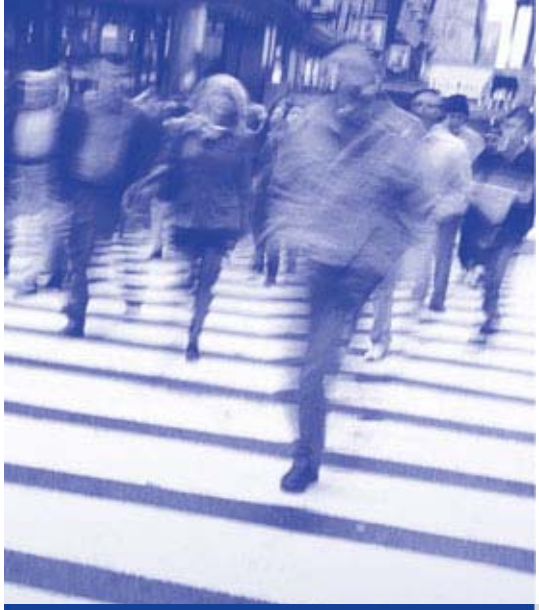

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# Measure Evaluation Results

## BOL 2.3 Ticketing on Board

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# *Executive Summary*

The measure 'Ticketing on-board' was aimed at extending the on-board ticketing services to the buses of the suburban areas of Bologna. Prior to the MIMOSA project only urban buses were equipped with on board self-service ticket vending machines. Nevertheless, this solution is not applicable to suburban buses which often remain outside the depots at night and it is not recommended to drive with money in strongboxes all night long. The objective of this measure was therefore to develop and implement an appropriate system for magnetic ticketing service on board to facilitate the accessibility of public transport in the suburban areas of Bologna. To achieve this, the measure was implemented in the following stages:

**Stage 1: Technical analysis for the system development** (September 2010 - January 2011) Thanks to the development of the new electronic ticketing system that started in Bologna on 1st January 2010, a solution for ticketing on board that uses the on board computer and validator already installed on buses was implemented. The new system allows the driver to issue tickets by means of an on-board computer selecting the requested tariff, coding a virgin magnetic ticket and validating it; the driver receives money from PT users.

**Stage 2 – Software development and testing phase** (February 2011 - June 2012) The software application was developed in cooperation with the supplier of the new ticketing system. A first release was issued, tested and presented to driver representatives to agree the procedure and proceed with the system start up. A request came from drivers to be able to annul the last ticket issued: to include this functionality a second software release was issued in June 2012.

**Stage 3 – Training to drivers** (June 2012- October 2012) In June 2012 training activities started with a three hours training course for nine drivers (who will become the trainers for other drivers): the course consisted of a general presentation of the system and a practical testing of issuing tickets. Also a user manual with practical instructions for drivers was distributed. After the launch of the system on three lines in July 2012, training courses were extended to all drivers of the suburban service and took place in the public transport depots of Bologna and the province. At the end of the courses about 600 drivers were trained.

**Stage 4 – System start up** (June 2012- October 2012) In July 2012, the service was opened and tested on three buses lines. In October 2012, the service was extended to the entire suburban buses lines. .

For the impact evaluation, the degree of users' acceptance was used as a relevant indicator. Nevertheless, it was difficult to reach a large amount of targeted users and to gather their opinions on the service since they are occasional customers who travel at different times and on different lines. Interviews were therefore conducted with 50 drivers of three equipped buses lines which shared their personal feedback on the system and their perception of the users' acceptance.

**Key-results** showed positive impacts of the measure. Indeed, feedback gathered from the drivers perspective was very positive: more than 50% stated that users' have a positive opinion on this new service. Additionally, 85% of the bus drivers thought that the ticketing on board increases the quality of the service offered to passengers.

Through the process evaluation, the barriers and drivers encountered during the process could be identified. One of the **main barriers** was the necessity to review salary at the request of drivers for the additional performance of ticket selling. To overcome this barrier an agreement was reached and drivers receive a commission of 30% of the total value of tickets they sold. Users pay a higher price by buying on-board which mostly finances drivers´

commissions. **The main driver** for the implementation of this innovative solution was the hardware devices already installed. This is an advantage both for the company in that it does not have to bear the costs of purchase and maintenance of the new devices and also for drivers issuing the tickets as they do not have to handle and take care of an additional portable device. Furthermore the drivers do not need to handle tickets with a specific value but simply have a number of virgin magnetic tickets without value.

**The main recommendation** coming out from this measure is the relevance of involving trade unions who represent drivers in order to develop a system that better matches the specific needs of drivers who will issue the tickets. This collaboration with the trade unions would also contribute to reaching an agreement on the economic aspect of payments to drivers.

In the future, this system will be applied to the fleet of Ferrara that is also managed by TPER spa. Additionally, further software release will be implemented providing the possibility to issue multiple passengers tickets in response to specific requests from the bus drivers.

# A Introduction

## A1 Objectives

**High level objectives:**

- Increase use of public transport

**Strategic level objectives:**

- Increase quality of public transport service in terms of accessibility

**Specific measure objectives:**

- Realization of a system for magnetic ticket issue on board in order to facilitate the accessibility of public transport

## A2 Description

With this measure a solution for on board ticket issue for suburban buses was developed. The on board ticketing on the urban service buses is provided with self-service ticket vending machines but for suburban buses it is not possible to install self-service ticket machines onboard because it is unadvisable to have strongboxes on buses which might remain out of the depots all night.

Thanks to the development of the new electronic ticketing system that started in Bologna on 1st January 2010, a solution for on board ticketing that uses the on board computer and validator already installed on buses was implemented.

The new system allows the driver to issue tickets by means of an on-board computer selecting the requested tariff, coding a virgin magnetic ticket and validating it; the driver receives money from PT users.

# B Measure Implementation

## B1 Innovative Aspects

**Use of new technology:** Usually tickets on board are issued through dedicated devices: the innovative aspect of this application is that drivers do not need special devices but they use the on-board system already installed for ticket validation (the on board computer and the validator) to issue magnetic tickets on board.

## B2 Research and Technology Development

The R&D activity had an ambitious objective: starting from the analysis of the specific need (sell tickets on board) we aimed to find the technological solution with the lowest impact both from the technical and organizational aspects.We evaluated several solutions that implied the installation of a specific device for ticket issue but we found one or more of the following problems:

- lack of free space on the bus to install the new device;
- high operation costs for maintenance and stocks;
- difficulties to guarantee the full efficiency of the devices (change of paper, change of toner);
- training of thousands of drivers on a completely new device;
- long installation phase to equipp the whole fleet

The solution we singled out uses the hardware already installed on board (validator and on board driver computer) and implies only the development of a software application that was installed on buses using the wifi network available in the depots.

## B3 Situation before CIVITAS

Before the development of this measure only urban service buses were provided with self-service ticket vending machines while on the suburban service there was no possibility to buy a ticket on board. On the other hand, it was not possible to install ticket machines on suburban buses because the buses might remain out of the depots all night. The threat of vandalism and theft is prevalent.

## B4 Actual Implementation of the Measure

The measure was implemented in the following stages:

**Stage 1 - Technical analysis for the system development** (Sept 2010 - Jan 2011)

The first step was the analysis of the technical feasibility of a system for on board magnetic ticket issue on suburban buses which cannot be equipped with self service vending machines. The solution found is based on the on board computer and the validator already installed on the bus for the season tickets. This solution does not require further devices (i.e. printers), with has an advantage in terms of maintenance and reliability.

The system works as follows: The bus driver has magnetic tickets without any codification (virgin ticket), that means without any value on them. When a passenger asks for a ticket:

1. the driver selects the fare on the on board computer;
2. the drivers receives money from the user and gives the virgin ticket to the passenger;
3. the validator accepts the virgin ticket and codifies it;
4. the validator also validates and prints on the ticket the type (single ticket, daily ticket), number of zones and the price;
5. all data are stored on the on board computer for reporting activity.

During the selling phase, the validator continues to validate the tickets of passengers boarding the bus that means that a manual ticket purchase does not stop the validator functions. As soon as the purchase is completed, the validator becomes ready to accept a virgin ticket.

When the driver ends his shift, a short report for the driver with the number and amount of tickets sold is printed by the validator on a virgin ticket. The report allows the driver to check on the payslip that the correct amount is detracted: total amount of ticket sold – the remuneration for the driver (30% of the total sold).

Fig 1 shows the on board equipment: at the bottom right side of the picture near the driver seat you see the on board computer on the top left side of the picture you see the validator.

**Fig. B4.1 – On board devices**

**Stage 2 – Software development and testing phase** (Feb 2011 - June 2012)

The software application was developed in cooperation with the supplier of the new ticketing system. A first release was issued, tested and presented to the representatives of drivers to agree the procedure and proceed with the system start up.

A request from drivers was to have the possibility to annul the last ticket issued: to include this functionality a second software release was issued in June 2012 and it implied a shift in the system start up.

**Stage 3 – Training to drivers** (June 2012- Oct 2012)

During June 2012 the training activities started with a 3 hours training course for 9 drivers (who will be the trainers for the others): the course consisted of a general presentation of the system and in practical tests of ticket issuing. Also a user manual with practical instruction for drivers was distributed.

During September and October 2012 training courses were held for all drivers in the depots of Bologna and the province. At the end of the courses about 600 drivers were trained.

**Stage 4 – System start up** (June 2012- Oct 2012)**:**

From 1st July 2012 the system started on 3 lines: Table B4.1 shows the lines main data .

**Table B4.1 – Main data of the bus lines**

| Line n. | From | To | Travelling time | Route lenght | Trips weekdays | Trips Saturdays | Trips Sundays |
|---|---|---|---|---|---|---|---|
| 686 | Bologna | Tolè | 1h 20m | 44 km | 25 | 24 | 0 |
| 576 | Bologna | Crevalcore | 1h 10m | 40 km | 44 | 33 | 0 |
| 537 | S. Giovanni in Persiceto | Galeazza | 59m | 30 km | 20 | 15 | 0 |

First data concerning sales data from 1/7/2012 to 15/10/2012 show 3.535 tickets sold with a revenue of 10.311,00 euro.

The feedbacks concerning the operation of the service on these 3 lines were very positive and starting on 22nd October 2012 the system will be extended to all the lines of the suburban service.

## B5 Inter-Relationships with Other Measures

This measure is related to measure 2.1"Integrated PT fare system". The new on board equipment installed for the new fare system allows the implementation of the on board ticketing for suburban buses.

There are no bundled indicators between the two measures because the on board ticketing is a service limited to occasional users and it will not have relevant impacts on the global ticketing system

# C Impact Evaluation Findings

## C1 Measurement Methodology

### C1.1 Impacts and Indicators

| Evaluation area | Evaluation category | Impact | n. | Indicator | Source of data | Month |
|---|---|---|---|---|---|---|
| Economy | Benefits | Operating Revenues | 1 | Operating revenues | Sales data | Before: - After: 45 |
| | Costs | Capital Costs | 2 | Investment Costs | Company | Before: - After: 45 |
| | | Maintenance Costs | 3 | Maintenance cost | Company | Before: - After: 45 |
| Society | Acceptance | Awareness | 4 | Awareness level | Surveys | 45 |
| | | Acceptance | 5 | Acceptance level | Surveys | 45 |

**Indicator 1-3 "Economical evaluation area":**

"Operating revenues": we can only consider revenues from tickets sold from 1th July 2012 to mid October 2012 on the 3 lines activated.

"Capital costs": we consider the total cost for the realization of the new system for on board ticketing.

"Maintenance costs": we extimate an annual maintenance costs (the system is at the moment under warranty).

**Indicator 4-5 "Society evaluation area":**

The acceptance of users is a relevant indicator for a complete evaluation of this measure but it's difficult to measure with direct interviews of users: the ticket on board is purchased by occasional customers and this characteristic makes it difficult to reach them with a survey.

To manage this situation and to evaluate the social aspects of the new ticketing service we realized during the first week of October 2012 a survey of 50 bus drivers driving on the 3 lines already activated to ask them for their personal feedback on the system and their perception of the users acceptance. The paper questionnaires were distributed to drivers and collected in the depots. The questionnaire referred to the service in general on the 3 lines not to specific service conditions (for example school time).

### C1.2 Establishing a Baseline

Before the system development passengers had no possibility to buy a ticket on suburban buses so this is a new service for transport users.

As we explained in the evaluation indicator section, we didn't have the possibility to reach directly the users (occasional customers) with a survey so we were not able to ask them questions to collect baseline data.

## C1.3 Building the Business-As-Usual Scenario

This measure has reflections on the quality of the service offered to customers and for this characteristic it's difficult to imagine what would have been the situation without implementing it.

The quantification of effects is quite impossible: we can only qualitatively say that public transport users have difficulties in buying tickets in some suburban areas where there are no ticket offices/shops nearby.

As concerns the specific indicator we examined we can say that:

- revenues coming for occasional users would have been lower because in the suburban and extraurban service expecially during Sundays people had difficulties in finding the ticket and often they travelled without paying.
- service quality perception would have been lower

## C2 Measure Results

The results are presented under sub headings corresponding to the areas used for indicators – economy, energy, environment, society and transport.

## C2.1 Economy

**Table C2.1.1: Operating revenues, investment costs, maintenance costs in Euro**

| | **2011** | **2012** |
|---|---|---|
| **Operating revenues** | - | 10.331,00 (*) |
| **Total Investment costs (in euro)** | 90.000,00 | |
| **Maintenance/operating costs** | - | 27.000,00 (**) |

(*) Data reported concerns sales data on the 3 lines that were activated in the period from 1/7/2012 to 15/10/2012. The amount is related to n. 3.535 tickets sold.

(**) Operation, maintenance costs: the system does not increase operative costs for the hardware because it uses existing devices already installed on board. The only maintenance cost concerns the software and can be quantified at 5.000,00 euro/year.

Only for year 2012 we have also the costs for the drivers training: 1hour for about 600 drivers with a total amount of about 22.000,00.

We have only partial data on revenues because the system was only activated on 3 lines from 1st July 2012. Comparisons between costs and revenues will make sense when the system will operate on the whole suburban service.

## C2.2 Energy

Not applicable

## C2.3 Environment

Not applicable

## C2.4 Transport

Not applicable

## C2.5 Society

**Indicator 4 "Awareness" Indicator 5 "Acceptance"**

Table C2.5.1. shows the drivers acceptance of the new system. More than 85% of the sample has a positive/very positive opinion on it

**Table C2.5.1: Drivers system acceptance (sample size 50)**

| **Which is your opinion on the new system for the ticketing on board?** | |
|---|---|
| | % |
| 1. Very positive | 11,5 |
| 2. Positive | 74,1 |
| 3. Indifferent | 5,1 |
| 4. Negative | 9,3 |
| Total | 100,0 |

Table C2.5.2. summaries the answers of drivers on usage of the system: about 73% did not find any difficulty and the remaining 27% mainly gives the indication that it would be useful that the system allows to issue more tickets of the same type in one time because now the driver has to repeat the issue for each ticket and it requires time

**Table C2.5.2: Drivers opinion on the system use (sample size 50)**

| **Did you find difficulties in using the system?** | |
|---|---|
| | % |
| 1 Yes, many | 0,0 |
| 2 Yes, some | 27,1 |
| 3 No | 72,9 |
| Total | 100,0 |

Table C2.5.3. summaries the impressions of drivers on the passenger acceptance. The perception is positive for 47,3% of the sample while 47,4% is indifferent to the innovation and 5,3% is negative.

**Table C2.5.3: Perception of passengers acceptance (sample size 50 drivers who sold more than 3.000 tickets)**

| **On your opinion, how was the impact on the passengers?** | |
|---|---|
| | % |
| 1.Very positive | 10,5 |
| 2. Positive | 36,8 |
| 3. Indifferent | 47,4 |
| 4. Negative | 5,3 |
| Total | 100,0 |

Table C2.5.4. summaries drivers impressions on passengers difficulties in using the system. The perception is very positive: about 74% of the sample says that passenger have no difficulties in using the system. The main difficulty for passengers is the fact that they have to validate the ticket after the driver issues it and often they do not remember to do it.

**Table C2.5.4: Perception of the passengers use (sample size 50)**

| **Did the passengers find difficulties in using the system?** | |
|---|---|
| | % |
| 1 Yes, many | 10,5 |
| 2 Yes, some | 15,8 |
| 3 No | 73,7 |
| Total | 100,0 |

Table C2.5.5. indicates that the new ticketing system is perceived as an improvement in the quality of the transport service offered to passengers service : about 84% of drivers agree on this.

**Table C2.5.5: Reflections on service quality (sample size 50)**

| **Do you think that the ticketing on board increases the quality of the service offered to passengers?** | |
|---|---|
| | % |
| 1 Yes | 84,2 |
| 2 No | 15,8 |
| 3 Don't know | 0,0 |
| Total | 100,0 |

Table C2.5.6 gives the indication that drivers consider that this new service facilitates the use of public transport (about 76% of the sample).

**Table C2.5.6: Reflections on public transport use (sample size 50)**

| **Do you think that the ticketing on board could facilitate the use of public transport and favour an increase in use?** | |
|---|---|
| | % |
| 1 Yes | 76,0 |
| 2 No | 24,0 |
| 3 Don't know | 0,0 |
| Total | 100,0 |

## C3 Achievement of Quantifiable Targets and Objectives

| No. | Target | Rating |
|---|---|---|
| **1** | Increase quality of public transport service in terms of accessibility | ** |
| **2** | Realization of a system for magnetic ticket issue on board in order to facilitate the use of public transport | ** |
| **NA = Not Assessed O = Not Achieved * = Substantially achieved (at least 50%) ** = Achieved in full *** = Exceeded** | | |

Target 1 and 2 were assessed with the results of the questionnaire to drivers. We take into consideration the perceptions they had concerning passengers' opinions.

## C4 Up-Scaling of Results

A first up-scaling will be the application of the system to the fleet of the city of Ferrara that is also managed by TPER spa. The activation is planned for December 2012.

## C5 Appraisal of Evaluation Approach

The criticality we already explained in the description of the evaluation indicators was that we did not have the possibility to interview new service users to have direct feedback that should have been of interest. However, the survey of the drivers that are in direct contact with passengers and interact with them represents a good evaluation opportunity and allows us to have both a technical, organization feedback as well as insight into the impact on users. Drivers also gave comments and suggestions that were of great interest for the company in order to futher improve the service.

## C6 Summary of Evaluation Results

The key results are as follows:

- **Drivers acceptance** – The results of the survey demonstrated a very positive acceptance of the system from drivers.
- **Users acceptance** – Through questions to drivers concerning their perceptions on user acceptance we find that also passengers are satisfied with the new service and expressed positive feedbacks.

## C7 Future Activities Relating to the Measure

The system will be applied also to the fleet of Ferrara that is also managed by TPER spa..

We will also implement a further software release providing the possibility to issue multiple passengers tickets as requested from drivers.

# D Process Evaluation Findings

## D0 Focused Measure

| | | |
|---|---|---|
| X | 0 | No focussed measure |
| | 1 | Most important reason |
| | 2 | Second most important reason |
| | 3 | Third most important reason |

## D1 Deviations from the Original Plan

The deviations from the original plan comprised:

- **Shift of the system start** – we had a shift in the originally planned service start because we added the annul functionality requested by drivers.

## D2 Barriers and Drivers

### D2.1 Barriers

**Overall barriers**

**1 - Additional functionality request from drivers:** During the presentation of the new service representatives of drivers asked to include a functionality to annul the last ticket issued: to include this functionality a second software release was issued in June 2012 and it implied a shift in the system start up.

**2 - Additional wages request from the driver** - the drivers requested to the company an extra pay for the ticket issue service. They argued that it's a supplementary duty for them that also implies the management of money.

**3 - Drivers request concerning tickets** - drivers don't want to have tickets with value because in the past there were some cases of theft

### D2.2 Drivers

**Overall Drivers**

**1 - No additional equipment purchase needed** - Main driver for the implementation of this innovative solution for on-board ticketing is the presence on buses of the devices (on board computer and validators) of the new electronic ticketing system. The on board system is open to software implementations and allowed to realize an on board ticketing application using the hardware devices already installed. This is an advantage both for the company in general that do not have costs for new devices purchase and maintenance and for the driver that use the on board computer for issuing tickets and do not have to handle and take care of a portable device. Furthermore the drivers do not need to handle tickets with a value but he simply has a number of virgin magnetic tickets without value.

**2 - Additional functionality request from drivers:** During the presentation of the new service representatives of drivers asked to include a functionality to annul the last ticket issued. This request was an added value for the system success: we had the possibility to improve the first release and give to users a final version that matched their needs.

## D2.3 Activities

**Overall activities**

**Drivers have extra wages for ticket issue -** In order to tackle barrier n. 2, an agreement was signed with bus drivers' trade unions. It foresees the payment to the driver of 30% on the total value of tickets issued. Tickets on board are issued with a higher price and this mark-up mostly goes to the driver.

**Cooperation with the supplier of the on board equipment -** To make use of driver 1 the transport operator cooperated with the supplier of the on board equipment and software to develop the on board ticketing application using on board computer and validators to 'issue' tickets on board without any additional devices and using virgin tickets. This activity allowed also to tackle barrier n. 3

**Realization of a software update –** To tackle barrier 3 that is also driver 2 we realized an update in the application that provides the anull funcitonality. We gave finally to users a final version that matched their needs.

# D3 Participation

## D3.1 Measure Partners

**ATC spa** as public transport operator in Bologna till end of January 2012 and TPER spa as new operator from February 2012 developed this application in cooperation with the electronic ticketing system supplier

## D3.2 Stakeholders

- Public transport users
- Bus drivers

# D4 Recommendations

## D4.1 Recommendations: Measure Replication

Not applicable

## D4.2 Recommendations: Process (Related to Barrier-, Driver- and Action Fields)

- **Agreeement with drivers representatives**: It's extremely important to involve trade unions that represents drivers in order to develop a system that answers the concrete needs of drivers that have to use it to issue tickets. It's also important to agree on the economical aspect related to the reimbursement of drivers