TELEPHONE CALL ACCOUNTING

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ABSTRACT: In most organizations, telephoning represents one of the largest single expenses. Yet management of the telephone is usually a neglected function, and is often assigned as a part-time task to someone whose major interest concerns other matters.

Telephone Call Accounting, the computerized allocation and reporting of telephone usage, enables organizations to dramatically reduce telephone expenses, with initial savings of thirty percent or more a common experience.

The application of the computer to telephone management offers the Information Manager an opportunity to contribute in a major way to his or her company's bottom line and opens another door to the technology of the Office of the Future.

This paper begins with an historical background to the current environment and an overview of business telephone systems for the uninitiated. It describes the source and nature of telephone usage information, explains telephone call accounting concepts and techniques, and shows how telephone usage costs can be reduced and controlled.

HISTORICAL BACKGROUND. Management of the telephone has not until recently been a priority item with most organizations. In contrast with the extensive attention that is usually paid to data processing, with its well trained managers and technicians, telecommunications is usually left as a part-time task for the Facilities Manager, the Office Services Administrator, or the Controller. These individuals often perform merely a caretaker function. The reason for this can be found in the history of the telephone company.

Alexander Graham Bell patented his invention in 1876 and thus obtained a monopoly that lasted into the 1890's. During that time the Bell Telephone Company sold telephones and built exchange facilites in major cities. When the original patents began to run out, independent telephone companies arose to compete with Bell and much of the early innovation toward automation came from these competing firms. But by then Bell had become strong enough to limit competition by refusing the use of its intercity facilites and by absorbing many of the new independents.

In 1913 the Bell Company agreed, in what came to be called the Kingsbury Commitment, to make its intercity facilites available to independent companies, and to cease aquiring interest in any competing company unless required to do so by a regulatory agency; although, it was not until the early 1920's that real peace was achieved and these commitments kept.

During this period Government regulation of the communications industry began to develop at the state level, starting in 1907 with New York and Wisconsin. And in 1934 the Federal Communications Act provided for strict supervision of interstate operations. For decades after, telephone subscribers had to obtain all of their telephone equipment and calling facilites from the one telephone company that had a regulated monopoly in their area.

This started to change with the so called "Hush-a-Phone" court decision in 1956, which allowed physical attachment of equipment that was not manufactured or authorized by Bell. But this decree still did not allow direct electrical connection of equipment to telephone lines, only connection by electrical induction. Then in 1968, in the Carterfone case, direct connection was permitted, and so the subscriber no longer had to lease equipment solely from the phone company.

Soon after that the Federal Communications Commission, under what was termed the MCI decision, approved a new category of Specialized Common Carrier, which could compete with Bell's intercity toll facilites. Several companies began to develop competing intercity transmission facilities and other companies started renting transmission facilities in bulk from Bell and reselling them to individual subscribers at a discount from Bell's own retail price.

These two developments, the permission to connect non-standard equipment and the approval of competing common carriers, have stimulated competition and created an increasing number of alternatives for the telephone subscriber, particularly since the mid 1970's. And now the divestiture of the Bell Operating Companies by American Telephone & Telephone Company--the successor of the original Bell Telephone Company--has even further complicated the telecommunications environment.

North American telephone companies have provided the best communications system in the world, and done so with a level of service that has encouraged all but the largest organizations to rely almost completely on the telephone company for decisions relating to the kind and amount of facilites that are needed. With over half a century of experience dealing with one telephone company, most businesses are still not geared to paying much attention to the telephone bill, much less the alternatives that have become available, and executives feel ill equiped to deal with the arcane details of telecommunications.

WHY CALL ACCOUNTING?. Many executives are not convinced that the time and effort apparently needed to learn to manage their telephones will be worth while, particularly if the telephones seem to be working properly. However, there is a great deal of money to be saved. So much in fact that an investment in telephone management may pay greater dividends, particularly initially, than anything else that can be done anywhere else in the organization, including further investment in its own operation.

In organizations that permit uncontrolled use of the telephone, twenty to thirty percent of the time spent on the telephone, and a corresponding twenty to thirty percent of the monthly calling costs, is likely to be unnecessary and can be eliminated without decreasing the effectiveness and productivity of its employees. To the extent that telephoning is of a non-business nature, reduction of such phoning may even increase productivity.

This saving of twenty to thirty percent (some experience even forty percent or higher), contributes directly to the bottom line for profit making companies. When these savings,

which translate directly into profits, are compared with the amount of sales that would be required to generate an equivalent profit, the significance of these savings becomes even easier to see.

In order to achieve these savings, management must be able to identify who is making or receiving which telephone calls. This information should be made available to each department head, who is perhaps in the best position to determine, employee by employee, what level of calling is appropriate. And by distributing this information on a regular basis in the form of a "telephone bill" to each individual employee, along with guidance in the expected use of the telephone, employees will become conscious and self-discipled in its use.

Furthermore, if monthly telephone expenses are allocated to each manager proportionately to the actual telephone expense incurred by his or her area, department managers are even more motivated to follow through in supervising their employees' telephone usage.

Obtaining and processing this telephone usage information is not a difficult or expensive proposition, particularly in view of the pay back.

Fundamentally there are two call accounting processing functions that must be performed: (1) determine the price of each call and (2) identify who is to pay for it. There is additional detail information, such as the date and time of the call, and what city or country it was made to, that is also useful, but call pricing and call allocation are the keys to cost control

We will next take a brief look at how the public telephone network is arranged with respect to call pricing, and then how modern business telephone systems function, as it pertains to call identification and pricing.

THE PUBLIC TELEPHONE NETWORK AND CALL PRICING. Each organization's telephone system, like its residential counterpart, is connected to a local telephone company "central office". Each central office acts as a hub for telephones that are in its immediate vicinity and that share the same central office number, which is the first three digits of the company's seven digit telephone number. Calls made from an organization to other telephones tied to the same central office are directly connected by the central office. For example, calls from 212-678-1100 to 212-678-2104 will be made through the 678 central office to which both telephones are connected.

Calls made to telephones whose hub is a different central office are connected by the telephone company via a circuit between the central offices, if the two central offices are near each other, or via one or more intermediate switching centers. The particular combination of switching centers that will be chosen may vary from call to call, depending on the number, source, and destination of other calls being made by other parties at about the same time, but the price of the call will be determined in part, not by which path was used in connecting the call, but rather the geographical relationship of the called and calling central offices.

North American telephone central offices have been grouped, as is commonly known, into areas, each identified by a three digit area code. Since the recent divestiture of the local Bell Operating Companies from AT&T, there has been an additional grouping to facilitate separate pricing by the local and long distance carriers. These new groupings sometimes

fall along area code boundaries, but often they do not. These are called the Local Access and Transport Areas (LATA). Those calls contained within the same LATA are charged by the local company, while those that are made from within one LATA to telephones located in another LATA, and are thus carried by an intra-state or inter-state long distance carrier--such as AT&T, MCI, or US Sprint--are paid to that carrier.

Within each LATA there is a further subdivision which identifies local calling areas in the immediate vicinity of each central office and consist of the central offices located roughly in concentric bands around each central office. Local calls, which use to be "free" (that is, included in the basic monthly charge for the telephone service), are increasingly being charged for separately, just like long distance calls.

All of the pricing associated with telephone calls, whether they be local or long distance, are determined by government regulatory agencies at the state and federal level and published as part of regulations called "tariffs." These tariffs are rarely written by the agencies themselves; rather, nearly all tariffs are proposed and written by the telephone companies and common carriers, subject to the approval of the relevant agency.

The tariffs are arcane documents that are difficult to read and the pricing schedules are varied. Since the advent of competition in long distance service, the pricing schedules have become even more varied and complicated. However, for call accounting purposes we will see that call pricing can be simplified into two broad categories, discrete (individual) call pricing and bulk rate pricing. Either category of pricing may be distance sensitive.

Distance sensitive rates, as the name implies, vary with the distance between the calling and called parties. In regular Direct Distance Dialing (DDD), for example, calls are individually priced in this way. The distance between the originating and terminating central offices is calculated from a formula which uses the geographical coordinates from a standard set of vertical and horizontal coordinates that have been established for each central office in the U.S. and Canada.

A distance sensitive pricing schedule will list the rate for each of a set of distance ranges (e.g., 1 to 10 miles might be 25 cents for the first miniute of calling time, 11 to 22 miles might cost 27 cents, etc.). And usually there are either separate prices for day, evening, and night time calling, as well as weekend and holiday, or a basic pricing schedule is accompanied by a schedule of percentage discounts for off hours calling. Sometimes the distances are bands of states instead of miles. For example, calls to Hawaii are priced at rates that vary according the state from which the call is made (e.g., 69 cents from California, but 74 cents from New York). Foreign call pricing varies according to the country or region of the world called (e.g., a call to Sweden might cost 1.94 per minute, while one to Argentina might be 2.60).

Bulk rate pricing involves a standard rate for all calls made to certain regions of the country, or world. Rather than just distance sensitive, these prices are volume sensitive as well. The more you use the facility during a particular billing period the lower the monthly unit cost. WATS (Wide Area Telecommunications Service), for example, is an example of a bulk priced facility.

The calls that are made under a bulk pricing plan are completed through the same central office and regional switching center network as DDD calls; only the pricing is different. With volume pricing, a call made early in the billing period is likely to be more expensive than one made later in the period over the same facility, when lower rates have kicked in because of the accumulated volume of calls made earlier in the month.

For call accounting purposes, however, when pricing individual calls, we do not need to be concerned with this variation. We are only concerned with applying the average cost per minute of that facility to each call. In fact, to use the volume variation in billing rate in our call pricing may confuse telephone users, who are likely to question different costs for similar calls made at different times of the month. For organizations with a fairly consistent call volume, this average cost will be very stable, varying less than a cent per minute of calling time from month to month.

Let us turn inward now to see how business telephone calling is handled at the customer site and how it is connected to the public network.

BUSINESS TELEPHONE SYSTEMS. Very small businesses subscribe for one or more telephone business lines, which are connected to individual telephone instruments, and function just like residential telephones, although service to businesses is usually more expensive. Larger businesses will have more business lines and these may be connected to a hardware device called a Key System, which provides for an operator console, internal extension to extension calling, and other features. Each call is still initated or received on one of the individual business lines, which is connected to each individual instrument and which lights up a key on the instrument when the line is in use. Key Systems are usually limited to environments with less than one hundred extensions.

Larger companies use a system called a Private Automatic Branch Exchange (PABX) or simply Private Branch Exchange (PBX), which routes calls internally between individual users, and between individuals and the telephone company central office for outside calls, in a manner similar to the switching performed at the central office itself. Modern PBX systems, which some manufacturers choose to call by different acronyms, like IBX (Integrated Business Exchange) or CBX (Computerized Branch Exchange), are stored program digital computers which provide a host of programmable features in addition to the basic switching function.

The PBX is connected to the central office through groups of trunk lines. Each group of one or more trunks connects the organization's telephones to a particular facility at the central office. For example, there will be a group of trunks for local and long distant direct dial (DDD) calling. If the company subscribes to one or more WATS pricing plans, each of the these plans will also be represented by a group of trunks. The decision whether to make the call on DDD or on a particular WATS facility, for example, is made at the customer site, and then one of the appropriate trunks, if one in the set of trunks for that facility is currently available for use, is chosen accordingly.

Likewise, if more than one long distance carrier is subscribed to, the additional carriers may each have their own group of trunks. Normally all of these groups of trunks will go to the local central office, but will then be connected to the relevant carrier or facility. The public network is currently in the process of being converted to "equal access", which allows the user to dynamically select his long distance carrier for each particular call by dialing a five digit prefix to denote the desired carrier, if it is different from the one that had been chosen as the default carrier. This reduces the need for additional trunk groups.

Before the advent of the Automatic Route Selection feature in PBX's, it was necessary for the caller to manually select the carrier or pricing schedule (e.g., DDD vs one of the WATS facilities) that he wanted to use for the call by keying in a one or two digit prefex

to tell the PBX which trunk group from which to select a trunk. This required that each employee know the best route to use, or at least follow a set of rules to determine what trunk group access code he should use according to where the call was going, and even sometimes what time of the day the call was being made. These rules were nearly impossible to enforce without call accounting, which could track incorrectly chosen routes, and even then were never fully successful.

Most modern PBX's now have Automatic Route Selection, which can be programmed by the PBX installer to choose a trunk from the least costly route of those available or, where equal access is available, to insert an appropriate prefix to access an appropriate alternate carrier. Now the business caller only has to enter one code, such as the number 9, to get an outside line, followed by the number called, and the PBX will determine the appropriate trunk group to use.

We have seen the various ways the telephone caller is connected to the public network. The specific facilites that are made availble to the individual user can be adjusted within the PBX, extension by extension, on a need to have basis. Telephones in "public" areas, such as conference rooms, lobbies, and on the production floor, might be programmed in the PBX to be limited to local calling, or even strictly for internal calling. Where outside calling is permitted, certain extensions might be programmed in the PBX to permit long distance calls, but only if a least cost facility, such as WATS, is available, while other telephones, such as those of senior executives, will be given unlimited access to outside lines.

Most advanced PBX's permit the assignment of individual telephone user Authorization Codes, each with its own set of capabilites, such that when the authorization code is entered, its capabilities will override any limitations that had been placed on that particular extension. Thus, for example, an individual with an appropriate Authorization Code might make a long distance call from a phone that is otherwise restricted to making only local calls.

Now we look at how infomation about each call is recorded and made available in computer usable form.

RECORDING THE TELEPHONE CALL. Virtually all PBX's, and even some Key Systems, are capable of recording the details of each outgoing telephone call; that is, those made from the PBX to the central office or onto a tie line connecting the PBX to another PBX. Most will also record incoming calls. Extension to extension calls, however, are normally not capable of being recorded. The contents of the computer records vary from one PBX manufacturer to the next, but typically they will contain the following information:

Date of call
Time call started or finished
Duration of call
Extension that initiated or received the call
Dialed number, if the call is outgoing
Number of the Trunk on which the call was carried
or the Number of the Trunk Group
Authorization Code, if used
Account Code, if used

The Account Code feature permits the caller, by entering an account code at the time the call is made, to charge the call to an account other than one normally assigned to that extension or authorization code. This can be used to automate the billing of telephone expenses to clients or to project expense accounts.

Allocation of the outgoing calls to the department and the individual to be charged for the call can be based on the extension, the authorization code, or the account code.

Incoming calls can similarly be allocated based on extension or account code. The costs of incoming WATS calls, which are paid for by the receiving company, can thus be allocated to the party receiving the call. Even incoming calls that are paid for by the outside calling party should be tracked, since they represent employee telephone usage.

Notice that one crucial item of data is missing, the price of the call. This must be calculated using the other information given in the call record, in conjunction with the relevant tariff or, in the case of bulk priced facilites like WATS, the unit average cost experienced on that facility.

Price calculations cannot be one hundred percent accurate, because the recorded duration of the call is from the time a trunk was seized, or some delayed time relative to trunk seizure time, while the telephone company begins its recording of call duration for charging purposes at the time the call is answered by the called party. The telephone company central office equipment has this call start time--it is called "call supervision"--and, if the telephone companies were willing to do so, it could made it available to the business subscriber. Some PBX's have even been designed to be able to use it when and if it becomes available. Until recently telephone companies have given no indication that they will make it available to their subscribers, but there have been indications that that will change in the forseeable future.

In the mean time, however, the call accounting system must deduct an estimated setup time from the measured call duration of outgoing calls. This is normally one half minute, but it can be greater in areas where the central office switching equipment is slow. It is possible to tune this time by comparing the number and duration of calls as recorded by the PBX during a given billing period with the number and duration of calls actually being billed by the telephone company.

In the case of calls subject to discrete pricing, such as DDD calls, the price calculation can be one hundred percent accurate as far as the tariff is concerned, but may vary from the actual price charged by the carrier because the estimated call duration may differ with the duration used by the phone company.

Once calls have been allocated and priced, the call detail information is ready for summarization and reporting.

USING THE CALL INFORMATION FOR COST CONTROL. Once employees learn that their telephone calls are being monitored, even if it is only a rumor, telephone expense will drop significantly. If nothing happens to substantiate the rumor, however, and reports are not consistently issued on a regular schedule, costs will return in a short time to where they were to begin with.

Once a reporting period has been established, call detail reports should be created and issued as soon as possible after the end of the period. The longer the delay between the

time the calls were made and the time they are reported, the harder it will be for callers to remember why they made each call, and the greater the tendency to dismiss the reports as "history".

For the individual telephone user, it is sufficient that his or her manager is reviewing the list of the telephone calls which were made each month to instill a degree of consciousness and frugallity in using the telephone. For the cost center managers and accounting people, however, the computed costs should be tied into actual costs. This appears to create a dilemma, since the bills from the telephone company normally take at least a week or two to arrive and different carriers may bill at different times in the month, and yet to wait until all the bills have arrived before issuing the monthly telephone detail reports conflicts with the need to report the call details promptly to the employees and their managers.

The solution is to use last months telephone bills, which the accounting department has been booking during the past month as they were recieved, and use that total as the total for the month. The difference between the total booked from last months bills, which reflect costs incurred during the prior month, and the current call accounting totals, which reflect the just completed month, can be distributed back across the various costs centers proportionately according to usage. Along with these adjustments-to-actual, other overhead costs, such as labor or equipment amortization, can be included in this distribution.

Thus, each manager is not only charged for actual costs, over which he now has some control, but his share of the overhead will also be proportional to his department's telephone usage.

CONCLUSION. Telephone costs are one of the three or four top expenses in most organizations. Through identifying and accounting for those costs, down to the individual telephone user, and allocating those costs to where they are actually occurring, major cost reductions can be achieved and maintained. These savings can be obtained at reasonable cost with no increase in staff .