ELECTRONIC TICKETING SYSTEM: IMPLEMENTATION PROCESS

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INTRODUCTION

There are no doubts that the implementation of automated systems for fare collection, or electronic ticketing, is already a reality within the Brazilian market of public transport. About five years ago the experiences regarding this subject covered not more than 13 cities, from which only 5 integrally operated their electronic ticketing systems. The others had partially implemented it or had projects still under the planning processes. Some had interrupted their operation (NTU, 1998).

Recent data identify more than 80 projects already established in the Country, more than 30 being implemented, and about 14 projects being developed, where the implementation is foreseen up to the end of this year (NTU, 2004).

Those figures show an unquestionable trend of migration from the present systems of fare collection (cash payment) towards automated control systems. This migratory boom of collecting technology is not an isolated phenomenon, being its causes related to the decrease on the number of passengers carried and to the increase of operational costs, which are also intrinsically related to the presence of the alternative transport (paratransit) and the low quality of the service provided by operators to public transport services.

In some cases, the need of change was so evident that operators had not waited for a decision or guideline provided by local authorities and implemented and managed their own systems without any subsidy. This is the case of the cities such as Angra dos Reis, Cabo Frio and Rio de Janeiro, all of them located in the State of Rio de Janeiro.

The main objective of this paper is to develop an in depth assessment within this framework of continuous changes and technological updating. It will also describe a methodological procedure (based on a case study) that may help the implementation process of other electronic ticketing systems in public transport companies operated by bus.

ELECTRONIC TICKETING

The increasing use of electronic ticketing systems in the Brazilian market is not only related to the above mentioned phenomena but also, and mainly, to the advantages that those systems provide to bus operators.

Among those advantages, we can highlight the replacing of physical means by information management that, besides speeding up the procedures, allows a better control of the operation, with less effort, consequently resulting in a lower operational cost.

The speed in knowing the financial status of a bus route operation is one of the immediate results of the information management in the automated fare collection procedure. Under this scenario, a cultural change in the transport sector could also be a consequence of such procedure of technological improvement. This shows that the adoption of this new technology is possibly an unchangeable strategy, with clear impacts on the development of new learning areas for the company itself and a direct consequence on the increase of the quality of services provided.

It is not easy to clearly identify the main objective of bus companies when they choose an automatic ticketing system, since that there are multiple possible purposes. Each one has its own priority within specific situations.

According to NTU (1998) a series of such purposes can be identified:

- more easy integration;
- better control and forecast of fare collecting;
- safety improvements;
- better control of passengers traveling for free ;
- better control of the transport voucher;
- more easy procedure of operational data collection;
- more comfort and better access to users;
- better working conditions for operators;
- reduction on the boarding time;
- reduction of fare collection evasion.

Cities facing problems linked to the lack of safety can foresee significant improvements when adopting the electronic ticketing system. A reduction of fare evasion, the prevision of the total amount collected, the control of free trips (students, elderly passengers, people with disabilities), and of the transport voucher are among the main reasons justifying the migration of bus companies towards the automated systems of fare collection.

Experiences

Some trials developed on the implementation of procedures of electronic ticketing have been already thoroughly discussed within the academic environment, such as the case of Campinas (São Paulo state) and its system of open integration. Since then, none of the new examples of electronic ticketing deserved special attention. However, it is also remarkable the results achieved with the implementation of electronic ticketing systems in the two greatest Brazilian cities (São Paulo and Rio de Janeiro), producing impacts in the national market, showing the unchangeable trend of adoption of electronic ticketing systems.

A survey carried out by NTU (2003) shows that, from the total universe of cities, capitals, and metropolitan areas surveyed, 35% have already implemented automatic ticketing systems and 41% have replied that there was already a project for implementing such systems within the short run. Only one of every four cities of metropolitan areas informed that they are not intending to implement such technology in the short run.

When restricting the sample to the Brazilian capital cities, the trend towards electronic ticketing implementation is also remarkable, since 40% of those cities are already operating them and only 14% do not intend to implement it on the short run.

Regarding the purchase and implementation of electronic ticketing systems, about 58% of them were done with the purchase of the equipments, while the remaining 42% have done a leasing contract.

The smartcard technology without contact has been consolidating its use within the Brazilian market, since almost 70% of the systems already implemented are based on this methodology. Table 1 shows the levels of utilization of each technology in Brazilian cities with more than 300,000 inhabitants.

Table 1: Cards technology (%)

Technology	Prevalence (%) among towns with ticketing
Smartcard without contact	69
Magnetic technology (tickets/card)	37
Smartcard with contact	32
Other technologies (inductive, bar code)	5

Source: NTU (2003)

The cost reduction of the smartcard technology without contact may be one of the reasons of such high percentage, as well as the processing speed and high durability.

The importance of controlling users traveling for free can be assessed by the high percentage of electronic free tickets issued for students in cities that adopted the new fare collection systems. Such percentage reaches about 84%. In many cases the percentage of students compared to the total amount of passengers traveling by bus has decreased, after the implementation of the electronic control (NTU, 2003).

As far as the electronic transport voucher is concerned, about 58% of cities with implemented systems of electronic ticketing have already launched it, mainly because it is considered a strategic measure to face competition with the alternative transport (paratransit) (NTU, 2003). With the electronic voucher, the users of the transport voucher become again captive users of the public transport companies, which benefit also from the advantage of facing the illegal vouchers market. It is believed that such percentage is not higher due to the complexity inherent to the automated transport voucher.

Another significant fact is that only 1/3 of the ticketing systems assessed by the NTU (2003) survey adopt the transient integration as an operational strategy, made possible with the implementation of the electronic fare collection system. It is believed that the not so well succeeded Campinas trial, where the transient integration had resulted in a profit loss greater than 20% of the total system collection, has contributed for such a low percentage.

IMPLEMENTATION PROCESS

The technical literature regarding automated tariffs collection is focused on their purposes and on the experiences of application, as well. The process of implementation that occurs mainly inside the company has not deserved in the scientific environment, a deeper assessment, proportional to its importance. Figure 1 presents a schematic structure that outlines the main stages followed, common to all companies implementing electronic ticketing systems.

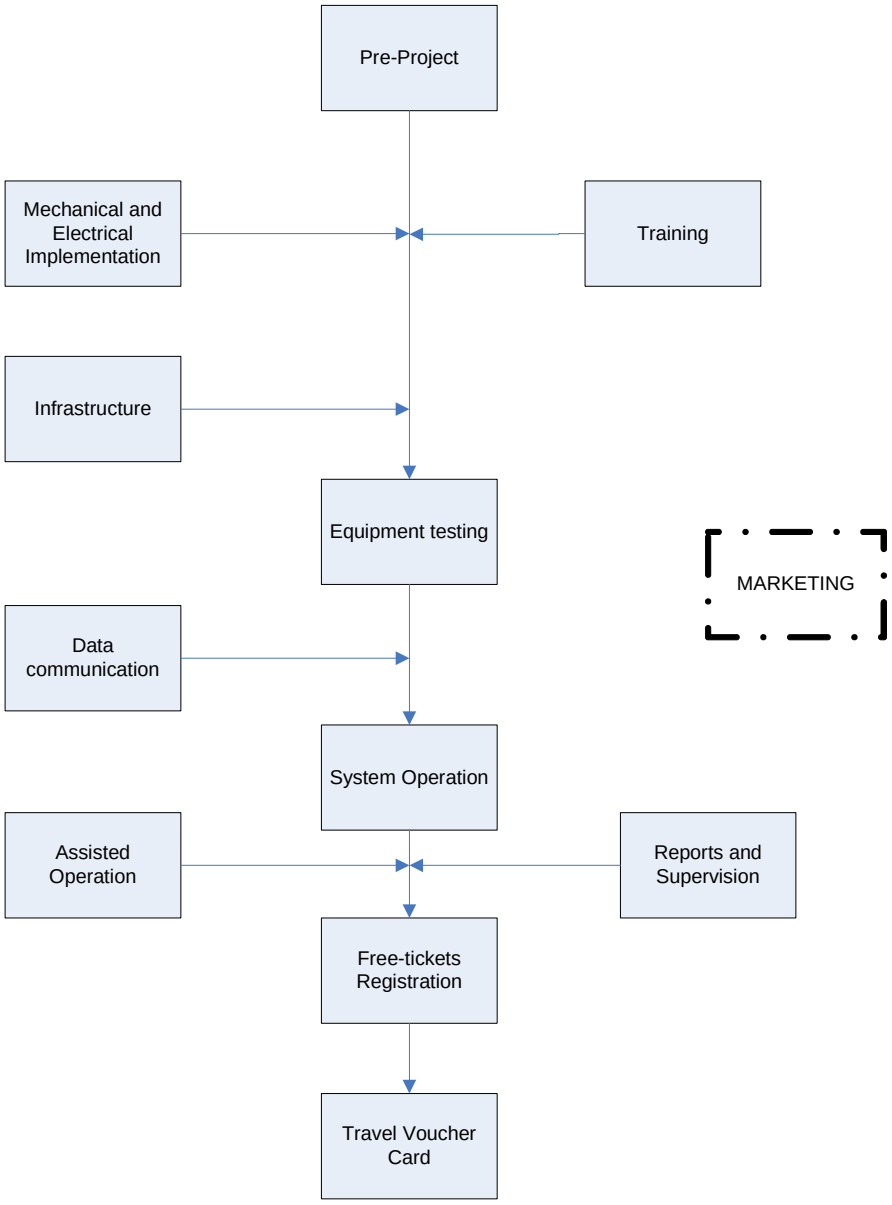

Figure 1: Schematic Structure of the Implementation Process

This generic structure serves to show clearly the implementation process of an automated ticketing system in a bus company environment. The whole process is detailed in the following sections.

Pre-project

The pre-project consists of the initial implementation stage and is probably the more important of the whole project, since it covers all data survey processes, mainly related to data collection of suppliers and the ticketing trials operating all over the world. With the technologies development and the logic of the systems used for automated fare collection, the number of technology suppliers and appropriated operational systems has grown considerably, as well as the trials of their application.

Thus, a great importance was given to the market survey, since it is the starting point for establishing the functional requirements of the system that is going to be implemented. This definition, that is a critical stage of the whole process, will allow the definition of the universe of available technologies and systems, since only some of them will be appropriated to the main purposes required by the contractor of the ticketing system.

Usually this is the longest stage of the whole implementation procedure, assuming that the universe of analysis is restricted, and a more detailed evaluation about the characteristics of each supplier and his position in the market is vital and important.

Once this analytical stage is completed and the appropriate supplier is defined, it is necessary to start the negotiation and the detailed specification of the contract, where all duties and obligations of the involved parties have to be defined. At this stage, it is necessary to establish the quality and liability expected from the system that is going to be implemented.

Mechanical and Electrical Implementation

The stage of mechanical and electrical implementation and the definition of the electrical setting of the system occur simultaneously and constitute the first stage of the project flowchart. Depending on the structure of the contractor company, it can be necessary to contract and train a transient team for this specific electrical setting. Such technicians will be responsible for all the process of definition of the electrical setting (cables and wires) and other devices. This operation must be assisted by a technician of the supplier company.

In all processes of implementation of electronic ticketing systems, there is a question mark on keeping or not the conductor. The companies that do not use the front door to boarding passengers generally change the users flow (from the back to the front door). This will allow and facilitate them, in the future, to operate without the conductor to check the cards, and consequently reducing the implementation costs of the electronic system due to a shorter length of cables needed for the operation.

Since it is a more laborious process, it is recommended that the companies interested in the electronic ticketing implementation, begin this process of boarding and alighting passengers inversion as soon as possible, due to the difficulty of doing it simultaneously with other tasks of the implementation process. Another normal activity that can be carried out during the inversion of the boarding and alighting directions consists of changing mechanical turnstiles to electronic ones. The utilization of this kind of turnstiles is one of the requirements of the electronic ticketing systems, since it assures a better operation environment, considering that it only allows the user to pass through the turnstile after the electronic recognition of the card that can be generated either from the validation device or from other devices placed inside the conductor draw or on the vehicle panel, in the cases of minibuses.

After those changes on the physical configuration of the vehicles, system configuration stage is initiated. Usually, this operation is assisted by a technician of the supplier of the electronic

system and its conclusion, after performing a set of tests, will allow the vehicles to run the services.

The process of having the vehicles in normal operation can occur together with the personnel training process, with an emphasis on the training rhythm of the bus crew. Generally it is possible to have an average of 6 vehicles ready for operation each day. This figure could be higher according to the availability of vehicles and trained staff. The vehicles availability is one of the greatest bottlenecks of the whole process, since the vehicles would be available to the changes required at night, when the team is not working.

Training

The training process can be developed in two stages: administrative and managerial training and training of operators. The managerial training has the purpose of presenting the system to the managers and administrative staff in order to disseminate knowledge of the procedures to the other workers.

This stage has as main focus, the identification, within the group of workers, of those more capable to become multipliers and supporters of the whole training process. The human resources department will have to select the best workers for the training process regarding the operators, as well as the workers who will be in charge of clarifying the more usual doubts occurring in the day-to-day work of the company.

These two groups will be selected among the workers who present more capacity during the system learning process. Part of those workers will be responsible for training all the company operators, being known as the Multipliers. The other part, here named as Supporters, must be available and prepared to assume key-positions and to assure that the system will run as previously planned. These two groups must be exhaustively trained, since the quality of operators' training will be directly related to the consolidation of the perfect knowledge of each one about the process stages.

The utilization of the multipliers chosen within the company during the training process, instead of the presence of a technician from the technology suppliers, is justified since this process of knowledge transmission is extremely time consuming, and thus, it will demand the presence of many technicians, resulting in higher implementation costs. Also, the presence of the workers of the contractor company facilitates the dialogue along the training process. The constant need of updating courses regarding the procedures at every new change of the main version of the system reinforces this understanding.

After this stage, the initial schedule for training the operators of the system can be established. The location of such activity at the same level of the mechanical and electrical implementation process is due to the fact that both activities need a common planning and execution activity. For a more rational use of human and material resources involved and for a better operational efficiency during the implementation process, it is recommended to establish a specific schedule for the system operators (drivers and collectors) that depends on the planning of the mechanical and electrical implementation stages of the system, within the vehicles.

Under this model, the workers which work daily in the available vehicles set by the mechanical and electrical adaptation would be trained. The workers who will work in the next morning following the liberation of the vehicles would be trained in the afternoon of the next

day and those which will work during the afternoon shift would be trained during the morning.

This procedure assures that the operators of the system can directly apply the knowledge acquired along the training process and so it minimizes the risks of problems with passengers travelling in the vehicles, in an eventual incapacity of the operators of the new system.

It is recommended the segmentation of the training process per groups (workers in the same terminal, for example). This strategy allows those workers in the terminal to help the ones that are not sure of how to deal with the new system, as well improving a more localized contact with the users of the system, who certainly will be curious on how to deal with this new operational system.

In the training schedule, attention must be paid to the members of the staff who work as substitutes of the regular ones in a vehicle or route. Those workers, operating buses stopping in the same terminal, must be trained, before they begin operating in a route or vehicle with the system already installed. This strategy highlights the need of scheduling training process per group of routes operating within the same terminal.

This process of training the staff and making vehicles available for operation should be supported by workers of the bus company. A good strategy is to select drivers and conductors with higher performance during the training sessions of the new electronic system. They would be able to support and follow up other members of the staff operating for the first time buses equipped with the new electronic system. They would also be able to help the new group, on their first contact with the new procedures, outside the training room.

Regarding the training itself, it is necessary to consider, in the case of drivers and conductors, the development of a specific way of transmitting the whole learning process language. It should be different from that used in the case of managers and administrative clerks training process. Thus, it is recommended the recording of a specific learning video tape, with the participation of a company worker (driver or conductor) who got a good performance during the selection of multipliers / supporters. This video tape can be used as a starting point of the training process of new classes and also on updating courses developed for all staff. The updating courses must be carried out at every change of the version of the electronic system and also for those workers with understanding difficulties during the operation of the new ticketing system.

It is important to establish a “typical” training process with a permanent structure, due to the undesirable characteristic of high turnover of workers in public bus companies. The design of a small pamphlet containing the main guidelines for all workers may also help the effectiveness of the training process.

Infrastructure

The infrastructure stage corresponds to the adjustment of the necessary equipment connected to the operation of the electronic system in the bus company garage. Among the activities to be carried out during this stage of the process, we can find the project and setting of the infrared devices in the appropriate area. There are some ways of transmitting data among the vehicles and the main computer center but infrared communication is the more common technology, due to its cost effectiveness.

The setting of the infrared devices in the appropriate area aims at assuring the communication with all vehicles parked into the garages, since those vehicles will necessarily be in this area for cleaning, mechanical checking, etc. During this time, the transmission of information is performed from the vehicle to the system.

The setting of the infrared devices in the appropriate area of the garage is directly related to other two factors: the installation position of the infrared readers inside the vehicles and the design of the parking space for the vehicles. The positioning of the readers inside the vehicles aims at the reduction of the installation costs, mainly wiring material, and also to put them in a place to facilitate data transmission to the infrastructure assembled in the garage. Regarding the design of parking spaces, they are defined to help drivers in the vehicle positioning in order to assure the communication between the vehicle and the main system.

All information collected from the vehicles or transmitted to the vehicles has origin / destiny in a reception computer, usually close to the communication point that transmits the collected data to the Central Processing System Unit. Thus, it is necessary to develop some civil engineering work in the garage to support the installation of an optical fibre network, connecting the reception computer to the Central Processing System Unit.

The procedure previously described assures a smooth operation of the system allowing the implementation of another key-activity that is the stage of equipment stress.

Equipment stress

The process of equipment stress is a stage common to all technology suppliers and it is not exclusive of the processes connected to the implementation of automated fare collection systems.

This stage consists basically of the observation of possible impedances (or problems) of the operating equipment and, in order to be carried out, all the stages with direct influence on the system operation should already been fulfilled. This justifies its localization in the flowchart showed on Figure 1. There is not a rigid period for this kind of monitoring process but it is believed that from two to three months is enough for checking possible necessary adjustments in the electronic system operation.

During the testing stage, the objective is not only double checking some physical and logical aspects of the system, but also to adjust the bus company for the day-to-day operation with the new technology for fare collection.

Along this period many adjustments on the validation software have to be carried out, as well as improvement on the ergonomics of the system that result mainly, from the observations and the experience of the staff during their daily management of the new technology. It is interesting that, even with the experience gathered by the new technology suppliers, local peculiarities, related to cultural aspects or even to weather conditions, allow specific changes in several aspects of the system, that are mainly related to the ergonomics and the processes of communication among the set system / staff / users.

Another important aspect to be taken into account along the equipment stress control consists on the incorporation of a maintenance program for the ticketing system (electrical and mechanical devices) to the already available programs of preventive and corrective maintenance of the Maintenance Section. This procedure will assure better conditions for the system with a smaller risk for failures.

Along this stage, the bus company has total control of almost all equipment needed for the system operation, but the cards still have the code of the technology supplier. The variety of cards changes among technology suppliers, but usually the staff (driver, conductor, etc.) has a specific card to support the operation.

Another extremely important activity during the equipment stress stage consists on the constant verification of the turnstyle rotations, compared to the amount registered in the validation device. Only the absolute certainty of the liability of the registered data by the electronically management payment system, it is possible to continue with the process of implementation of the electronic ticketing system.

Data communication

The stage of data communication goes simultaneously to the stage of equipment stress and could perfectly be included in it. However, due to its importance for the success of the undertaking, we have chosen to analyze it as a separate stage.

In summary, this stage consists on the system configuration and a series of tests on the communications protocol. It is initiated by the reception of the hardware equipment – sales points and card readers – and by the assembling of the central of ticketing.

A series of tests on the communication protocol is carried out among all the future sale points, via modem, within the network of optical fiber at the company garage and between other garages (if there are some) and the main headquarter of the company.

Daily the system collects the data stored in the validation device of every vehicle, through infrared readers, and it transmits to the system contained in the validation device the new software versions, as well as the list of cards that have been already blocked and the updating of the operational and / or tariffs parameters.

The system registers all vehicles that go through the supply trench and the status of communication between the bus and the reception central, as well. Those cars with which communication was not established are registered in the system and its data are individually collected, through a palm top.

The liability of the communication systems and the appropriate working of a process of equipment stress allow that one may advance in the process of the system implantation, surpassing the more critical stage of the operation – the turning of the key.

Key turning

Although the importance of the process, what here was stipulated to be called as key turning is nothing more than the change of the cards that before belonged only to the company that supplied the solutions and technology and now started to pertain to the bus company contractor of the ticketing system. The system starts to operate with cards with a cryptographic key, in which half of characters is responsibility of the system supplier and the other half is supplied by the bus company, so the name of this stage was derived from this operation.

Before the process, the company must prepare and print all the new cards that can, among other functions, work as functional identity or even as a time-clock card. All the cards needed to the system must be prepared, as well as the cards for the workers and operators.

The change of keys consists in the changing of the version of the validation devices of all vehicles, in order that they start reading only the new cards, as well as the change of cards of all workers.

The process is critical since there can not exist any vehicle without the software updating, as well as there can not be any operator working with the former version of the card. The occurrence of any of such events makes the vehicle not operational, forcing the presence of a maintenance team at the place.

In order to assure that this process occurs without trouble for the users, it is recommended that both processes (changing of the software version in all vehicles and change of the workers' cards) occur during one night.

The change of the key in all vehicles must be performed as long as they came to the garage after their last travels, during the supplying process, cleansing and mechanical check-up. This procedure is carried out for each vehicle through a palm top. In order to ease the visual verification of the vehicles with the new software version, it is recommended the use of a sticking plaster in a visible place, showing that the vehicle had already gone through the process of key conversion.

As there are, in some companies, some lines that work without stop and other ones that initiate their operations during dawn, it is recommended that the process of keys exchange occurs during the weekend, when the amount of circulating buses is much smaller. This procedure decreases the complexity of the process, since the vehicles and workers that are going to operate after the changing of the system can be programmed with greater safety.

But the more critical stage of this activity consists of the collecting of the old cards of all workers and the distribution of the new ones. For this procedure, it is recommended that all the operators who have finished their working day, present themselves to the garage for the exchange of cards. As we have an opportunity of gathering all the workers of the company, it is recommended the fulfillment of a refreshing training course, since that soon the cards will be made available to the users of the system of public transport.

Once more, attention should be paid to the operators who are off duty, holiday, or to the ones who are absent for health reasons. It must be assured that these will only come back to the work after the change of their cards and the refreshing training process.

Now, with the definitive system card, the same operational cards used during the equipment stress stage are kept, with the exception of the card for transport voucher that will go to be used by the system users, according to the legislation in force.

When this project stage is arrived, one expects from the system the required liability for the beginning of the own operation. The following stages of the implantation process (assisted operation and reports and supervision), occurring simultaneously, will assure such liability.

Assisted operation

This stage of the process consists on the following-up of the system as a whole, by the technicians of the contracted company. In summary, the following stages are covered:

- cards working;
- operation on board;
- system configuration;
- data collection and transmission;
- credits generation;
- reloading on board;
- accounts reporting.

During one period that can reach up to six months, all these activities are constantly monitored by technicians of the contractor and contracted companies. With the exception of credits generation and reloading on board, all other activities were already being done during the previous stages of the project. The difference consists only on the fact that in this stage all elements of the system belong to the bus company.

As it is a tool of the electronically management of payments, it is necessary the creation of funding credits that will be distributed to the cards of the users of the system of public transport by bus. This is one of the activities with greater responsibility in a ticketing system and the decisions related to the value and validity of the credits generated must be taken within rigid criteria.

Another critical point of the system liability is concerned to the reloading on board of the cards of transport vouchers. The Brazilian law establishes a benefit through which the employer will anticipate the worker for the amount of expenses for travelling home-work and vice-versa (Lima and Faria, 1999).

One of the consequences of the ticketing systems consists of the replacement of the transport voucher made of paper, such as it is usually distributed, by the magnetic card of the transport voucher. So, instead of the paper tickets given to the employee in his working place, the users of the transport voucher will get credits in their voucher cards during the communication between card and validation device.

Depending on the size of the town in which the system is being implanted, this activity can be more or less complex. Within a network with few vehicles and transport vouchers, the data for reloading on board of the credits of every card voucher can be made available by the system for all vehicles, what allows that a user of that card version, in the first working day of every month, has their credits reloaded when embarking in some vehicle.

The same service is not possible in a big town, with many vehicles and users. In this case, the solution can consist in reloading on board only in the lines where the user of the card voucher has the right of it through the benefit.

Reports and Supervision

Together with the activity of assisted operation, there is the stage named as Reports and Supervision. During this moment of the process, a department of supervision is created and it will be inserted into the organizational structure of the bus company.

This sector is in charge of the monitoring of reports and the detection of frauds by the users and / or operators of the system. Among the more common reports that support the operational management of the company, there are:

- passengers / direction;
- times of travel / direction;
- daily utilization of cards (quantity and quality);
- roulette operations.

The importance of the supervision sector and of this stage of the process become clear when we analyze the results found in the practical trial that served as basis for the schematic structure adopted in this paper: about 200 of the 800 company operators in which the system was implanted were identified as committing some kind of irregularity in the utilization of their functional cards and from these, almost half were dismissed by the deceitful use of their cards.

Theoretically, the process of implantation would be ready in this stage; however, due to the particularities of the Brazilian law, such as the concession of free transport and the existence of the transport voucher, we need to perform additional stages that are complex since they include the relationship with the users.

Registration of free transport

The process of registration of users travelling for free includes the planning of one or more registration permanent centres, dimensioned according to the peculiarities of the cities where the system will be operating. For instance, in cities where free trips are limited to people aged more than 65 years, it may be interesting to establish an agreement with institutions that work directly with aged people. In cities where students have access to free trips, the more appropriate solution would include an off-line registration of those users, preferably at schools, what would avoid over-dimensioning the registration centres.

Although this stage of the project is not directly related to the implementation process, it requires much more attention than the previous stages. Usually, this task would be under the responsibility of the authorities or regulating agencies, which are responsible for the supervision of free transport rules. However, in the Brazilian case, bus companies have assumed this responsibility.

Free and popular voucher cards

The last stage of the project consists on the process of issuing the cards with credits that can be either the travel voucher cards or the regular cards. The user can “customize” the card with the amount of credits he considers more appropriate for his travel pattern.

A previous registration of the user must be performed in order to make easy the blocking process of the card in case of loss or theft, with the respective restitution of the credits. Usually, the cards are granted to the users based on specific terms specifying an amount to be paid in case of card loss or damage.

It is desirable that agreements are established with banks, malls, etc., in order to increase the selling points, where users can purchase cards or reload them with new credits amount.

Marketing

The marketing activity goes simultaneously to all the process of ticketing implementation. Under a certain way, it is initiated during the pre-project and proceeds, even after all the activities related to the project have been finalized.

Some resources usually used include the bus intern decoration, explanation folders distributed inside the vehicles, publicity spaces in the media, discussions with student organizations, tenants' associations, etc.

This activity should clarify to users the benefits generated by the new system and how they should behave and contribute to get the most from the new technology.

CONCLUSIONS

There are many aspects still to be assessed regarding the implementation of an electronic ticketing system in a bus company, with special attention to the routines and facilities that the new system brings to the operational management of the whole business. The understanding of the influence of a smart ticketing system can be assessed into three distinct and complementary stages: the process of implementation (detailed in this paper), the impact on the management of transport companies and the consequences in the public transport market.

The technical literature dealing with automated fare collection is mainly concentrated on objectives and implementation trials. The impact of the system implementation in the transport companies, more remarkably in urban transport companies, will probably be more exhaustively assessed in future studies, splitting the impacts generated on different departments: human resources, operation, maintenance, warehouse, treasury, cash flow, informatics, and electronic ticketing.

This study presented a structure of procedures developed, starting from a practical trial, for the structuring of an implementation model for electronic ticketing systems in public transport bus companies, that had not yet deserved the related focus to its importance, in the scientific environment.

We believe that the methodological procedure described in this paper can contribute for minimizing possible problems faced by bus companies in the process of moving from a conductor fare collection to an automated one. It is important to be aware of peculiarities of each specific case in the migration process and also be prepared to find the best solution to mitigate problems generated during the whole implementation process. Thus the possibilities of facing problems and solving them in an adequate way will also be higher.

It should finally be highlighted that under the regulation, competition, planning, management and operation perspectives for the urban bus industry, electronic fare collection systems will probably facilitate and subsidize the decision making process, vital in the long term strategic planning of bus companies of urban buses, the electronic ticketing should make easier process of supervision and control.

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