Integrated Ticketing and Information System of the mass transport in Bucharest

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ABSTRACT: Tariff integration is an important target for urban transport societies in Bucharest, leading to an increased attractiveness of the traveling public for urban transportation, given the conditions that the transport with personal vehicles is growing very fast. In this way, will result an improved provision and coordination between the main public transport operators by means of a complete and daily updated database.

RESUME : L'intégration tarifaire c'est un important objectif pour les compagnies du transport urbain de la Municipalité du Bucarest, conduisant à l'augmentation de l'attractivité dans les conditions d'une amplification alarmante du transport privé.
Par la réalisation d'une base de dates complète et ''courant'' on peut perfectionner en même temps la prévision et la coordination entre les principaux opérateurs du transport public.

1 GENERAL ISSUES

Bucharest's mass transport is performed by public and private operators. Public transport is the main transport capability and is ensured by surface (buses, trolleybuses and tramways) and underground (metro) transport means. After 1990, the public transport demand in Bucharest has suffered a significantly decreasing due to the six-fold increasing of the number of private cars.

The paper proposes a solution for encouraging the passengers to use the public transport way by making it more attractive and flexible. This can be achieved by the integration of all transport ways, meaning an implementation of a complex computer-based system enough powerful to make possible a fare collection system capable to work according to the type of the services offered, and also to implement a real time public information system regarding the traffic status and the transport optimum variant for a certain destination.

This solution is based upon the existing state-of-the-art information systems within the metro network regarding fare collection control and traffic surveillance, and also on the optical fiber networks crossing the city through metro tunnels and galleries. The general designer of the metro infrastructure and installations – S.C. METROUL S.A. – has elaborated many studies and projects regarding the electronic information system for the passengers that employ the metro as a transport mean.

The surface public transport operator – RATB – and its consultant – S.C. METROUL S.A. – are involved in the tramlines modernization, elaboration of a computer-based traffic control system and also in the implementation of an automatic ticketing system which will allow a further development of an integrated system for all transportation ways, both surface and underground.

This paper proposes the achievement of an integrated ticketing and information system by coordinating the passengers' information systems employed by the two transport operators. It also describes the technical and economical aspects that should be taken into account in order to achieve the proposed system.

The system will be developed on modules and stages; the first stage is to completely computerize the fare collection system of RATB. The proposed solution is based upon use of the magnetic and/or contactless cards. There are also included some aspects regarding the necessary metro fare collection

system changes needed to be done in order to make it capable of supporting the magnetic cards, this way making possible the further integration of the two computer-based systems.

2 THE MAIN PUBLIC TRANSPORTERS IN BUCHAREST

RATB – is responsible for administration and exploitation of surface urban transport and is subordinated to the General Council of Bucharest city.

The main public vehicles of RATB are presented in Figure 1.
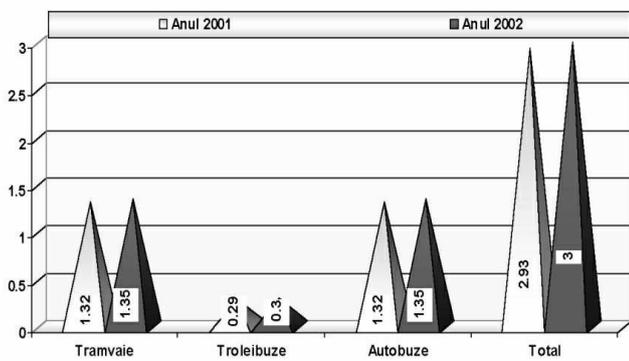

Figure 1. Average daily trips (mill.)

RATB possesses 1.668 vehicles, 173 lines, 2481 stations, 19 exploitation stations, 32 electrical substations.

METROREX – is responsible for administration and exploitation of the metro transport network and is subordinate to Ministry of Transport Civil Works and Tourism.

Metro network represents approximately 20-30% of the public urban transport network of Bucharest city; the rate of passengers employing the metro transport network varies between 15-20% with chances of being increased in the following future, by a better correlation based upon complimentary principles with surface transport.

The whole metro network commissioned until 1989 contains 60 km of double line, 41 stations, 3 depots and one repairing station.

Alongside of the two main transport companies, there is another licensed private transport company which exploits some micro-buses lines.

3 DATA ABOUT PASSENGERS

At this time, 50 trains are running daily through the metro network, transporting safely, comfortably and regularly over 350,000 passengers, according to the Figure 2. Over 3 billions passengers had used the metro since the commissioning until today.
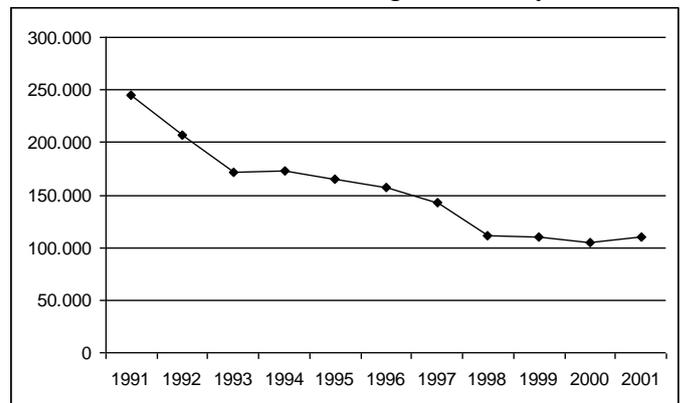

Figure 2. The number of metro passengers

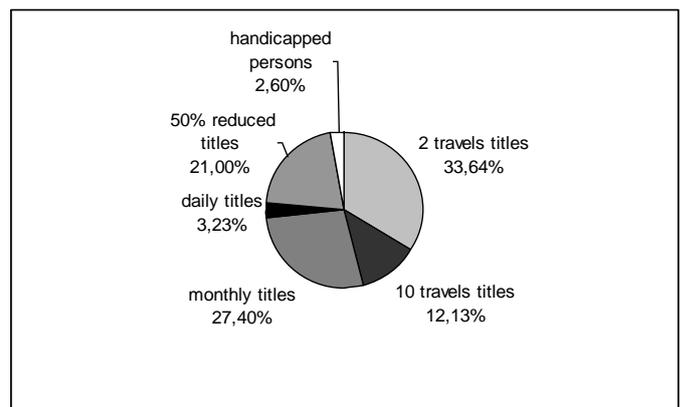The rates of used types of travels with the metro are presented in Figure 3.

Figure 3. Rates for used types of travels

4 ACTUAL FARE COLLECTION SYSTEMS

4.1 RATB – fare collection system (open system)

The RATB fare collection system is an open system having the following main characteristics:
- an open system with free access inside vehicles
- flat fare, but with special tariffs for some pre-urban areas
- with paid transfer for ordinary tickets
- without integration with metro system

Transport titles are for:
- one urban line
- two urban lines

- general urban
- pre-urban line
- one pre-urban line
- two combined lines
- one long distance line
- general for economic agents
- for one day, for 7 days, for 15 days
- free of charge cards

Figures 4-5 present some of the sales points and actual validation devices.

Figure 4. Sales point

Figure 5. Validation device

4.1.1 Advantages

The RATB fare collection system offers:
- information regarding the total and partial amount obtained by selling travelling titles;
- information regarding the number of monthly and free titles;
- open system, free access in vehicles.

4.1.2 Disadvantages

The RATB fare collection system:
- does not allow the obtaining of any statistical and operative data regarding transport volume and loading structure;
- allows a high level of committing frauds both by employing transport titles with insufficient security elements and the validation method;
- doesn't allow network configuration and exploitation based on precise and objective criteria.

4.2 METROREX – fare collection system (closed system)

The actual fare collection system is based upon magnetic titles.

Main components of access control system are the followings:
- turnovers with mechanical blocking by tripod;
- transport titles validation devices ;
- local control and data processing unit;
- central control and data processing unit;
- power supply system;
- one-way gates;
- special access gates.

Figures 6-8 present some of the sales points, validation devices and one-way gates.

Figure 6. Sales points

Figure 7. Validation devices

Figure 8. One-way gates

4.2.1 Advantages

The advantages of METROREX actual fare collection system are:
- Statistical function for the high level (number of passengers/stations/hours);
- centralising data regarding passengers' traffic;
- number and type of transport titles used;
- the possibility to locate any eventually malfunctions occurred to the validation devices in real time;
- supports heavy passengers' traffic;
- the possibility of fast evacuation in case of fire;
- reliability and high efficiency.

4.2.2 Disadvantages

The disadvantages of the actual fare collection system are:
- missing automatic ticket vending machines;
- the lack of tariff integration between the main public transport operators from Bucharest city; by achieving this integration it could be then possible to increase the public transport system attractiveness by using a single transport title METROREX – RATB;
- moderate cost of maintenance.

5 NECESSITY OF INTEGRATION

The main target for integration of the fare collection system is to provide superior services to the passengers.

The advantages of using the integrated system are:
- Protection of incomes for the transportation operators;
- The possibility to exploit more efficiently the unique public transport market;
- Transport titles must have more powerful security elements;
- free correspondence between RATB lines and vehicles, within a certain area;
- free correspondence between RATB and metro network;
- automatic fare collection system will do the weekly balance and will provide all necessary data for financial balance sheet between RATB and METROREX.
- automatic data processing;
- database created between METROREX and RATB. This database will allow the achieving of some statistical functions like origin-destination – high level function;
- decreasing the number of frauds;

- using an "intelligent card" creates the possibility to pay other services, acting like an "electronic wallet".

6 INTEGRATED FARE COLLECTION SYSTEM

The actual world tendency is to use contactless cards. The price for these cards is today at 14-15 cents.

The automatic fare collection system will provide the following functions:
a. Issuing of the transport titles
- single use cards pre-loading;
- reloading cards loading and reloading;
- personalize certain cards;

a. Operations of cash register for cards loading and reloading only;

b. Checking and automatic validation of transport titles made on cards support inside RATB vehicles and in subway stations;

c. Cards checking with portable devices;

d. Memorizing, transmitting and processing the data regarding the issuing and selling the transport titles by types and commercial locations, cards checking when passengers buy them and issuing of a cash voucher (value, issuing place, the exact time and date etc.)

e. Memorizing, transmitting and processing the data regarding the use of the transport titles and the possibility of processing data in order to establish the level of public transport routes loading (direction, hours and stops);

f. Memorizing, transmitting and processing the data regarding the vehicle position on route and the vehicles operation, the driver's and the ticket inspectors' activity;

h. Providing technical conditions for tariff integration with the automatic fare collection system of METROREX and other max. 6 future operators, including the transactional and financial balance;

i. Providing the interface with SAP system.

6.1 The functional levels are the followings:

- "Issuing" Level (commercial locations)
- "Validation" Level
- "Communication" Level: vehicles - system communication, Cu and optical cable

- "Management" Level: Operation locations (garages-depots), Management locations, Service locations
- "Central" Level: Data base management server; Server for WEB applications; Server for reports and data base storage.
- "Administration/Developing" Level

Vehicle-system and system-vehicle communication will be performed at each vehicles' entrance/exit in/from depot/garage.

6.2 The communication between system and vehicle

The communication from the system to the vehicle will comprise at least the following elements:
- synchronization of date and time;
- the tour and the line;
- the list of the valid transport titles;
- the base tariff;
- black list.

Communication from the vehicle to the system will comprise at least the following elements:
- driver identification;
- inspectors identification;
- vehicle identification;
- tour/line identification;
- beginning and finishing the driver's shift;
- data about the ticket inspectors team activity;
- transactions (transport titles validation);
- base tariff;
- technical alarms and other incidents (rejected cards, cards included on the black list etc.)

6.3 The types of transport titles

The automatic fare collection system will employ 2 technological types for transport titles:
- cards that can be reloaded;
- single use card.

6.4 Elements of tariff policy for RATB

Tariff integration between RATB and METROREX will be possible at two levels:
- "Passenger" Level by using some types of transport titles (called "integral"), both accepted along the two networks;
- "Commercial" Level by mutual compensation operations between the two operators.

6.4.1 Tariff system approach:
open (free access)

6.4.2 Tariff zones:
3

- urban area (1)
- close pre-urban area (2)
- far pre-urban area (3)

6.4.3 Lines:
- with normal tariff (3 levels of tariff for areas 1, 2 and 3)
- with special tariff (3 levels of tariff for express, night routes plus a reserve)

6.4.4 Tariff offer:
a. single use cards;
b. reloading cards:
  b.1. Low tariff season cards (50% reduction)
  b.2. Full tariff season cards
  b.3. Diversified season cards
  b.4. Free of charge cards - 8 types

6.5 Validation of transport titles

All the transport titles will be validated at each boarding on RATB vehicles, and at each entrance of a subway station.

6.6 Checking the transport titles

Transport titles inspection on RATB vehicles and within METROREX paid access areas will be performed by mobile teams belonging to these two operators. At passenger's request or at the inspector's initiative, the card will be checked with portable devices that issue an official checking ticket. The card can also be checked in any validation device placed inside the vehicles or in the subway station, by pressing an anti-vandalism button. The results of the checking will be displayed on the validation device screen.

6.7 The validation devices

Validation devices placed inside each vehicle will be connected in local networks through a standard interface and will comprise the equipment (master);

All types of the mounted validation devices, placed inside the vehicles, will be made in ergonomic shapes and they should avoid hurting passengers in case of violent contacts;

Validation devices will be secured against any vandalism actions.

6.8 SAP management system

The automatic fare collection system will provide the SAP management system with the required elements for economical-financial analysis of RATB activity:
- number and structure of the issued transport titles;

- the revenue from cards loading-reloading;
- the revenue from cards selling - after manual summarizing of the cash registrations;
- number and structure of the used transport titles on modes, vehicles, lines and intervals;
- RATB-METROREX transactional balance;
- data related to driver's activity (number of working hours etc.)
- data related to the vehicle (mileage, line, tour etc.)
- data related to card inspector's activity.

6.9 Tracking equipment for on-route vehicle location by using GPS.

The basic function of GPS system is to transfer to the on-board master equipment the on-route vehicle location at the moment of validation. This information will be used for the passenger flow management in every station and in the future for the traffic management system.

7 MARKETING ACTIVITIES

To succeed in this integrated fare collection system, the implementation will provide the following activities:

7.1 To find out and to promote an attractive name for the system.

7.2 Intensive marketing actions, like:

- promotions in RATB and metro stations by banners and posters;
- promotions by televised media, by static and dynamic advertising and by giving detailed interviews;
- promotions on radio station by messages;
- promotions in Bucharest and other cities newspapers;
- promotions in train-stations and airports from Bucharest;
- advertising by Internet;
- promotion by applying posters on the buses, trolleybuses and trams, on the phone-cards;
- promotion by distributing leaflets at RATB and metro stations sale points.

8 CONCLUSIONS

Integrated ticketing and information system between the two major public transporters represents an important objective for Bucharest public transport societies.

Taking into consideration the importance of development, the integrated transport system for the Bucharest city, starting with the ticketing and information system for passengers, a co-finance has been obtained for this project from the European Investment Bank.

By achieving the integrated ticketing and information system and other institution measures, the expectation is to make important progresses in order to improve the mass transport system in Bucharest city.

9 REFERENCES

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