service itself. The morning and late afternoon ridership peaks roughly correspond to similar calling peaks. The cost-effective management solution for telephone information service, as for operations, is the use of part-time employees.

Traditionally, with the use of former bus drivers as agents, union rules prohibited the employment of part-time agents. However, this pattern is changing. Eight of the 15 case study sites currently employ part-time agents, and one other is negotiating with its union for the right to do so. Three systems (Allentown, San Antonio, and Orange County) employ primarily part-time agents. This list includes both unionized and nonunionized authorities. Of those not employing part-time agents, officials in Washington, D.C., and San Diego opposed the practice; St. Paul and Portland had strong unions and used former bus drivers, and Albany and South Bend were too small for it to be an issue.

The major arguments against the use of part-time agents is that (a) they do not work enough hours to become proficient, and (b) they have high turnover rates requiring frequent and expensive training of new hires. None of the authorities currently employing part-time agents reported any problems of this nature. Although the sample is small, and many factors are involved, there is no statistical evidence that part-time agents are less proficient, nor is there statistical evidence that authorities with large numbers of part-time agents employ fewer agents than authorities of comparable size.

Contracting Out the Service

One of the most dramatic experiments encountered in researching this paper was the decision of the Chicago area Regional Transit Authority (RTA) and the Chicago Transit Authority (CTA) to contract out their telephone information service to a private firm. This author is unaware of other authorities that have taken this step. It is a particularly startling development given that it took place in one of the old-line, strongly unionized, northern urban transit authorities.

The Chicago Transit Authority operates the bus and rapid rail systems in the city of Chicago and nearby communities. The Regional Transit Authority operates or contracts for the operation of commuter rail and suburban bus services, as well as performs regional multimodal planning and financing functions. Until March 1983 CTA provided all telephone information service for Chicago area public transit in-house under contract to the RTA. At that time, the RTA contracted out all transit telephone infor-

mation to the firm of Very Important Personnel, Inc. (VIP). VIP is essentially a temporary employment agency that provides fill-in support staff to private corporations.

The decision to contract out was made for both cost and quality reasons. Chicago officials estimate that by contracting out they will reduce the cost of telephone information by $500,000 annually. This cost savings is due almost entirely to the change from unionized CTA agents (primarily former drivers and ticket agents) earning $9.00/hr to nonunionized, entry-level clerks earning $6.00/hr. RTA officials also believe that the quality of the service has been improved. They characterized CTA agents as often "unfriendly" and "difficult to discipline or fire" because of union regulations.

As discussed in the section on Automatic-Call-Distributor Equipment, Chicago has experienced significant efficiency improvements; however, it is impossible to definitively attribute these improvements to any one of the following factors:

- New ACD equipment,
- Replacement of former bus drivers with entry-level clerks, or
- Replacement of unionized government employees with nonunionized private sector employees.

Chicago officials tended to downplay (for understandable reasons) the significance of the last point. This author tends to believe that, along with the ACD equipment, it was highly significant. In combination, these two changes enabled Chicago to regain management control and impose and enforce work standards on their employees.

The transition to the new system was not without its problems. Initial cost savings were not as high as anticipated. New agents were rushed into service with low knowledge levels. Although caller complaints about agent rudeness essentially stopped, complaints about inaccurate information and calls taking too long soared.

Chicago officials recognize that mistakes were made because the process was rushed (undoubtedly to secure a fait accompli for political reasons). CTA personnel were initially used as trainers and, not surprisingly, resented losing the service. Microfiche data and microfiche data retrieval machines were vandalized during the last weeks of operation at CTA. By the time the machines arrived at VIP, most were in need of repair.

In retrospect, it is somewhat surprising that Chicago did not experience even more serious labor problems in implementing this decision, as it involved the transfer of CTA jobs. It does appear that Chicago ameliorated the potential for labor problems by placing agents in other open positions within the organization. A few even accepted transfer to VIP at the lower salary. Nevertheless, it is a commentary on the strength of management's hand in labor relations today that this change could be effected with as little trouble as occurred.

Eliminating Agent Positions

An equally dramatic experiment was undertaken at the Portland transit authority (Tri-Met). Due to budgetary constraints, Portland needed to reduce the cost of its telephone information service. Public opinion surveys revealed that 10 percent of callers made 65 percent of all calls. (The "frequent caller" syndrome is a commonly perceived problem in the industry but little data exist regarding its extent.) Portland's goal was to create a special product that would remove frequent callers from the regular telephone system and to target live telephone information to new riders with little knowledge of routes and schedules.

This goal was pursued through the replacement of 11 out of 17 live telephone agents with prerecorded taped messages for each of the 65 Portland routes. This system is known as Call-A-Bus (CAB). Because Portland's agents are mainly highly paid former bus drivers, this action resulted in savings of $242,000 in annual operating costs.

The CAB is not advanced technology, it is rather a different application of older technology implemented specifically to reduce labor costs. Thus, it has been included in the labor management section rather than the section on new technologies. This is not a CRIS system; the messages are prerecorded by humans rather than computer-generated, and there is little real-time updating capability. Also unlike CRIS, each message must supply information on an entire route, not just a small relevant section. This results in extremely long and complex messages.

Four agents now staff a traditional live telephone information service during business hours only. Most calls (70 percent) go to the CAB system, which operates 24 hr/day. A small office has been set aside to house the tape recorders, and a separate machine is required for each tape. One telephone agent spends approximately one-half of her time maintaining the tapes. This work involved performing semiannual updates, reroutings, and record-keeping such as call rates per machine. The tape system affords callers instant access in that there are almost no holds or busy signals. Portland officials estimate that given the anticipated expansion of the transit authority, including the addition of light rail service, the CAB will save $1,015,597 in personnel costs by 1986. This calculation is based on 8 percent inflation, the present reduction in staff, and the augmentation in staff that would have been necessary to maintain current service levels.

To compensate for the reduced availability of live information, other forms of marketing were substantially increased. New informational bus stop signs were located throughout the region. These signs include information on fare zones, routes, frequencies, and directions. In addition, Portland had previously invested heavily in interactive video communication. The downtown transit mall consists of eight trip planning kiosks that provide systemwide maps and menu-driven, user-activated video screens that identify routes, destinations, and relevant schedule data. This concept will be greatly expanded with the advent of the light rail system.

The CAB system is clearly oriented to the user who has a certain degree of familiarity with the route network. As callers with absolutely no knowledge of the transit network, we must confess to being left behind by a typical taped message within 5 sec. It clearly would be impractical to create a separate message for smaller route segments and to maintain a separate tape recorder for each.

Portland officials report that during the first few months of operation, there were considerable complaints about the change. However, after almost a year of operation, there were few complaints. Nevertheless, there were some disturbing changes in Portland's efficiency measurements. Most particularly, the lost call rate increased from approximately 14 percent to 26.4 percent--the highest level observed among the 15 case studies. Lost calls are a prime indication of unmet demand. The increase in this indicator clearly suggests that Portland has reduced the supply of live agent service beyond the reduction in demand for this service and its diversion to CAB.

On the other hand, cost savings were indeed sub-

stantial. The cost per call for CAB is $0.06, compared with $0.74 for agent-handled calls. Among the case study sites, Portland now devotes the lowest share of its operating budget (0.2 percent) to telephone information.

Lacking public opinion survey data, it cannot be stated definitively whether the CAB system provides as effective a service as live agents. Certainly the lost call rate is indicative of unmet demand. The relative lack of complaints could mean that Portland is meeting people's informational needs in other ways (as Portland officials contended), or that a portion of the constituency has simply ceased to attempt to obtain information. Although Portland may have found a cost-effective way to meet the needs of frequent riders, there must be concern about the impact of this system on future ridership growth. Given the complexity of the CAB message, and the high lost call rates, individuals with the greatest need for information (non-riders or infrequent riders) receive the poorest informational service from Portland. If the needs of this market segment are not met, from where will ridership growth come?

At the time of the case study, Portland officials vigorously defended this system as one begun for budgetary reasons, but one that had become desirable in its own right. Since that time, several management changes have taken place and some telephone information agent positions have been restored.

CONCLUSIONS

The conclusions from this study are that the crucial element in improving the efficiency of telephone information is labor productivity. Actions, whether technological or management-oriented, that attack the problem of labor productivity, have the potential to produce more efficient service. These actions include installation of ACD equipment with management information system capability, use of part-time agents, and contracting out services. All of these actions have one feature in common: they provide management greater supervision over employee work habits and greater control over the establishment of work assignments.

On the other hand, automated data retrieval, despite the expectations for it, has not had this impact. In theory (although no hard data exist), it is capable of improving the quality of the information provided. But this is different from improving the efficiency with which the information is provided. Automated data retrieval has had a positive impact on efficiency only when combined with a management-control tool--ACD equipment.

Both CRIS and Portland's CAB system appear to have the potential to improve some efficiency measurements, but their impact on effectiveness is questionable. Although CAB improved the cost per call, it harmed other efficiency measurements such as lost call rates. This, in turn, may well have a negative impact on effectiveness by failing to meet the demand for information. Contrary to expectations, CRIS had a relatively neutral impact on effectiveness in San Diego. CRIS is marketed by private contractors primarily as a means to directly affect ridership (hence revenue) levels by improving the quality of telephone information. This, in turn, justifies its capital cost. Viewed as a means to improve the efficiency of producing telephone information, with a much more tenuous connection to ridership and revenue (i.e., effectiveness), the cost is hard to justify in comparison with other available tools.

Thus, in considering a change in the telephone information system, it is important for a transit system to understand its goal. If the system is primarily concerned with improving marketing effectiveness, automated data retrieval may well be the answer. CRIS may also be effective in certain circumstances (such as cold weather climates). If the interest is in improving efficiency, ACD equipment (by itself or in combination with automated retrieval) or labor management strategies are more appropriate. In selecting a goal, the agency must realize the potential interrelationship of efficiency and effectiveness. Strategies that improve certain efficiency measurements (such as Portland's CAB system) may have negative consequences for marketing effectiveness, and thus cost the authority money in the long run by depressing ridership growth. However, both automated data retrieval and efficiency actions such as ACD equipment may enhance the ultimate effectiveness of telephone information. Automated data retrieval provides better information, even though it does not improve the efficiency by which the information is produced. ACD equipment, for a modest capital investment, can improve the amount of information disseminated, which also may have an impact on effectiveness. It definitely does have an impact on staffing levels, unit costs, and other efficiency measurements such as lost calls and holds.

A topic for future research might be the establishment of a relationship between these various actions and transit ridership levels. UMTA is conducting such a study in regard to CRIS, but this author is not aware of studies involving automated data retrieval or ACD equipment. It would be particularly worthwhile to know whether information quality (consistent, up-to-date answers as produced by automated data retrieval) or quantity (short and infrequent holds produced by ACD equipment) is the more significant factor, or if either has any impact.

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The opinions expressed in this paper represent only those of the author.

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Transit Marketing: The State of the Art

CAROL WALB and ROSEMARY BOOTH

ABSTRACT

The role of marketing in the transit industry has undergone numerous changes in the past decade, expanding as the task of attracting new riders or retaining existing riders has become more complex. A review of current marketing practice at representative transit agencies in North America is summarized in this paper. The review demonstrates the complexity of the marketing function, which encompasses market research, service development, pricing, promotion, consumer aids, and evaluation. Although most agencies surveyed reported activities in each of these areas, few had comprehensive programs that linked all elements. Considerable sophistication was demonstrated in specific promotional techniques such as radio and television advertising; use of car cards and billboards and in consumer information aids such as schedules and timetables, telephone information systems, and system maps. Quantifiable evidence of the effectiveness of such techniques is generally lacking, however, and a need for further research is evident. The review revealed a number of promising new practices. Included among these are market segmentation and target marketing, direct contact marketing, electronic user information aids, and consumer orientation training for transit agency employees.

In recent years significant advancements in marketing practice have generated considerable interest in the transit industry in transferring some of the successful techniques to the public sector. At the same time, there is a recognition that the marketing of a public sector service good such as transit is different in many respects from the marketing of consumer goods in the private sector.

Although the level of interest in transit marketing has been increasing since the 1970s, little attention has been given to evaluating marketing programs or specific marketing techniques. As a result, transit marketing often occurs without a clear cost justification and cannot command the full support of top management. Some evidence of what works in the context of transit marketing is provided by current and past practice. In this paper an assessment is presented of current practice in transit marketing. The research for this paper was sponsored by the Urban Mass Transportation Administration under the Service and Methods Demonstration Program.

This paper is the product of three research steps, including a review of prior research, an inventory of current marketing techniques, and a survey of marketing directors from 25 transit agencies in North America. The remainder of the paper is organized into three sections. The first provides a discussion of the role of marketing in transit and its relationship with other planning and operational functions within an agency. The second section includes a description of the range of marketing techniques currently used by transit operators. The final section contains a summary of the organization and function of marketing in the transit industry today and an assessment of the relative effectiveness of the most commonly used techniques in each functional area.

ROLE OF MARKETING IN TRANSIT

Although transit managers almost universally agree that some level of marketing is necessary, there is