M06.02 – Executive summary

This measure foresaw the start up of an "On demand transport system", suitable for no-peak public transport demand, taking into account also the weakest users' needs.

The existing "On demand" service is a manual on-demand transport system ("Accabus") reserved for disabled people. This manual system isn't able to optimize the resources.

In order to have a more efficient "on demand" service BST (public transport company in Brescia) decided to provide a technology that allows flexibility and trips optimization:

• to minimize the number of busses and the travel time;

• to adopt a software able to manage the work shift in order to optimize the trips (so reducing labour and fuel costs);

• to increase of shared journeys up to 20% and shared passengers up to 25%;

• to optimize time of booking of the service.

During the measure implementation several actions were implemented:

- New potential targetted on demand users were investigated among "weak users" cathegory. "Brindo con Prudenza" project was proposed. It was a dedicated "on demand" bus service to avoid car use by young people during the weekend allowing them to drink. The project was an unsuccess.
- Benchmarking researches were carried out among different on demand software used in Italy and Powersoft sw was selected as suitable for Brescia "On demand" service,.
- Software purchasing and software testing. The softwere purchased was produced by Powersoft and needed to be personalized to be used for "Accabus " according to BST specific requirements. Several problems occurred during the testing phase and Pawersoft was not able to find a solution. The personalization of the software was not carried out by Powersoft and the measure was stopped.

From the evaluation point of view there was no impact of this measure on the city, as "Brindo con Prudenza" project had not have subscribers and the software puchased for "On demand" sevice was not considered suitable for "Accabus".

A. Introduction

A1 Objectives

The measure objectives are:

(EE) High level / longer term:

- To start up an "On demand transport system", suitable for no-peak public transport demand, taking into account also the weakest users' needs.

(FF) Strategic level:

- To investigate a new way to develop an efficient public transport service that satisfies the real needs of all citizens.

(GG) Measure level:

(1) to manage "On demand" PT service through a suitable technology that allows flexibility and trips optimization, in order to minimize the number of busses and the travel time (increasing of shared journeys up to 20% and shared passengers up to 25%) and reduce labour (optimizing time of booking of the service) and fuel costs;

(2) to evaluate "On demand transport system" suitable for no-peak public transport demand, developing a service addressed to weaker users such as elderly people instead of using traditional PT service when it is not suitable.

A2 Description

The measure consists in managing a service suitable for no-peak public transport demand, taking into account also the weakest users needs.

In fact, during the measure implementation Brescia Trasporti took into consideration two aspects for the improvement of the "On demand" service:

- the importance of reacing specific urban areas (especially peripheral urban areas) and

- the importance of satisfing specific PT users (such as vulnerable users).

During the measure implementation several actions were implemented:

- New potential targetted on demand users were investigated among "weak users" cathegory. "Brindo con Prudenza" project was proposed. It was a dedicated "on demand" bus service to avoid car use by young people during the weekend allowing them to drink. This service was strongly driven by the City Administration's councillorship of "Transport, Traffic and Youth Affairs". At the time there was a unique councillorship that in 2010 was split into the councillorship of "Mobility and Traffic" and the one of "Youth, Sport and Innovation".

The Local Authority decided to encorage yung people to use safer late evening "On demand" public transport as an alternative to private cars. The administration involved in this project also the various urban councils, the community associations, bar/pubs, etc. Brescia Trasporti arraned dedicated meetings to implement the "Brindo con Prudenza" on-demand public transport service. The service was organised using at least 2 buses in the municipal area of Brescia, from 10.00 pm to 6.00 am Fridays and Saturdays and during holiday time period. The "On demand" bus should bring

young people from some identified collecting points in the Municipality to the bars/pubs involved in the initiatives. Only customers from 16 to 25 years old were entitled to use the service. The service had to be booked in advance by phone by 2.00 pm on Thursday. In case of a mid-week holidays, booking had to be done 2 workdays in advance.

The buses, if no calls were received, from 9 pm to 3 am were at disposal to youth along a specific itineray. The stops were identified with the bar/pubs managers involved in the initiative. The itinerary was a close ring along "movida": starting from piazzale Arnaldo, through corso Zanardelli, via Togni, via Dalmazia, via Solferino and viale Bornata. Moreover a map of the itinerary and the stops was available in the pubs.

The service started operating on an experimental basis on 5th December 2009 to 28th February 2010. 0 calls were received by the call centre to book the service in advanced and nobody used it. Therefore the service was suspended. After this experience yeoth people were not considered suitable for an "On demand" night service during the weekend and the e attention was completely focused on a desabled needs.

Since 1992 there has been in Brescia an "On demand" service called "Accabus". This service is suitable for off-peak public transport demand and takes into account the elderly/disabled people needs. The most important aspect of the measure is the recognition of the best technology to manage an "on call" bus service, in order to offer a renewed on-demand transport service in Brescia. The goal was an improvement of the service already offered to the public and an improvement of the planning of the same service trough the acquisition of a new software able to manage the service reservations thanks to an automatic system.

Benchmarking researches were carried out among different on demand software used in Italy and Powersoft sw was selected as suitable for Brescia "On demand" service,.

The system to be purchased should fit with the strategic choiches made by the city of Brescia which are of a high quality and a sustainable transport system, that satisfies also the needs of the weakest users (for more details see section B4 "Actual implementation of the measure").

- Software purchasing and software testing. The softwere purchased was produced by Powersoft and needed to be personalized to be used for "Accabus " according to BST specific requirements. Several problems occurred during the testing phase and Pawersoft was not able to find a solution. The personalization of the software was not carried out by Powersoft and the measure was stopped.

The sowtware test faild as several technical problems occurred in relation to:

- cartography, the cartography suggested by Poweresoft to BST have not got georefereed civic numers of the streets and severeal new residential areas of the city were missing

- streets name and street identification, the softwere was not able to recognise the same name of the street located in different neighborhoods and it was not able to identify doubled street names

- one way road with contraflow bus line, several problems occurred while introducing this figure, as the software was not able to easily allow this operation

- trip lenth in combined trips, when the operator ask to the software to combine trips, the software don't allow to introduce time spent on board as a preriquirement. This was one of the specific request done by BST in sw personalization.

B. Measure implementation

B1 Innovative aspects

- New conceptual approach
- Use of new technology/ITS
- New mode of transport exploited
- Targeting specific user groups

The innovative aspects of the measure are:

- **New conceptual approach, New mode of transport exploited, Targeting specific user groups** – An "On demand" transport system for Brescia represents a new way of facing elderly/disabled people mobility and a new way of satisfying the real needs of these specific users.
- **Use of new technology/ITS** – The existing "On demand" service can be improved purchasing a specific software able to manage all type of requests and to calculate the shortest and fastest journey. The software should plan and manage trips and must be based on map projections. It should schedule a database containing all the main features of the service, like users' requests, the description of city's network, the description of trips, etc. The Graphical User Interface (GUI) could be able to acquire, visualize and eventually modify data. After the elaboration of the software, it should be able to give an optimized chronological trip suitable for the users' request (bus stops and time of beginning and end of the trip). In addition to these features, the software should have three important algorithms: one for mapping addresses on the map, one to optimize shortest trip on the cartography and the last one to optimize ways and timetable choice.

B2 Research and Technology Development

"Accabus" is the "On demand" service that has existed in Brescia since 1992.

There has been a significant increase in the number of passengers carried (as shown in *Fig.1- data available from 1995*) and it is hoped that this figure will continue to increase. For this reason BST believed that a computerized support would be necessary for an increasingly articulated planning. At the moment the system is "manual". The service could have been improved purchasing a specific software able to manage all types of requests and, at the same time to calculate the shortest and fastest trip.

The purchase of the software would have allowed BST to have a tool to ensure an optimum service. The result should have been the maximization of the combined trips, while reducing the use of resources (number of busses and drivers).

YEAR	TOTAL NUMBER OF PASSENGERS
1995	6'949
1996	6'786
1997	8'436
1998	10'174
1999	10'458
2000	12'286
2001	14'030
2002	12'990

2003	14'167
2004	14'584
2005	14'977
2006	16'569
2007	17'143
2008	16'473
2009	16'649
2010	16'097
2011	16’400

Fig.1: Total number of passengers/years

During the RTD activities BST carried out a benchmarking about other “On demand” services already existing in other cities, in order to decide the right technical specifications to be re-proposed in Brescia and to choose the most suitable software.
There were:

- "many-to-one" software applications available mainly used for school services, for users with the same trip destination;
- software for on call services, but not for disabled services, such as the Brescia’s one.

BST explained service requirements in technical specifications, pointing out the differences with the "classic" on-call services (based on the experiences of Milan and Parma, for example).
It was important to make the supplier understand the type of service required also in relation to the size of the city and to the number of users.
The software application resulting from benchmarking activity seemed to meet BST requirements.

B3 Situation before CIVITAS

Since 1992 Brescia Trasporti has operated, a manual on-demand transport system (“Accabus”) reserved for disabled people, but this manual system isn’t able to optimize the resources.

This service carries customers through the city on planned or occasional dates using 6 buses, from 7.30 to 21.15. To book the service, customers have to register and buy a special type of bus-pass.

Currently, an operator, basing on his knowledge of the city’s streets (detours, one-way streets, street’s width) has to choose the best route and to calculate the time it takes. He also has to associate the service to one of the drivers available in the time slot requested.

It is necessary to book the service by phone before 2:00 pm of the day before the trip because the booking service is based on a manual system and therefore it is not possible to optimize it for what concernes:

- trip time (from the moment when the driver picks up the user to the moment when the driver leaves the user at the desired destination)

- number of trips possible at the same time.

Most of the services that Accabus provides are “one single-user service”.

B4 Actual implementation of the measure

The measure was implemented in the following stages:

> **Stage 1: Research activities** *(from October 2008 to March 2011) – During this stage an in-depth analisys of the users needs was carried out, in order to single out a solution able to satisfy users as much as possible. BST started with a benchmarking about other on demand systems already implemented in Italy, as best practice in the management of this particular kind of transport system. For example, the on demand transport system implemented in Milan*

(called "RadioBus" and "Bus by night") were studied organizing technical visits in ATM (Milan public transport company). A visit to the operative rooms and to the busses depot was arranged. Particular attention was given also to the case of the city of Parma, where an on demand service (called "PRONTO BUS" in urban area,"T-BUS"in extraurban are) is used in off-rush hours and for more flexible trips.

The implementation of two different "On demand" transport solutions was made: the first one was a night service adderessed to the young; the second one was addressed to disabled users.

BST proposed an experimental phase. During this phase the national campaign "Brindo con Prudenza"(that aimed at promoting also road safety), was locally promoted by BST and CBS. This experience was an occasion to test the interest of young people to an "On demand" PT night service. The implemented service scheduled an initial subscription, to let users get a password to book the service. Users were taken to the desired destination and brought back to the starting point during the night. To book the service a call centre was available from Monday to Thursday. Call for booking was free.

The service was promoted through massive advertisement on local newspapers ("Giornale di Brescia", "Bresciaoggi", "il Brescia"), local reviews ("Brescia Up"), on busses (Fig. 2) and on signals spread in the city and on dedicated leaflets (Fig. 3).

Fig.2: **The bus dedicated to the "Brindo con prudenza" service**

Fig.3: **Promotional campaign of the project "Brindo con prudenza"**

In spite of all that, from 5th december 2009 (start of the experimental phase) to 28th February 2010 (end of the experimental phase), the interest shown by young people for a night "On demand" service was null: the booking service registered 0 calls.

Fig.4: **Bus used for the existing Accabus on demand service**

Therefore, according to the measure objectives, BST decided to improve the existing daytime "On demand" service (called "Accabus"), dedicated to other specific targets (i.e. disabled or elderly people characterized by particular mobility needs during the off-peak hours) (Fig. 4). This solution required the purchase of a software for the booking service management. The Accabus service was also improved introducing 2 new busses (purchased in measure 01.06). The tender for the software purchase is included within this stage.

The technical specifications of the service requirements had also to integrate with the company's existing situation operating system, specific and consolidated technicians skills.
The software should have been able to manage all type of requests and to calculate the shortest and fastest trip.

After a quite long benchmarking activity, the company able to provide the most suitable software was selected (Powersoft) and on March 2011 BST received a technical and economical proposal for the whole software package, including specific customisation measures.

Stage 2: Operative phase *(from March 2011 to October 2012) – In an early meeting with Powersoft, the company provided BST with the opportunity to customise the application. Personalization was a necessary condition for the implementation of the system, in order to achive the project goal. After the software economic offer, the necessary activities for the software (application developed by Powersoft) activation started, in particular a test phase during which BST tested the SW.*

The chosen SW had the following features:

The system could easily be interfaced with BST AVM system (Automatic vehicle Monitoring) and, in addition Powersoft proposed to integrate the SW with the equipment on board of the vehicles. (to make the on-board devices for the buses work correctly, data transfer needed to be bi-directional between the Operations Centre and the vehicles, using various types of vectors which could be integrated).

The PowerDriver DTSS system could solve and optimize trip planning offereing a flexible transport service (with no need to plan routes, starting points, termini or stops in advance).

DTSS could organize the vehicle routes by entering any new request during the current ride. As a result, transit could be faster and the use of the vehicles could be maximised.

Testing phase of the SW provided by Powersoft:

In this phase both the old and the new software were used to simulate the management of the service.

BST instolled the new SW provided by Powersoft and started a testing phase in Brescia.

DTSS uses a GIS System (Geographic Information System), duly interfaced with the database, to configure the service network. The database must also contain the remaining viability elements such as speed, bus transit times and direction (inbound/outbound) for the different time bands, days and periods. The database can be updated with data gathered while the service is actually being provided.

During this testing phase several managing problems arose in the data input phase required by the two SW modules "Road Manager" and "Routing planner" to work correctly

- "Road manager"

This module is primarily concerned with the management of the map. You must enter all the information on the roads that the buses of the Accabus service can take. After the acquisition of maps, which contain references to civic numbers, you must define the directions of roads and intersections (Fig.5).

Data entry in Road Manager is a necessary condition to start the simulation, therefore it must be constantly updated in order to produce a good result: so the first step of planning is to enter any deviation related to the actual conditions of the area (work in progress, modification of the one-way, etc.).

This condition needs to have a dedicated person to costantly update the data for all the city and suburbs served by PT transport.

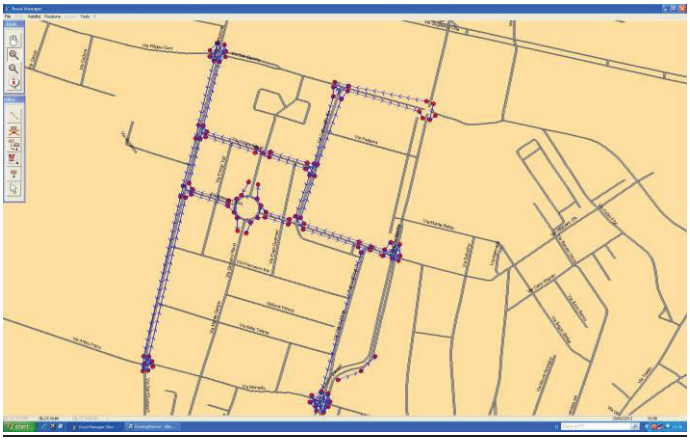

Fig.5: Road Manager Interface

- Routing Planner Module

Routing Planner automatically creates the best routes according to the geographic position of the addresses and destinations to be reached, taking into account any extra criteria defined by the operator, such as:

- *optimum passenger load (or best vehicle occupancy);*
- *shortest transit time;*
- *maximum time on board the vehicle (this is a fundamental criterion in BST case, since their passengers are disabled);*
- *minimum number of vehicles in use.*

The DTSS system can generate a series of final data pertaining to each single day or to a period of time defined by the operator. The main data are:

- *kilometres covered by each vehicle;*
- *number of passengers carried;*
- *ride time / idle time per vehicle;*
- *number of bookings;*
- *number of people on board a bus at any given time;*
- *average length and duration of each ride per vehicle;*
- *number of passengers carried by a bus.*

To plan the service, the planning module requires the operator to enter basic data (vehicle and final destination) as well as the users' requests (destination and times), using georeferenced maps. The needed cartography[19] was not updated, and onece aquired it was necessary to purchase a new PC to manage both cartography and SW.

[19] 16th march 2011 - focus on the type of cartography supported by the software;
31st March 2011 - the software does not support the existing maps so, upon Powersoft recommendation, BST contacts Ubiest (Company for the map) for an offer on the supportable cartography needed to implement the system;
8th April 2011 - Ubiest provided BST with an economic offer for the right cartography (the second one, that BST had to pay for to speed up the process, despite the fact that assessment of the map's compatibility was up to Powersoft)

The routing planner module test phase foreseen in February 2012 was postponed.

While waiting for the updated maps BST was able:
- to roughly plan the service on the basis of the existing system,
- to analyse the potential of the PowerDriverDTSS various masks and,
- to see which elements could really better the system already used

A database of regular users (Fig.6, 7) was loaded into the system, but only when the maps were available it was possible to add the data concerning the starting point of each journey and the relevant destination.

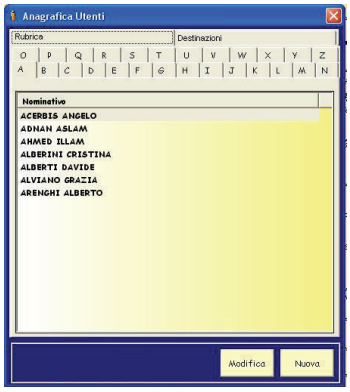

Fig. 6: Database of regular users

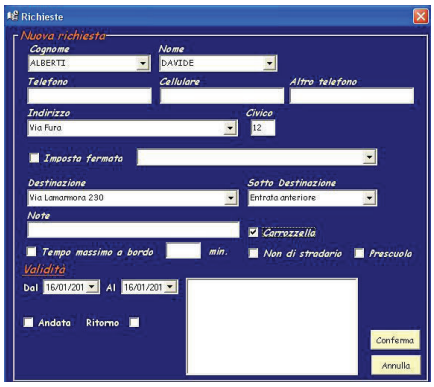

Fig. 7: User database: the address, destination and sub-destination fields have been filled but their graphic representation on the maps is missing, since the maps is pending.

After receiving a complete set of maps from Powersoft, BST checked if a wider and better choice of services could really be provided to passengers.

Fig.8: **Example of booking management using the new software**

11th April 2011 - request of purchase for Powersoft software, Ubiest maps
27th April 2011 - Acquisition of Ubiest Cartography

The main problems were:
- that the SW could not work correctly in relation to street managing in fact PT service serve Brescia and suburbs in which there are streets with the same name. The SW has also problems in managing streets with long names (it automatically cuts of the eccessive carachters);
- that the SW is not able to manage a real" door to door" service. Infact civic number are not managed as they are in reality.
- Pawersoft was not able to find a solution to these basic prolems.

Therefore the testing phase of the SW wasn't considered succesful and it was decided not to use the SW for on demand service "Accabus".

B5 Inter-relationships with other measures

As one of the objectives of the measure is to improve the public transport service quality, this measure has interactions with **Measure no. 01.06 "Clean and energy efficient public transport fleet in Brescia"** in which buses for On demand service were bought.

C. Evaluation – methodology and results

From the evaluation point of view the main objective of the measure consisted in the evaluation of an "On demand transport system" suitable for no-peak public transport demand, and in developing the technology to manage this kind of service in Brescia.

The evaluation at the beginning of the project foresaw the measuring of the impact of the SW use, expecially in optimizing the trips, ways and timetable choices.

The testing phase of the SW wasn't considered succesful and it was decided not to use the SW to manage the on demand service "Accabus" reservations.

The not sucessful testing phase didn't allow to evaluate the measure impact. Therefore the ex post data collection wasn't carried out and the comparison After-Before; After-BaU is missing. As a consequence the evaluation was focussed mainly on the measure process.

C1 Measurement methodology

The indicators were set to evaluate the measure efficiency in terms of objectives achievement. (see section C1.1).

The selected indicators, n. 7 (Km per day maximum) and 8 (Software flexibility) should have been particularly useful for the up scaling.

Indicator 5 (N. of calls per year) was deleted from the initial list of indicators. The new software purchased didn't register the numeber of calls therefore such indicator was useless to measure the software performance. The purchased software was only able to improve the trip organization, while the call center for the trip reservations was expected to work like before, without monitoring the actual number of calls received, but only estimating them.

C1.1 Impacts and Indicators

Only ex-ante was collected.

Table C1.1: Indicators.

No.	Impact	Indicator	Data used	Comments
1	Economy	Average operating revenues	Periodic reporting of operating revenues – BST database	The economical indicators are provided directly by the MLs as the detailed values are considered "sensitive" data, therefore they cannot be spread. Main Indicator
2	Economy	Average operating costs	Investment costs of service implementation - BST database	The economical indicators are provided directly by the MLs as the detailed values are considered "sensitive" data, therefore they cannot be spread. Main Indicator
3	Transport	Quality of service	Survey among on demand users - BST database	Main Indicator
4	Transport	Waiting time	Minimum waiting time	Main Indicator

			from the reservation of the trip to the use of the vehicles	
5	Transport	calls per year	Number of calls recorded	NO MORE COLLECTED
6	Transport	total number of passengers per year	total number of passengers per year - BST database	Main Indicator
7	Transport	Km per day maximum	Total number of kms per year - BST database	Useful for the up scaling Main Indicator
8	Transport	Software flexibility	Number of combined trips respect to the total number of trips	Useful for the up scaling Main Indicator
9	Society	Awareness level	Variation of the total passengers respect to the previous year	Main Indicator
10	Society	Acceptance level	Number of passengers that changed their habits: from occasional to systematic users	Main Indicator

Detailed description of the indicator methodologies:

- **Indicator 1** *(AVERAGE OPERATING REVENUES)* – Is defined as the ratio of total income generated from fares and tickets divided by the total passenger-km in a given time period (year). Because of sensitive data, this indicator is provided directly by the ML.
- **Indicator 2** *(AVERAGE OPERATING COST)* – is defined as the ratio of total operating costs incurred by a service divided by the total passenger-km or vehicle-km completed by the service in a given time period (for example day, week, month or year). Operating costs include, for example, the personnel costs, fuel, electricity and maintenance costs for the vehicle(s) involved. They do not include **investment costs** in vehicles and infrastructure, etc. Because of sensitive data, this indicator is provided directly by the ML.
- **Indicator 3** (*QUALITY OF SERVICE*) - In order to monitor the quality of service, a survey among the "On demand" users has been arranged. The administered questions are listed below and for each question interviewed people answered giving a mark from 0 (worst judgement) to 10 (best judgement). See Annex 3.

  Questions:

  1. Service booking conditions;
  2. Vehicles cleanliness;
  3. Satisfaction about the comfort on board;
  4. Satisfaction about the driver's kindness/helpfulness;
  5. Satisfaction about the punctuality.
- **Indicator 4** (*ACCURACY OF TIME KEEPING IN ON DEMAND SERVICE*) - Minimum waiting time is defined as the time between the call to phone centre and the arrival of the bus at the bus stop.
- **Indicator 5** (*N OF THE CALLS BEHIND PER HOUR*) – the indicator has been deleted from the initial list. **NO MORE COLLECTED**

- **Indicator 6** (*N OF POTENTIAL PASSENGERS/IN A GIVEN TIME PERIOD*) - Total number of passengers per year.
- **Indicator 7** (*KMS PER DAY MAXIMUM*) - Total number of kms per year traveled by the vehicles used for the "On demand" service.
- **Indicator 8** (*SOFTWARE FLEXIBILITY*) - This indicator is expressed by the total number of combined trips (more than one passenger per trip) respect to the total number of trips.
- **Indicator 9** (*AWARENESS LEVEL*) - Variation of the total number of passengers respect to the previous year.
- **Indicator 10** (*ACCEPTANCE LEVEL*) - is intended as the number of passengers that changed their habits: from occasional to systematic "On demand" service users. The indicator is calculated as variation of the number of systematic users respect to the previous year.

C1.2 Establishing a Baseline

The "On demand" service in Brescia called "Accabus", dedicated to disable people, has existed in Brescia since 1992 and it is managed by Brescia Trasporti SpA. Before the implementation of the Civitas measure, for the service erogation, a Software was already available, but it still was "manual" (for example, in the organization of the itineraries based on the reservations received by the call center).

As the new software for the service management was purchased in 2011, the baseline year was set in 2010 for all the indicators.

Indicator 1 and 2 (Average operating costs and revenues) evaluate economical aspects linked to the on demand service erogation and were provided directly by the transport company.

• **Indicators concerning economical aspects**	• **BASELINE** • **(2010)**
• 1. Average operating revenues	• 2,29
• 2. Average operating costs	• 16,56

Tab. 1: **Indicators concerning economical aspects**

Indicators 3, 9 and 10 (quality of service, awareness and acceptance level) give an idea of the overall perception of the service by the on demand service users. In particular, the quality of service (ind. 3) was collected through the administration of a questionnaire to the users asking them their opinion about the service. The awareness and acceptance level derived from the historical data series of the on demand passengers, as the service is dedicated to disable people and is object of conventions with the Municipality of Brescia. The awareness level was expressed by the variation of passengers respect to the previous year, as a positive variation of this indicator could mean a higher level of awareness of the service. The acceptance level was expressed by the variation of the number of systematic users respect to the previous year, as a positive variation of this indicator could mean a higher level of acceptance towards the service.

• **Indicators concerning the overall service perception by the users**	• **BASELINE** • **(2010)**
3. Quality of service	• average judgement: 8,6/10
• 9. Awareness level	• Variations of the number of passengers respect to the previous

	year -3,3%
• 10. Acceptance level	• Variations of the systematic users respect to the previous year = -7,6%

Tab. 2: **Indicators concerning the overall service perception by the users**

Indicators n. 4 (Waiting time), 6 (total number of passengers per year), 7 (Kms per day maximun) and 8 (Software flexibility) have been selected to monitor the overall features of the service, as they will probably benefit from the introduction of the new software in terms of total number of passengers yearly transported, Kms traveled by the on demand vehicles per year and number of combined trips.

• **Indicators concerning overall features of the service**	• **BASELINE** • **(2010)**
• 4. Waiting time	• 17 hours and 30 minutes
6. total number of passengers per year	• 16'097
7. Kms per day maximum	• 121'099
• 8. Software flexibility	Percentage of combined trip respect to the total trips =15,8%

Tab. 3: **Indicators concerning overall features of the service**

Indicator 5 (number of calls per year), as better explained in the C.1 and C.1.1. sections of this MERT, hasn't been collected because in the light of the new purchased software, the number of calls won't be registered but estimated like before and wouldn't benefit from the new software introduction.

C1.3 Building the Business-as-Usual scenario

The BaU scenario building generally take as reference the assumption that without the Civitas contribution probably the new software for the on demand service management wouldn't have been purchased.

As regards the indicators n. 1 (Average operating revenues) and 2 (Average operating costs), concerning the economical aspects linked to the on demand service, 3 historical data were available, referring to years 2008, 2009 and 2010. These data cannot be considered a sufficient series to project a reliable trend curve, therefore the following assumptions have been done. The 3 available values show an alternate trend, that demostrate that the value of these indicators depend on external factors such as for example the active conventions with the Municipality of Brescia, the kind of users to which the service is addressed that have specific mobility needs or the influences caused by extraordinary events (breaks of the vehicles, and so on). Therefore, as cautelative value, the average number of the 3 was taken as reference for the BaU scenario.

Indicators concerning economical aspects	**BaU (2012)**
1. Average operating revenues	2,18
2. Average operating costs	16,08

Tab. 4: BAU for **Indicators concerning economical aspects**

As regard indicator 3 (quality of service), 3 historical data were available, referring to the questionnaires administered in 2008, 2009 and 2010. These data cannot be considered a sufficient series to project a reliable trend curve, therefore the following assumptions were made: looking at the

3 available values, year 2009 registers a value that is higher than year 2008 and 2010, but the number of the filled in questionnaires was lower. For these reasons the value registered in 2009 was considered anomalous, therefore the BaU scenario for this indicator equals the average values registered for the other 2 years.

Indicators concerning the overall service perception by the users	**BaU (2012)**
3. Quality of service	average judgement: 8,6/10

Tab. 5: BAU for **Indicators concerning the overall service perception by the users**

Indicators 9 (Awareness level) is calculated basing on the number of on demand passengers while indicator 10 (Acceptance level) is calculated basing on the number of on demand systematic passengers. The methodological assumption made for the BaU scenario building of these indicators is the following: the historical data series available for the indicators 9 and 10 are characterized by an alternate trend that doesn't take into consideration the external factors that could influence the success of the on demand service. As a matter of fact, the service is centered on a particular kind of users (disable people) which have very specific mobility needs.

As regards indicator 9, the total number of passengers (directly deriving from the indicator n. 6) was projected in order to calculate the BaU value of the indicator n. 9 using the estimated theorical data as reported in the following table (Tab. 6).

YEAR	Ind. 6 Total number of on demand passengers (in RED the estimated theoretical values)	Ind. 9 Variations respect to the previous year of the number of on demand passengers (in red the calculated values basing on the estimated theoretical number of passengers)
1995	6'949	-
1996	6'786	-2,30%
1997	8'436	24,30%
1998	10'174	20,60%
1999	10'458	2,80%
2000	12'286	17,50%
2001	14'030	14,20%
2002	12'990	-7,40%
2003	14'167	9,10%
2004	14'584	2,90%
2005	14'977	2,70%
2006	16'569	10,60%
2007	17'143	3,50%
2008	16'473	-3,90%
2009	16'649	1,10%
2010	16'097	-3,30%

2011	18986	18%
2012	19683	4%

Tab. 6: number of on demand passengers and Variations respect to the previous year

Similarly to the previous indicator, as regards indicator 10, the total number of systematic passengers (data provided for the calculation of indicator 10) was projected in order to calculate the BaU value of the indicator n. 10 using the estimated theorical data as reported in the following table (Tab. 7).

YEAR	TOTAL NUMBER OF SYSTEMATIC PASSENGERS (in RED the estimated theoretical values)	Ind. 10 Variations of the systematic users respect to the previous year (in red the calculated values basing on the estimated theoretical number of systematic passengers)
1995	4'565	-
1996	4'377	-4,10%
1997	5'374	22,80%
1998	6'373	18,60%
1999	7'463	17,10%
2000	8'543	14,50%
2001	8'963	4,90%
2002	8'325	-7,10%
2003	8'754	5,20%
2004	9'335	6,60%
2005	10'201	9,30%
2006	12'008	17,70%
2007	11'264	-6,20%
2008	9'318	-17,30%
2009	9'538	2,40%
2010	8'815	-7,60%
2011	11572	31%
2012	11952	3%

Tab. 7: number of systematic passengers and Variations respect to the previous year

Indicators concerning the overall service perception by the users	**BaU (2012)**
9. Awareness level	Variations of the number of passengers respect to the previous year = +4%
10. Acceptance level	Variations of the systematic users respect to the previous year = +3%

Tab. 8: **Indicators concerning the overall service perception by the users**

The indicator n. 4 (waiting time) expresses the maximum waiting time that people have to wait from the reservation of the trip and the beginning of the service the day after. Without the Civitas contribution the Software, that should have improved the on demand bus service, including the waiting time, wouldn't have been purchased, therefore the BaU scenario value for this indicator equals the baseline one.

Indicator 5 (number of calls per year), as better explained in the C.1 and C.1.1. sections of this MERT, were removed from the intitial list of indicators because in the light of the new purchased software, the number of calls could not be registered but only estimated like before.

Indicator 6 (total number of transported passengers per year) can count on the availability of historical data series, therefore the BaU scenario was calculated projecting the historical data.

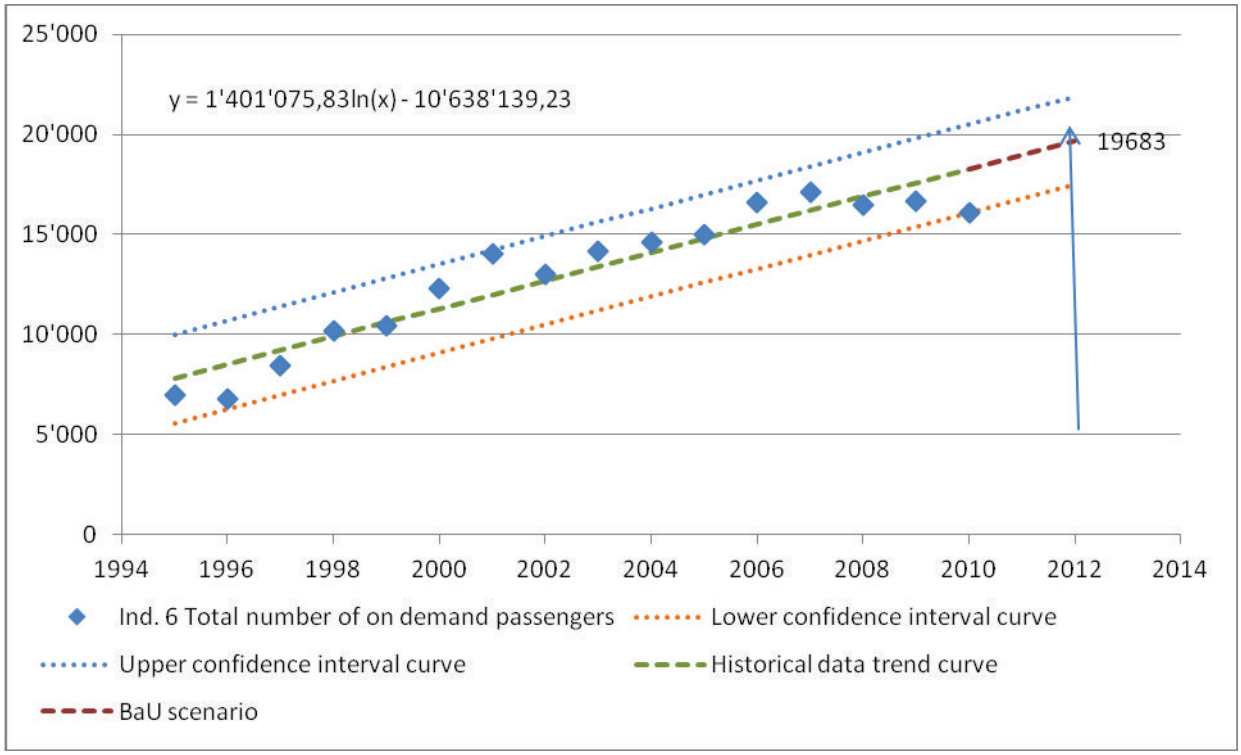

Fig. 9: projection of the historical data referred to the number of on demand passengers

As regard indicator 7 (Kms per day maximum), 4 historical data are available, referred to years from 2007 to 2010. As the historical data series is not sufficient for the projection of a reliable trend curve, for the BaU building of this indicator the following consideration were made: the traveled kms by the on demand busses per year seem to be correlated to the total number of passengers per year, as the amount of combined trips (with more than 1 passenger) is of modest entity respect to the total trips. Looking at the values of indicator 6 (total number of passengers per year) referred to the period 2007-2010 this hypothesis seems to be confirmed. As a matter of fact there's an overall slight decrease of the number of passengers in the last 4 years. The BaU value for this indicator corresponds to the average value of the 4 years period available. Taking as BaU value the Baseline one wouldn't be coherent with the general increase of the total number of passengers that derives from the projection of a longer historical data series (since 1995).

As regard indicator 8 (Software flexibility) expressed by the Percentage of combined trip respect to the total trips, 3 historical data are available, referred to years from 2008 to 2010.

Indicators concerning overall features of the service	**BaU (2012)**
4. Waiting time	17 hours and 30 minutes
6. total number of passengers per year	19683
7. Kms per day maximum	127890
8. Software flexibility	Percentage of combined trip respect to the total trips =15,97%

Tab. 9: **Indicators concerning overall features of the service**

C2 Measure results

The Before and BaU values are presented under sub headings corresponding to the areas used for indicators – economy, society and transport.

As already mentioned the evaluation foresaw the measuring of the impact of the SW in optimizing the trips, ways and timetable choices.

The not sucessful testing phase did not allow evaluate the measure from and impact point of view. Therefore the following tables are filled only in relation to baseline (Before) and BaU. The After value are **Not Assessed.**

C2.1 Economy

Table C2.1.1: Results obtained for the Indicators corresponding to area "economy"

Indicator	Before (2011)	B-a-U (2012)	After (date)	Difference: After –Before	Difference: After – B-a-U
1. Average operating revenues (€/pkm)	Year 2011 = 2,42	Year 2012 = 2,18	**Not Assessed (the measure was stopped)**	/	/
2. Average operating costs (€/pkm)	Year 2011 = 16,55	Year 2012 = 16,56	**Not Assessed (the measure was stopped)**	/	/

C2.4 Transport

Table C2.4.1: Measure results for the indicators of the category "Transport"

Indicator	Before (2011)	B-a-U (2012)	After (date)	Difference: After – Before	Difference: After – B-a-U
3. Quality of service	N° of questionnaires: 25 Average mark per year and per question and total average mark per year: 8,96/10	Average judgement: 8,6/10	**Not Assessed (the measure was stopped)**	/	/

4. Waiting time	The on demand service consists in reserving the trip within 2:00 p.m. of the previous day. As the first trip starts at 7:30 a.m., the minimum waiting time is 16 hours and 24 minutes	17 hours and 30 minutes	**Not Assessed (the measure was stopped)**	/	/
5. N. of calls per year	NO MORE COLLECTED		**Not Assessed (the measure was stopped)**	/	/
6. total number of passengers per year	Ind. 6: 16.400	Ind. 6: 19.683	**Not Assessed (the measure was stopped)**	/	/
7. Kms per day maximum	Total Kms in year 2010: 128'274	Total Kms in year 2012: 127.890	**Not Assessed (the measure was stopped)**	/	/
8. Software flexibility	Percentage of combined trip respect to the total trips: 12,57%	Percentage of combined trip respect to the total trips =15,97%	**Not Assessed (the measure was stopped)**	/	/

C2.5 Society

Table C2.5.1: Measure results for the indicators of the category "Society"

Indicator	Before (2010)	B-a-U (2012)	After (date)	Difference: After –Before	Difference: After – B-a-U
9. Awareness level	Variation respect to the previous year: +1,88%	Variations of the number of passengers respect to the previous year: +4%	**Not Assessed (the measure was stopped)**	/	/
10. Acceptance level	Total number of systematic passengers (2011): 8.919 Total number of occasional	Variations of the systematic users respect	**Not Assessed (the**	/	/

	passengers (2011): 7.481 Total number of passengers (2011): 16.400 Variation of systematic users respect to the previous year: +1,18	to the previous year: +3%	**measure was stopped)**		

C3 Achievement of quantifiable targets and objectives

No.	Target	Rating
1	Management of "On demand" PT service through a suitable technology that allows flexibility and trips optimization, in order to minimize the number of busses and the travel time and reduce labour and fuel costs; *Only the testing phase has been implemented, therefore the objective achievement hasn't been assessed during CIVITAS project.*	**NA (the measure was stopped)**
2	Evaluation of an "On demand transport system" suitable for no-peak public transport demand, developing a service addressed to weak users such as elderly people instead of using traditional PT service when it is not suitable; *Only the testing phase has been implemented, therefore the objective achievement hasn't been assessed during CIVITAS project.*	**NA (the measure was stopped)**
NA = Not Assessed O = Not Achieved ✶ = Substantially achieved (at least 50%) ✶✶ = Achieved in full ✶✶✶ = Exceeded		

C4 Up-scaling of results

No data are available to do the upscaling.

From a teoretical point of view it must be underlined that "On demand" service (Accabus) is already extended to all the city.

C5 Appraisal of evaluation approach

In this section we explain the problems incurred during the test implementation linked with the SW utilization. The evaluation of the measure is in fact referred not to the target achivement, but to the process evaluation.

CIVITAS project was important because it offered the chance to analyse the software available and the experiences of other already working services, assessing the possibility of personalizing the available software. This analisys is interesting to allow the measure replication and transferibility. This section is organized in a schematic way in order to sintetize the main aspects.

MAIN OBJECTIVE FOR THE COMPANY – ACTUAL SERVICE ORGANIZATION:

Brescia Trasporti needed to purchase a software which could deal with "on Call Service" that at present is manually dealt with.

Now the user calls the operator on duty, the latter, after taking note of the call, has to organize the trip by 5 pm of the day prior to the request, and he has to contact the user confirming the trip.

This kind of organization is clearly limited by both manual dealing and the impossibility of organizing requests. On the other hand, in a town like Brescia it can satisfy the users' requests transforming the service into an "ad hoc" service which takes into consideration the user's needs - it is to be underlined that in our case the user is disabled. Actually the "Accabus" user is a dependent customer and, in time, the relationship has gone well beyond the customer-supplier relationship.

BENCHMARKING ACTIVITIES

In Milan BST technicians visited the centre which deals with on demand transport service, and the presence of dedicated personnel who dealt with the booking service, besides the software, was instantly noticed.

Commercially the BST choice was to buy Powersoft DTSS, which was seen in Milan, as it would easily interface with the equipment already on board the busses.

As this kind of software was originally designed for school transport some personalisations were required for the " Accabus" service.

TEST PHASE: MAIN ACTIVITIES AND RELATIVE PROBLEMS

During the experimental phase there were several problems to be faced as, for instance, specific reference mapping.

- ✓ CARTOGRAFY AND ITS USE

In the traditional cartography there is no layer of precise civic numbers, besides this, in "normal" cartography there is no correspondence between the lanes for general vehicles and those dedicated to TPL. Time was spent for the purchase of new cartography; also this last one isn't complete in all its areas (for instance the whole area of council house buildings of Sampolino is missing) and civic numbers are marked spreading numbers between the first and the last civic ones, without the exact location. It would be necessary to go all around the city and manually correct existing cartography, overlapping it with the BST one, marking at every crossroad and along each arch which route the bus can actually follow, setting the standard speed per each arch. This would still give only approximate running time as it would not be possible to foresee traffic flow. It could be possible to impose a suitable running speed thought the software doesn't consider boarding time.

This seems to be one of the first critical points, keeping in mind that the software was originally designed for a "door to door" booking service, that is to say: from each user's civic number to each user's different destination, satisfying specific needs.

- ✓ THE MAIN SOFTWARE DEFECTS

After tests, made by qualified technical personnel, it was clear that the software presnts those defects typical of a software which has been tested little (it has neither got a consulting manual!).

In using this software for its service some "worms" that make the entering of information very slow, were evident. It is critical to enter the name of streets, as it foresees an archiving system based on time and not one based on alphabetical order besides the SW objectis to streets with a slightly different name as Via dei Musei and Via Musei. There also is the problem with homonymy of streets which are in boroughs close to one another, that are served by the on Call Service. The programme works researching streets not boroughs. Only a certain number of characters is allowed, the extra ones are cut off. The Christian name has to be entered before the family name so, quite often, most of the characters available have already been used just to write the first part of the name of the street.

It is particularly difficult to set parameters aiming at optimising the service, also because a lot of them are subjective. Such defect is typical of an immature software which still needs an important calibrating phase.

THE SOFTWARE USE: SOME QUALITATIVE/ECONOMICAL CONSIDERATIONS

When considering the quality that BST offers its users it is clear that the service quality is overall important as the passenger and his needs are the main concern. It is obvious that a software can't consider such needs. The software service would be an anonymous service and it would surely

influence the user's opinion and reflect on the number of the same users. The users number with the existent service has nearly tripled from 1995 (6,949 passengers) to 2011 (16,400 passengers).

All in all, it is evident that the good intentions which prompted the purchase of a software for the bettering of the "on demand" transport system clashed, in Brescia, with the costs required to implement and run the booking centre in the right way, leading to the disadvantage of the quality of the service which is now focused on the user's needs, on the user himself, that a machine cannot consider.

From an economical point of view, the actual service is implemented with the support of 2 drivers for 2 hours a day (BST calculate a personnel cost/year of €. 15.000,00 for the managing of the actual service).

The use of the new software would require 2 drivers for 2 hours a day, to recive the call but also the expertise of a TECHNICIAN to enter info data in the software as otherwise it would be impossible create the service (Structuring and running of the software). The cost for this activity would be about €. 45.000,00/year.

It is therefore very important to assess and verify all aspects of the proposed solution.

C6 Summary of evaluation results

The key results are as follows:

- **Key result 1** – Thanks to CIVITAS Project has been organized the benchmarking activities and a SW has been purchased to manage On demand service, but owing to the encoutered problems it will be used for school service. It will be tested for the school service in Desenzano del Garda, BS, where the service has to be set up.

C7 Future activities relating to the measure

BST has decided to systematically use software, in the future, for school service as it is characterized by gathering stops and a single destination. In particular, in this case it goes from multiple origins to a single destination.

D. Process Evaluation Findings

D.0 Focused measure

This measure is not a focused one.

D1 Deviations from the original plan

The deviations from the original plan comprised:

Deviation 1 title –SW testing phase was longer than expected and several problems incurred were related to the cartography set up.

D2 Barriers and drivers

In the following we summarise under key headings some of the barriers and drivers experienced during the implementation of the measure.

D2.1 Barriers

testing phase

A general lack of customisation of the program is the main causes of the unsuccessful of the measure, in fact:

- **Barrier 1 – At the beginning BST had problems with the cartography (origins and users' destinations should be georeferenced): a new map was puchased, as Powersoft company did not verify the compatibility of the map with the sotfware).**
- **Barrier 2** – the SW could not work correctly in relation to street managing in fact PT service serve Brescia and suburbs in which there are streets with the same name. The SW has also problems in managing streets with long names (it automatically cuts of the eccessive carachters);
- **Barrier 3** - the SW is not able to manage a real" door to door" service. Infact civic number are not managed as they are in reality.

Organizational phase

- **Barrier 1** –costs to manage the SW and to organize the service hasn't been appropriately considered
- **Barrier 2** – Before the start up of the metroline by 2013, Brescia Trasporti don't want to change the personelle already dedicated to Accabus.

D2.2 Drivers

N**one!**

D2.3 Activities

- **Recovery action 1)** cartografy - the software required a complex preliminary phase to build up the input database, which also required Brescia Trasporti to purchase two different new cartographies. As a matter of fact, Power Soft suggested to purchase the first cartography, which actually wasn't suitable to On Demand transport needs: this cartography didn't have the street numbers, while an On demand transport for disabled people requires a "door to door" service. The second cartography, purchased by Brescia Trasporti, after the UBIEST updates and after the Power Soft suggestion, still wasn't detailed enough: in fact, the streets numbers were incomplete, or they were missing on one side of the streets, or they were only partially inserted. Many personalization were introduced.
- **Recovery action 2)** specific courses. In July PowerSoft performed the basic training course and BST started the training of the actors by the acquisition of the software operating manual. Only in retrospect BST realized that this phase was initially underestimated.

D3 Participation

D.3.1 Measure partners

The partners related to this measure is Brescia Municipality.

D.3.2 Stakeholders

Mention of the stakeholders does not imply a certain degree of activity, influence or interest but is simply a list, for each activities implemented in the measure

- **Stakeholder 1 –** Citizens also with disabilities, students, Public Transport Users, Powersoft company.

D4 Recommendations

- **Recommendation 1 -** before deciding to substitute an efficient and high quality level service (such as Accabus) it is important to understand if a new SW is really able to improve benefits.
- **Recommendation 2** – contractual aspects related to service requirements and technical specifications for an "On demand" SW must not be undervalued
- **Recommendation 3 –** From an economical point of view is very important to assess and verify all aspects of the proposed solution (also personnel required and respective costs!!!!).
- **Recommendation 4 –** to manage a "real On demand service" is necessary to upgade info on cartography in real time (daily upgrated info on street site, the close roads, …). This activity must be opportunally estimated!

Annex 1: Data used for the BaU building

- **Indicator 1** *(Average operating revenues)* – **Unit**: €/pkm

  Year 2008 = 2,29

  Year 2009 = 1,96

  Year 2010 = 2,29

- **Indicator 2** *(Average operating costs)* – **Unit**: €/pkm

  Year 2008 = 16,05

  Year 2009 = 15,64

  Year 2010 = 16,56

- **Indicator 3** *(Quality of service)* -

Year	2008	2009	2010
N° of questionnaires	29	11	27

Average mark per year and per question and total average mark per year:

Questions n.	Average mark		
	2008	2009	2010
1	8,6	10,0	8,9
2	7,3	8,4	7,8
3	8,2	8,4	7,8
4	9,6	10,0	9,4
5	9,5	9,9	9,3
Total average mark	8,6	9,3	8,6

- **Indicator 6** *(N of potential passengers/in a given time period)*:

YEAR	TOTAL NUMBER OF PASSENGERS
1995	6'949
1996	6'786
1997	8'436
1998	10'174
1999	10'458
2000	12'286
2001	14'030
2002	12'990
2003	14'167
2004	14'584
2005	14'977
2006	16'569
2007	17'143
2008	16'473
2009	16'649

2010	16'097

- **Indicator 7** *(*Kms traveled by the on demand vehicles per year*)*:

Year	2007	2008	2009	2010
Total kms	143'028	121'685	125'747	121'099

- **Indicator 8** *(Software flexibility)*:

	Total single trips	**Total combined trips**	**Total trips**	**Percentage of combined trip respect to the total trips**
2008	12'290	1984	14274	16,1%
2009	12'379	1985	14364	16,0%
2010	12'025	1894	13919	15,8%

Annex 2: Ex ante and Ex Post data collection

- **Indicator 1** *(Average operating revenues)* – **Unit**: €/pkm

  A = B / C

  where: A = Average operational revenue for the service (€/pkm)

  B = Total operational revenue for the service (€)

  C = Total passenger-kilometres (pkm) for the service

  EX ANTE SITUATION:

  Year 2011 = 2,42

- **Indicator 2** *(Average operating costs)* – **Unit**: €/pkm

  Operating costs include, for example, the personnel costs, fuel, electricity and maintenance costs for the vehicle(s) involved. They do not include **investment costs** in vehicles and infrastructure, etc.

  A = B / C

  where: A = Average operational cost for the service (€/pkm)

  B = Total operational cost for the service (€)

  C = Total passenger-kilometres (pkm) for the service

  EX ANTE SITUATION:

  Year 2011 = 16,55

- **Indicator 3** *(Quality of service)* -

  EX ANTE SITUATION refers to the years 2011, as the operative phase is related to the new software purchase (scheduled in 2012). See section Annex 3

Year	2011
N° of questionnaires	25

  Average mark and per question and total average mark:

Questions n.	average mark (2011)
1	8,76
2	8,32
3	9,08
4	9,28
5	9,32
Total average mark	8,96

- **Indicator 4** *(Accuracy of time keeping in on demand service*) **- Minimum waiting time**

EX ANTE SITUATION: referred to year 2011 (before the implementation of the new software). Actually the on demand service consists in reserving the trip within 2:00 p.m. of the previous day. As the first trip starts at 7:30 a.m., the minimum waiting time is 16 hours and 24 minutes.

- **Indicator 5** *(N of calls per year)*

NO MORE COLLECTED

- **Indicator 6** *(N of potential passengers/in a given time period)*:

EX ANTE SITUATION

YEAR	TOTAL NUMBER OF PASSENGERS
2011	16'400

- **Indicator 7** *(Kms traveled by the on demand vehicles per year):*

EX ANTE SITUATION

Year	2011
Total kms	128'274

- **Indicator 8** *(Software flexibility)*:

EX ANTE SITUATION

	Total single trips	**Total combined trips**	**Total trips**	**Percentage of combined trip respect to the total trips**
2011	12'435	1788	14223	12,57%

- **Indicator 9** (*Awareness level*):

EX ANTE SITUATION

YEAR	TOTAL NUMBER OF PASSENGERS	Variations respect to the previous year
2011	16'400	+1,88%

- **Indicator 10** (*Acceptance level*):

EX ANTE SITUATION

YEAR	TOTAL NUMBER OF SYSTEMATIC PASSENGERS	TOTAL NUMBER OF OCCASIONAL PASSENGERS	TOTAL NUMBER OF PASSENGERS	Variations of the systematic users respect to the previous year
2011	8'919	7'481	16'400	+1,18%

Annex 3: Survey among the "On demand" subscribers

Considering the subscribers (80 users), the questionnaire are administered once a year (20/25 users are involved), and the sample size is chosen so that, in turn, all the users express their opinions every 3/4 years. The range of users is composed by 16 to 65 years people; the group is heterogeneous, the service is in fact done for many different reasons: work / study (mainly university), free time, time spending at the supermarket, ..)

Modulo Questionario Utenti ACCABUS_0

BRESCIATRASPORTI

THE TRANSPORT QUALITY FOR USERS

In order to monitor and improve the quality of service, please, compile this questionnaire, giving a mark from 0 (worst judgement) to 10 (best judgement).

- Service booking conditions (willingness to satisfy the customer's request)

1	2	3	4	5	6	7	8	9	10
not very satisfied			enough satisfied				very satisfied		

Note.....

- Vehicles cleanliness

1	2	3	4	5	6	7	8	9	10
not very satisfied			enough satisfied				very satisfied		

Note.....

- Satisfaction about the comfort on board;

1	2	3	4	5	6	7	8	9	10
not very satisfied			enough satisfied				very satisfied		

Note.....

- Satisfaction about the driver's kindness/helpfulness;

1	2	3	4	5	6	7	8	9	10
not very satisfied			enough satisfied				very satisfied		

Note.....

- Satisfaction about the punctuality.

1	2	3	4	5	6	7	8	9	10
not very satisfied			enough satisfied				very satisfied		

Note.....

OBSERVATIONS:

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