Executive summary

Aim of this measure is the design, the test and the implementation of a new system to monitor the Public Transport in the city of Craiova.

Vehicle tracking systems are commonly used by fleet operators for fleet management functions such as fleet tracking, routing, dispatch, on-board information and security. Along with commercial fleet operators, urban transit agencies use the technology for a number of purposes, including monitoring schedule adherence of buses in service, triggering changes of buses' destination sign displays at the end of the line (or other set location along a bus route), and triggering pre-recorded announcements for passengers.

Data collected as a transit vehicle follows its route is often continuously fed into a computer program which compares the vehicle's actual location and time with its schedule, and in turn produces a frequently updating display for the driver, telling him/her how early or late he/she is at any given time, potentially making it easier to adhere more closely to the published schedule. Such programs are also used to provide customers with real-time information as to the waiting time until arrival of the next bus or tram/streetcar at a given stop, based on the nearest vehicles' actual progress at the time, rather than merely giving information as to the *scheduled* time of the next arrival.

Transit systems providing this kind of information assign a unique number to each stop, and waiting passengers can obtain information by entering the stop number into an automated telephone system or an application on the transit system's website. Some transit agencies provide a virtual map on their website, with icons depicting the current locations of buses in service on each route, for customers' information while others provide such information only to dispatchers or other employees.

Before the start of CIVITAS Modern activities related to this measure RAT (the Public Transport Company managed its service by direct operator’s control. This way only the start and the end of each run could be controlled while no records were made during the run itself. Moreover the maintenance schedule and fuel consumptions were recorded by operators, with low reference to mileage, so generating not so reliable data not so useful for Company management. So RAT and Craiova Municipality decided to implement a new AVL system within MODERN project. The solution of installing GPS/GPRS equipment should provide several benefits, like: increase the reliability of the public transport system, provide better access to real time route information, set up of a service data base suitable for a better company management and for the revision of PT service.

The measure consists of the implementation of GPR/GPRS modules on 80 buses and 27 trams and installing 20 info panels for travelers in the main station and in several bus stops. TheaVL system operates by GPR/ GPRS system so acquiring data regarding the “on time position” using the GPS module and data transmission along with other information (ride times, speed, and fuel consumptions) by GPRS module.

The implementation of this produced the following advantages:

- For RAT, the PT Company in Craiova Bus tracking system allows to:

- Monitor schedule adherence of bus in service;
- Monitor the fuel consumption;
- Real time inform drivers about advance – delay at each bus stops
- Set up of a data base with records of bus service in order to verify the quality of service

- For passengers;

  - The information about the effective schedule at each bus stop;
  - A better quality of the service.

So the main purpose of RAT, constituted as a development strategy is represented by the modernization of public transport activity in order to meet diverse urban demands in this field. The new electronic integrated system which was implemented at RAT Craiova allows achieving outcomes as:

- Increasing the efficiency of urban transport activities ;
- Saving material, human, financial and temporal resources; the system eliminates the manual monitoring activity and allows saving fuel and money offering the fuel consumption chart by each route.
- Increasing of the passengers satisfaction level (timeliness races, easy modalities to pay transport titles, information panels from stations, safe and punctual transport relying on the significant increase of vehicle movement adherence level at circulation graphics.

Several lessons were learnt by the implementation of this measure:

- The collaboration of Modern partners in the design phase and in the procurement one was essential for the success of the implementation of the new infomobility system in Craiova.
- The infomobility system represents an important tool for the development of a new culture in the PT management: It is the first step of IT introduction within RAT; Craiova Municipality is waiting to have significant results from this implementation.
- The implementation of such a system requires a complex effort in terms of coordination of all the actors involved: Municipality, tender winner, communication and power supply companies. Such a complex management represented one of the most important lessons learnt within this measure.

A Introduction

A1 Objectives

The measure objectives are:

(A) High level / longer term:

- To improve information flows and optimise the traffic
- To introduce advanced ITC technologies in the PT process

(B) Strategic level:

- To optimise the urban traffic and PT fleet by using real time technic-GPS/GPRS applications

(C) Measure level:

(1) To manage the PT fleet by endowing 80 buses and 27 trams with info mobility tools in order to improve the accuracy of time keeping by 15% and the average occupancy by 5%

A2 Description

Basic function in all fleet management systems is the vehicle tracking component.

Before the start of CIVITAS MODERN project, in Craiova there was an ineficientlly fleet management system that led to errors and inaccurate information. Buses and trams were in delay and PT users did not have information about arriving vehicles.

Old traffic management system from RAT was based on human elements called “track officers” placed at the end of rout in order to validate the tracking sheet for each vehicle. The track officer decided the start for a new trip for every vehicle according to the timetable. Also, the daily activity of each vehicle is monitored by some employees from RAT that calculate the Km traveled by each vehicle on considered rout.

Considering all mentioned above, Craiova needed an eficient and modern fleet management system, without human errors, that can provide a quality public transportation service.

Figure A2.1- Info-panels

The purpose of the measure was then to implement GPS/GPRS – Operation Support System consisted mainly in the following:

- GPS/GPRS modules installed on 80 buses and 27 trams . The GPS/GPRS modules gather the coordinates that

are specific to vehicle position on the route through the communication antenna from the global system and send them to the server which stores them in a data base. These positions are compared every 60 seconds to the immobile positions of the stations where info panels are installed and by determinations done by the dispatcher software, the time when the bus reaches the stations is being displayed;

- a software that contains all routes in town installed on the board computer in each vehicle
- 2 servers and specific devices for the system's monitoring: RACKs (stands for electronic devices), displays
- 20 info panels for travelers(fig.A2.1).

The Info-mobility tools are integrated in a system with two main features: the first is the fleet monitoring with AVM -Automatic Vehicle Monitoring based on GPS and the second is the passenger information with data provided by AVM system.

The procurement procedure for purchasing the equipments necessary to the GPS/GPRS system was carry-out together with e-ticketing and surveillance cameras systems procurement procedure. This procedure took place by national tender electronic system and five companies submitted tenders.

B Measure implementation

B1 Innovative aspects

The innovative aspects of the measure is:

- **Use of new technology/ITS:** The implementation of the fleet management system represented a significative innovation for RAT; since the start-up of the complex of measures dealing with infomobility, e- ticketing and video surveillance the company operated only on operators records and there was not any IT to help the management. The improvement in quantity and quality of the information should help management to improve:

- Organization of the PT services, in terms of knowledge and management of passengers' frequentation of each line.
- fleet management costs; by a more accurate knowledge of effective mileage on each route
- Number of passengers using the service; this particularly because of the better information about the bus / trams passage at each stop.
- Network design, by taking into the account the new needs detected by the system.

B2 Research and Technology Development

The RTD task aimed to find a solution for GPS/GPRS system implementation in Craiova , in order to provide a good service for passengers and set a management tool for public transportation company.

Generally speaking the major constituents of the GPS based tracking system are the following:

1. GPS tracking device: The device fits into the vehicle and captures the GPS location information apart from other vehicle information at regular intervals to a central server. The other vehicle information can include fuel amount, engine temperature, altitude, reverse geocoding, door open/close, tire pressure, cut off fuel, turn off ignition, turn on headlight, turn on taillight, battery status, GSM area code/cell code decoded, number of GPS satellites in view, glass open/close, fuel amount, emergency button status, cumulative idling, computed odometer, engine RPM, throttle position, and a lot more.
2. GPS tracking server: The tracking server has three responsibilities: receiving data from the GPS tracking unit, securely storing it, and serving this information on demand to the user.
3. User interface: The UI determines how one will be able to access information, view vehicle data, and elicit important details from it.

The system installed in Craiova has been composed by:

- A board computers, incorporating a GPS GPRS module and a data transmission card type Vodafone installed on 80 buses and 27 trams;
- A central station ("the dispatcher); Through GPS the position (longitude and latitude) of the vehicle is transmitted to the central dispatcher room every 30 seconds. In the dispatcher room it is configured a map with all the routes based on Google map application containing the coordinates of the passenger's stations and the coordinates of approx. 10 intermediate points between 2 stations. By unify these points the routes are defined. The soft analyze the coordinates sent by vehicles and give automatically the vehicles positions on the map.
- 20 info panels for passengers; these can supply passengers all information transmitted by the central dispatcher. passengers. The software calculate the difference between the vehicles coordinates and the static position of the panel and applying an average predefined vehicles speed obtain the time for the next bus arrival in the passenger station.
- The system is working using database regarding:
    - Routes and passengers stations coordinates
    - Vehicles inventory number and type
    - Drivers name and allocated card number

The system supervises and controls the activities related to public transport and provides a powerful decision support. The Info-mobility tools are integrated in a system with two main features: the first is the fleet monitoring with AVM - Automatic Vehicle Monitoring based on GPS and the second is the passenger information with data provided by using GPRS technology available in the info-mobility system.

An important function is diagnosis - each vehicle has a board computer who gathers information related to number of kilometers, fuel consumptions, functioning hours, etc. It is, also, possible to implement a "predictive" maintenance program based on the information collected by the system, traffic conditions, and recommendation of the manufacturer for each vehicle.

Figure B2.1 – Informaiton panels

One of the information panels with expected remaining time to the bus arrivals

Vehicle tracking is one of the main functions of a FMS. This is made, usually, using GPS technology. The info-mobility system is made up of:

- GPS/GPRS modules integrated in one on-board computer were installed on 80 buses and 27 trams. The GPS/GPRS modules gather the coordinates that are specific to vehicle positions on the route through the communication antenna from the global system and send them to the application server which stores them in a data base. These positions are compared every 60 seconds to the ones of the bus stops where info panels are installed. By software can on time predict o the arrival time that is displayed on the panels;
- data base containing all the information related to roads, routes, time scheduling, vehicle data and the position of each stops. This data base with related management software was installed on the on-board computer from each vehicle and in Central Server too;
- 2 servers and specific devices for the system's monitoring: RACKs (stands for electronic devices) and displays;
- 20 real-time info panels for travellers.

Software applications for Fleet Management (ASMF)

ASMF has the following functionalities:

- Operation based on access rights
- Web type interactive graphic interface
- Registers the performed actions;
- Prints/displays reports on printer/display;
- Connection with other applications through standard interfaces;
- Creates safe copies („backup") and restores data in case of damages („restore");

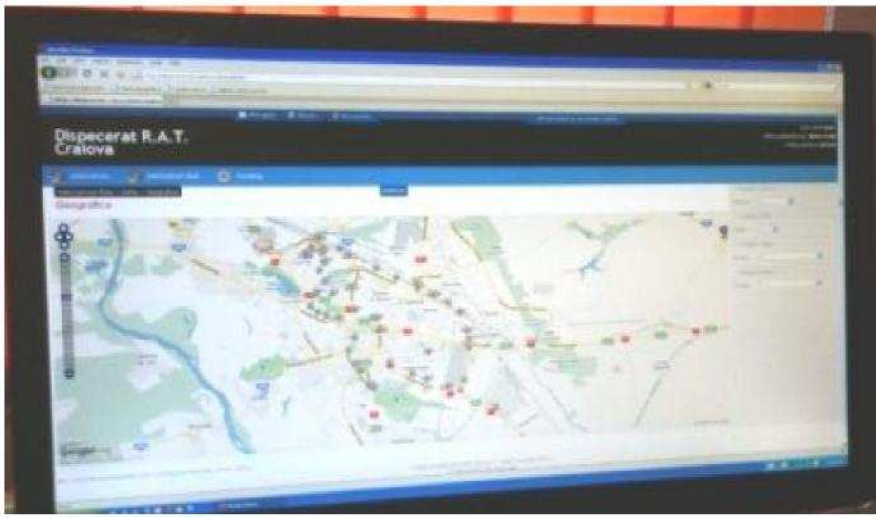


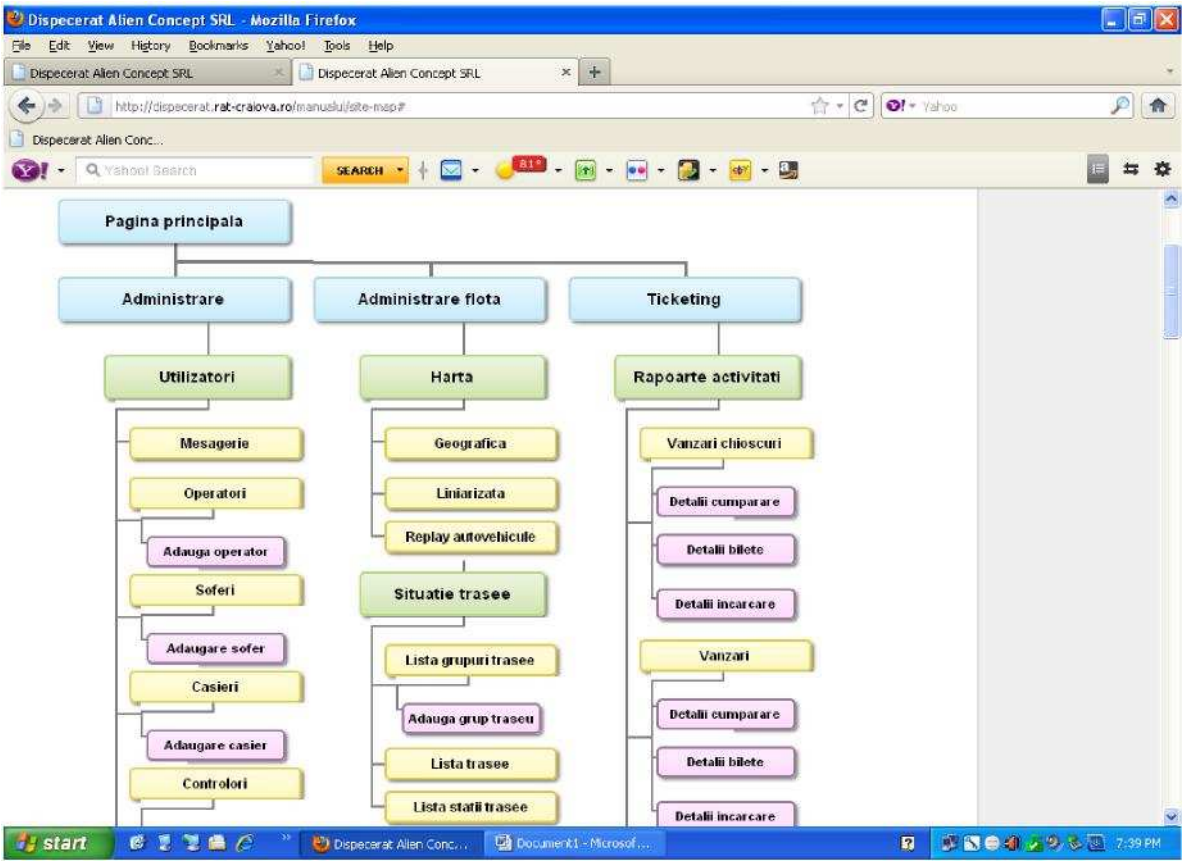
Figure B2.2 – software application screenshot

A central dispatcher for GPS monitoring was set up. Dedicated software was installed and a database was filled up with the following information: no. of bus, drivers name, GPS parameters and routes to be monitored. The system allows to optimize the bus routes and to plan the drivers by shift / bus no. / line.

The main routines developed in the program are:

- Administration of personnel and equipment
- Personnel management
- Adding user names for drivers, cashiers, inspectors
- Editing users data
- Eliminating users in management
- Working equipment administration
- Public transport vehicles administration

The system can be operated from any computer on the internet network, as it is a web-based application, giving management access possibility by using user name and password access system.



By using the system, predefined messages can be sent from buses to the dispatcher and reverse. The system permit permanent to the driver to see if the bus is in delay or advanced from his position comparing with the ideal time from planning.

The 20 digital panels for real time information about the time remaining for buses arrivals in the passenger's stations can inform in real time passengers about the effective time schedule.

The identification of the driver working that day is done through an employee card that is put to the identification device before starting the work shift.

Being a research and development pilot project the initially number of buses, trams, passengers' stations foreseen in the project was smaller than the entire fleet, or passenger's stations belonging of RAT.

The system respects the measure objectives and the spirit of the MODERN project an is operational for:

- GPS/GPRS tracking system on 3 trams routes from 3
- GPS/GPRS tracking system on 4 buses routes from 17
- GPS/GPRS tracking devices installed on 27 trams foreseen in the project from 34
- GPS/GPRS tracking devices installed on 80 buses foreseen in the project from 169
- 20 passengers stations endowed with real time digital panel information from 236
- Central dispatcher room installed at RAT headquarter where electronic reports regarding the GPS/GPRS tracking system and real time information in terms of time and locations are issued

INFO-Mobility system's application

- Passengers stations management
- Adding passenger's stations in the system
- Viewing added passenger's stations
- Routes and their organizing in groups of routes
- Adding and editing routes
- Deleting routes from the database
- Groups of routes
- Adding a pattern and a hourly type
- Allocation of daily schedule for drivers
- Vehicles route (itinerary)
- Adhesion to circulation graphic
- Performed semi strokes/ strokes
- Travelling times - distance between stations
- Display, information, messaging, journal
- Activities reports
- Drivers activities reports
- Activities scheduling
- Daily schedule
- Ideal graphic
- Driver's activity sheet
- Vehicles activities reports
- Driven kilometers
- Speed diagram
- Travelling times
- Topographical map
- Stations map
- Panels
- Panels display

In terms of electronic **reports**, the system provides:

- Daily added program
- Vehicle ideal schedule
- Roadmap for vehicles
- View level diagram
- Vehicles replay
- Travel time distance between stations
- Panels display
- View speed diagram
- Geographical map
- Schedules templates
- Drivers
- Routes station list
- Vehicles messages

Main results coming from the system are:

- Accuracy of passenger information in the stations about next bus arrival
- Automatic communication between drivers and central dispatcher room by predefined messages
- Alerts regarding technical revisions
- Electronic reports
- Vehicles fuel consumption

All these data are used by RAT in order to manage the public transport giving the possibility to reduce the fuel consumption by analyzing each route leading to cost reduction and also to improve the quality of the service in front of the citizens.

Real Time Information Panels:

1. Informing set panels for passengers in urban transport vehicles – PDICA

Main technical requirements:

- Minimum resolution:
  - Front-side panel – 16 x 120 dots (16 vertical dots and 120 horizontal dots);
  - Lateral panel: – 16 x 120 dots (16 vertical dots and 120 horizontal dots);
  - Back–side panel – 16 x 32 dots(16 vertical dots and 32 horizontal dots);
  - informing panel for passengers –5x80 dots (5 vertical dots and 80 horizontal dots);
- Led:
  - viewing angle – minimum 110/60 degree;
  - luminosity–approx. 500mc;
- Communication:
  - Local – RS232, isolated RS485 ;
- Operating voltage:
  - 18VDC 36V DC;
- Functional requirements :
  - Display mode: static/cyclic or flow;
  - Two different sets of fonts;
  - Luminosity control- automatic with sense device;
  - The information on the panel to be controlled by the Board Computer.

2. Panels for informing passengers in stations – PICS

Main technical requirements

- The panels will have 2, 3, 4, 5 rows (one rows=7x100 LEDs). On each panel one row will be used to display information from the City Hall and advertising messages; the other rows will display the routes which are (or not) GPS monitored.
- The colour of the LED: yellow

- mobile communication with ASMF
- Power supply voltage 230v/50Hz from public electricity network
- Metallic case vandal and bad weather resistant
- Firmware maintenance at distance

Functional requirements:

- For GPS monitored routes it must display information about: number and destination of the route, estimated time until the next vehicles arrive, hour an minute when the vehicle must be in station or minute and hour for departure in both end-lines points
- For unmonitored routes the panel displays the frequency or minute and hour when the vehicle is passing through station and minute and hour for departure in both end-lines points
- The information is displayed static, cyclic or flow;
- The luminosity of the panel is adjusted by measuring the outside luminosity with a sensing device.

Traffic Management System

System's architecture:

- the system must have a modular structure to allow the development in more than one stage, functionally and, also, quantitative.

Components:

- Local (fixed) communication equipment – EFX
- To make the Wi-Fi communication the following equipments, for one depot, are needed:
  - Workstation with
    - DualCore 2GHz;
    - RAM 1GB;
    - HDD 80 GB;
    - CD-ROM;
    - Network board;
    - 2x COM, 1x LPT, 1x USB 2.0;
    - LCD 15“, resolution 1024x768;
    - mouse, keyboard;
    - NTFS file system;
    - Antivirus program;
    - UPS 500 VA;
    - Access point type equipment (fixed communication);
    - Radio mode with access point function;
    - Operation modes: 802.11 b/g for access point function;
    - Wi-fi certificate;
    - Adjustable transmitting power security
    - Operational temperature: -20°C ... +70°C.

Software applications for Fleet Management (ASMF)

ASMF must have the following functionalities:

- Operation based on access rights
- Web type interactive graphic interface
- Registers the performed actions;
- Prints/displays reports on printer/display;
- Connection with other applications through standard interfaces;
- Creates safe copies(„backup") and restores data in case of damages („restore").

B3 Situation before CIVITAS

Before the MODERN project start up, the fleet management in Craiova was based on RAT employers "the monitor" operating at the head of the buses lines, in charge of the validation of the daily activity sheet of each vehicle and driver. The "monitor" was also in charge of the starting time for a new run for every vehicle according to the foreseen schedule. Among his duty there was also the evaluation of each bus mileage considering the route where they were operating.

B4 Actual implementation of the measure

The measure was implemented in the following stages:

Stage 1: Planning and designing the measure (Oct 2008-Sept 2009)

Several discussions and meetings between specialists from RAT and IPA and politicians from Craiova municipality were held, in order to determine how the solution will be applied and integrated into the Urban Development Strategy of the city. Finally the specialists from RAT and IPA and the politicians from Craiova Municipality Local Council got to a common point. This point refers to a PT management system. This integrated PT management system includes: e-ticketing, GPR/ GPRS and video surveillance.

The overall system was designed, based on three main hardware and software components; namely, the GPS tracking device and board computer; the central station (dispatcher); and the infomobility applications (based on the real time information data displayed on digital panels located in passenger's stations).

The information to the travelers regarding the route is provided by means of electronic panels installed in vehicles (3 panels have been installed outside each vehicle).

Stage 2: GPS/GPRS research ; GPS/GPRS system procurement procedure (Oct 2008-Jan 2011)

Technical specifications of the GPS/GPRS system (Oct 2008-May 2009)

The objective of this project was to create an effective PT information system for citizens and to optimize fleet management by using real time technical-GPS/GPRS applications and by the installation of info mobility tools.

The technical specifications of the GPS/GPRS and ITC system were carried out considering the technical system applied in Brescia City. All this were included in the technical tender for GPS/GPRS system purchasing.

Procurement procedure carrying out (Feb 2010- Jul. 2010)

In this period of time the public procurement procedures, the legislation for the GPS/GPRS system purchasing and the integration of whole public transport management system were studied. The whole public transport management system included: e-ticketing, GPS/GPRS system and video surveillance equipments and, the integrated technical specification for the whole system acquisition was developed.

The three measures, 02.04, 05.05 and 08.02, formed an integrated group of actions that developed a complex system of: monitoring, security and management of public transportation in Craiova.

A common procurement procedure for purchasing the equipments necessary to the eticketing, GPS/GPRS and surveillance cameras systems has been defined. The procurement procedure took place by national tender electronic system and five companies' submitted tenders.

The result of the tender was contested by 4 companies but all of them were rejected by National Claims Settlement Commission. Two of the contestant companies continued to claim the tender result in the Court of Law. The contestation process ended in June in favor of RAT and the contract with the winner company was signed at the end of June.

GPS/GPRS system delivery and installing (Aug. 2010-Jan2011)

In this stage, the GPS/GPRS system was delivered and installed and every subsystem was tested and calibrated for the purpose of implementing the system. The GPS/GPRS system that consisted in:

- GPS/GPRS modules installed on 80 buses and 27 trams;
- The software to manage all the system;
- 2 servers and specific devices for buses and trams monitoring. 20 info panels for travellers.

During the installing of the system, partial and final tests were organized in order to achieve the compatibility between the ideal graphic route time and the real time software tool and its modules allowing the switching between specific possibilities.

Each stage of the test has been specified in the system installation plan which was part of the contract. The communication equipment and related software were verified and tested to assure a good connection between the field equipment and the central acquisition system installed in the RAT dispatcher centre.

The test verifies that the system performance reached all the specified parameters so the system was approved by RAT Craiova.

After the finalization of the test the system was completely installed and started its operation. The system was constantly monitored in order to intervene and correct any operational problems or technical and conceptual malfunctions.

During the operation of the system all the data necessary to perform the evaluation were collected.

Equipments mounting and installation were made by RAT together with integrated system providing company.

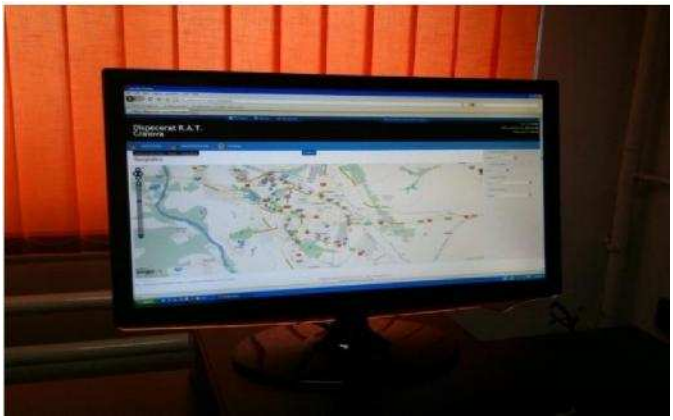


Figure B4.1 – Bus tracking example

The system was implemented at RAT.

Stage 3 Training for involved technicians (Aug 2010- Jan 2011)

The technician's training process has been held in the same time with the system's installation.

The training was provided for the following categories of technicians:

- Maintenance (hardware and software)
- Software configuration
- Data base
- System operation

B5 Inter-relationships with other measures

The measure is related to other measures as follows:

- **M 02.04** Integrated e-ticketing system in Craiova
- **M 05.05** Public Transport Security program in Craiova

The measures M 02.04, M05.05 and M 08.02 are closely linked since they share the same infrastructure(buses , trams and monitoring station). A commune procurement procedure was organized for the three measures. The on board control units were integrated to ensure the best performance and to provide an up-to-date technological solution. The monitoring central system of these measures share the same hardware architecture and integrate as much as possible the software applications.

C Impact Evaluation Findings

C1 Measurement methodology

C1.1 Impacts and Indicators

Table C1.1: Indicators.

No.	Impact	Indicator	Data used	Comments
2A	Economy	Average Operating costs	Euros/vKm	Annual operating costs: personnel, spare parts, maintenance, other costs
2B		Capital cost	Euros	Investments costs
18	Transport	Accuracy of time keeping	RAT records in "Daily activity sheet"	RAT data base
19		Quality of Service	Survey on PT users	Perception of the quality of service of public transportation (trams and buses). Face to face surveys
28		Average occupancy	Number of passengers per vehicle per trip	RAT data base Monitors' registration on tram line(101 102), E1R, E1T, line 9

Detailed description of the indicator methodologies:

Indicator 2 A (Average Operating costs) - Ratio of total operating costs incurred by the service divided by the total vehicle-km per year (€/vehicle-km).

A = B / C

where: A = Average operational costs for the service (€/vehicle-km)

B = Total operational costs of the service, including Personnel, Maintenance, internet communication and other costs related to the GPS/GPRS tracking service (€)

C = Total vehicle-km traveled by the trams and buses in services

RAT Company provided all the operation costs related to GPS/GPRS tracking service. (See annex 1: Costs calculation)

Indicator 2B (Capital cost) - Investment cost for the GPS/GPRS system

The Capital cost resulted from the purchasing and installation of GPS/GPRS systems on 80 buses and 27 trams and 20 information digital panels. The capital cost is according to purchasing invoice.

Indicator 18 (Accuracy of time keeping) – percentage of public transport services that arrive within an acceptable interval around the planned times given by timetables.

RAT provided annual reports related to accuracy of time kipping for trams and buses. The routs monitored were: tram line, rout E1T, E1R and rout no.9.

Indicator 19 (Quality of Service) - Survey based perception of the quality of service

The survey showed the perception of PT users on waiting time and information panels in stations. The sample size was calculated for a population of 300'000 inhabitants.

The questionnaires were structured in 2 sections:

- General information about citizens (job, age, gender, education level, contact data)
- Questions referring to the measure:
  - "How do you estimate the quality of service from view point of waiting time and information on vehicle arrival in the station?"(scale1-4)

Indicator 28 Average occupancy(peak/off-peak) average number of passengers per vehicle per trip

The average occupancy indicator is measured by counting the number of passengers in off-peak and peak period of day. The frequency of data collection was once a week, twice a day. The measurements were made once in peak period of the day and once in off-peak of the same day. The monitored lines were: tram line, E1Rbuses rout , E1T buses rout, and rout no.9. These routs have been monitored for 1 month, before and after measure implementation.(See annex 2- occupancy monitoring)

C1.2 Establishing a Baseline

Old traffic management system from RAT was based on human elements called "track officers" placed at the end of rout end validated the tracking sheet for each vehicle. The track officer decided the start for a new trip for every vehicle according to the timetable. Also, the daily activity of each vehicle was monitored by some employees from RAT that calculate the Km traveled by each vehicle on considered rout.

Average operating costs

Average operating costs have been calculated as ratio between total operating costs from trams and buses prepared for installation of GPS/GPRS system and total mileage of these trams and buses.

Raw data and indicator calculation	2009 Ex-Ante values
Total Operational Costs coming from the trams and buses prepared for GPS/GPRS system*(detalied operating costs are shown in the annex 1)*	30'139 €
Total km traveled by the buses prepared for GPS/GPRS system	2'945'536 Km
Total km traveled by the trams prepared for GPS/GPRS system	893'497 Km
Average operating cost	0.0078 €/vkm

Note: The operating costs include personnel and other costs, related to the fleet monitoring system only. Other costs(administration costs) are 20% of personel costs

Total capital cost

Total capital cost is the cost of investment. In 2009 there was no investment in GPS system.

Raw data and indicator calculation	2009 Ex-Ante values
Investment in the purchase of the GPS/GPRS system	0.00 €
Total capital cost	0.00 €

Accuracy of time keeping

Up to 2010, every vehicle had a daily activity sheet, issued by the driver. The driver brought the daily activity sheet to the dispatcher . At the dispatcher, the arrival and departure hours were written in the daily activity sheet. At the end of working day, a person charged with monitoring of the routs prepared a report necessary for mileage and fuel consumption calculation. The same person charged with monitoring of the routs issued a report relating to framing vehicles in schedule (accuracy of time keeping).

The accuracy of time keeping was monitored, in September 2010, before GPS/GPRS. The delay was between 10 and 15 minutes depend on traffic conditions and the driver had not the possibility to receive automatic messages regarding the position (if he is in delay or in advance comparing with the route timing).

Buses and trams lines monitored	2010 Ex-Ante values
E- 1T	50%
E-1 R	55%
Line 9	65%
Line 101- Tram line	70%

Average occupancy

The average number of passengers was monitored for 1 month – September 2010, before GPS/GPRS system implementation. RAT provided average occupancy for the routes where buses and trams will be equipped with GPS/GPRS system: Route E1R, Route E1T, Route No. 9 and Line No101 (tram

line). Occupancy data were collected by RAT people, one day a week, in peak and off-peak period of the day.

Routs and lines monitored	2010 Ex-Ante values Average occupancy- off-peak
Line 101- tram line	65%
Rout E1T	50%
Rout E1 R	60%
Rout No. 9	60%

Routs and lines monitored	2010 Ex-Ante values Average occupancy- peak
Line 101- tram line	70%
Rout E1T	55%
Rout E1 R	65%
Rout No. 9	65%

Quality of service

The questionnaires were disseminated to public transport users in stations for routs E1T, E1R, Rout No. 9 , tram line, and during workshops organized by MODERN project team. The workshops were organized during the Communication Campaign and seminar presentation(Fig. C1.2.1) that took place in May 2010, in the prefecture market (in the downtown).

120 feedbacks were received from people that expressed their opinion about the fleet monitoring system and information panels in the stations. In agreement with the dedicated target group it was kept contact data to evaluate the progres of the measure.

Questionaire content	**2010 Ex-Ante values**
Public transport user	80 % yes 5 % No 15 % occasionally
What is your view about the waiting time in the stations?	
Less good	75 %
Good	20%
Very good	3%
Don't know	2%
What is your view about no information related to vehicles arriving?	

Questionaire content	2010 Ex-Ante values
Less good	98 %
Good	0
Very good	0
Don't know	2%

C1.3 Building the Business-as-Usual scenario

In the absence of CIVITAS project, Craiova was not intended to implement GPS/GPRS system for fleet management. In the current risk climate of economic recession it seems very unlikely that such a project would have been completed.

Average operating costs

RAT assumed that the opertaing costs keep the same values over years 2010, 2011 and 2012 because in BAU situation the 80 buses and 27 trams kept the old fleet monitoring system, without CIVITAS project. All the costs are devided by the real mileage of the 80 buses and 27 trams for the years considered.

Raw data and indicator calculation	2010 BAU values
Total Operational Costs coming from the trams and buses with old fleet monitoring system (detalied operating costs are shown in the annex 1)	30'139.2 €
Total km traveled by the 80 buses that kept the old fleet monitoring system	3'665'503 Km
Total km traveled by the 27 trams that kept the old fleet monitoring system	819'643 Km
Average operating cost	0.0067€/vkm

Raw data and indicator calculation	2011 BAU values
Total Operational Costs coming from the trams and buses with old fleet monitoring system (detalied operating costs are shown in the annex 1)	30'139.2 €
Total km traveled by the 80 buses that kept the old fleet monitoring system	3'681'844 Km
Total km traveled by the 27 trams that kept the old fleet monitoring system	524'251Km
Average operating cost	0.0072€/vkm
Raw data and indicator calculation	2012 BAU values
Total Operational Costs coming from the trams and buses with old fleet monitoring system (detalied operating costs are shown in the annex 1)	30'139.2 €
Total km traveled by the 80 buses that kept the old fleet monitoring system	3'264'988 Km
Total km traveled by the 27 trams that kept the old fleet monitoring system	533'341Km

Raw data and indicator calculation	2011 BAU values
Average operating cost	0.0079€/vkm

Total capital cost

There is no investment cost in GPS/GPRS system.

Indicators and respective parameters	BAU values
Investment in the purchase of the GPS/GPRS system	0.00 €
Total capital cost	0.00 €

Accuracy of time keeping

The indicator keeps the same ex-ante values by routs, for the years 2011 and 2012, considering no GPS/GPRS system.

Buses and trams lines monitored	2011, 2012 BAU values
E- 1T	50%
E-1 R	55%
Line 9	65%
Line 101- Tram line	70%

Average occupancy

The indicator keeps the same ex-ante values by routs, for the years 2011 and 2012, considering no GPS/GPRS system

Routs and lines monitored	2011, 2012 BAU values Average occupancy- off-peak
Line 101- tram line	65%
Rout E1T	50%
Rout E1 R	60%
Rout No. 9	60%

Routs and lines monitored	**2011, 2012 BAU values Average occupancy-peak**
Line 101- tram line	70%
Rout E1T	55%
Rout E1 R	65%
Rout No. 9	65%

Quality of service

The indicator keeps the same ex-ante answers, for the years 2011 and 2012, considering no GPS/GPRS system.

Questionaire content	**2011, 2012 BAU values**
Public transport user	80 % yes 5 % No 15 % occasionally
What is your view about the waiting time in the stations?	
Less good	75 %
Good	20%
Very good	3%
Don't know	2%
What is your view about no information related to vehicles arriving?	
Less good	98 %
Good	0
Very good	0
Don’t know	2%

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

The years for ex-post measurements are considered 2011 and 2012

Average operating costs

In ex-post period, 2011 and 2012, the costs related to the fleet monitoring had a significant decrease after the measure implementation as 6 personnel units formerly devoted to this task were shifted to

other jobs thanks to the new system. In the same time, the new system implementation brought additional internet and maintenance costs.

Raw data and indicator calculation	**2011 Ex-post values**
Total Operational Costs coming from the trams and buses with GPS system(detalied operating costs are shown in the annex 1)	17’481 €
Total km traveled by the 80 buses with GPS system	3’681’844 Km
Total km traveled by the 27 trams with GPS system	524’251Km
Average operating cost	0.0042 €/vkm
Raw data and indicator calculation	**2012 Ex-post values**
Total Operational Costs coming from the trams and buses with GPS system (detalied operating costs are shown in the annex 1)	17’971 €
Total km traveled by the 80 buses with GPS system	3’264’988 Km
Total km traveled by the 27 trams with GPS system	533’341Km
Average operating cost	0.0047 €/vkm

Note: the operation costs include internet conection, personnel and administartiv costs

Average operating costs (€/vKm)	2009	2010	2011	2012
ex-post	0.0079	0.0067	0.0042	0.0047

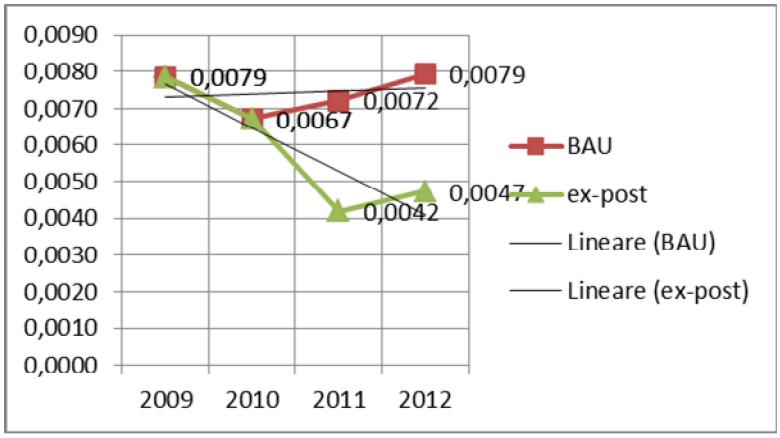


Figure C2.1.2 – Evolution of average operating costs

Total capital cost

GPS system has 10 years lifetime and the annual depreciation is 16796.5 €.

Indicators and respective parameters	2010 Ex-post values
Depreciation	0.00 €
Investment in the purchase of the GPS system	167’965 €
Total capital cost	167’965 €
Indicators and respective parameters	2011 Ex-post values
Depreciation	16’796.5 €
Total capital cost	151’168.5 €
Indicators and respective parameters	2012 Ex-post values
Depreciation	16’796.5 €
Total capital cost	134’372 €

C2.4 Transport

Accuracy of time keeping

The routs were monitored for 1 month – in September 2011, respectiv September 2012.

After GPS/GPRS system implementation, The daily activity sheet is issued by the computer. The vehicles frequency can be improved because the monitoring system can issue a speed diagrame for each vehicle monitored. After the GPS system implementation the accuracy of time keepin has been improved.

Buses and trams lines monitored	2011 – Ex-post values
E- 1T	70%
E-1 R	75%
Line 9	85%
Line 101- Tram line	85%

Buses and trams lines monitored	2012 – Ex-post values
E- 1T	75%
E-1 R	80%
Line 9	90%
Line 101- Tram line	90%

Accuracy of time keeping(%)	2010 ex-ante	2011-ex-post	2012 - ex-post
E- 1T	50%	70%	75%
E-1 R	55%	75%	80%
Line 9	65%	85%	90%
Line 101- Tram line	70%	85%	90%

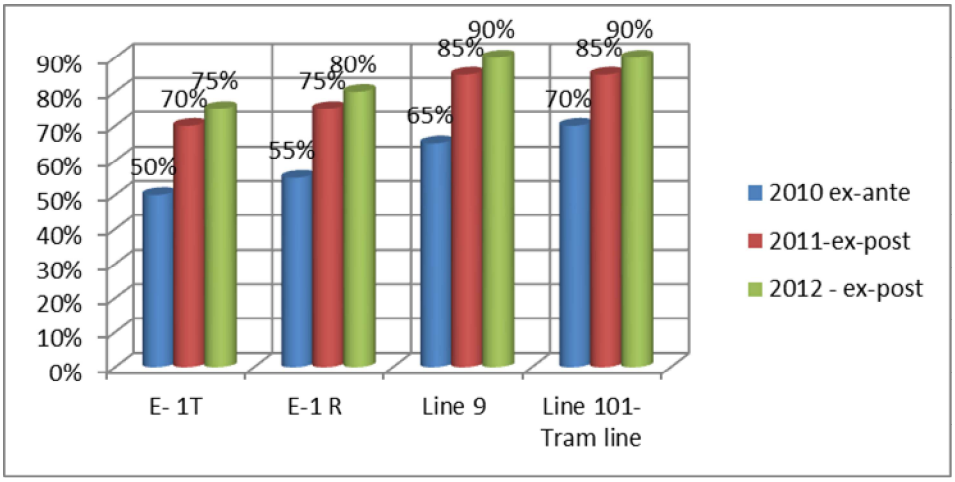


Figure C2.4.1 – Accuracy of time keeping evolution

Average occupancy

The indicator was measured in September 2011 and September 2012 to see the trend of the indicator over the system running period.

The data were collected 1 day a week, in peak and off-peak period.

Routs and lines monitored	**2011-ex-post values Average occupancy- off-peak**	**2012-ex-post values Average occupancy- off-peak**
Line 101- tram line	45%	70%
Rout E1T	40%	45%
Rout E1 R	50%	55%
Rout No. 9	50%	55%

Routs and lines monitored	**2011, ex-post values Average occupancy- peak**	**2012, ex-post values Average occupancy- peak**
Line 101- tram line	50%	75%
Rout E1T	45%	50%
Rout E1 R	55%	60%
Rout No. 9	55%	60%

Average occupancy- off-peak	**2010**	**2011**	**2012**
	ex-ante	ex-post	ex-post

Average occupancy- off-peak	2010	2011	2012
Line 101- tram line	65%	45%	70%
Rout E1T	50%	40%	45%
Rout E1 R	60%	50%	55%
Rout No. 9	60%	50%	55%

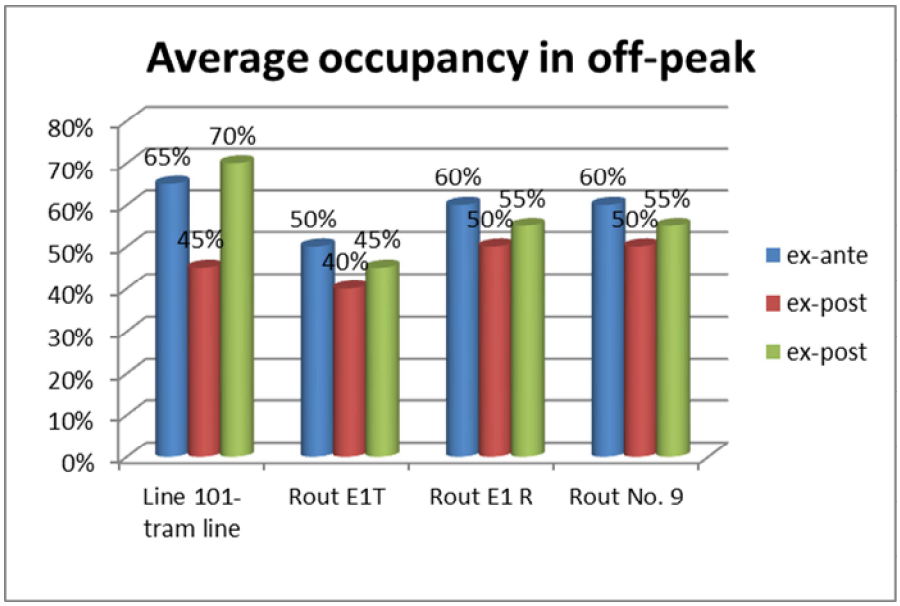


Figure C2.4.2 – Evolution of average occupancy in off peak

Average occupancy- peak	2010	2011	2012
	ex-ante	ex-post	ex-post
Line 101- tram line	70%	50%	75%
Rout E1T	55%	45%	50%
Rout E1 R	65%	55%	60%
Rout No. 9	65%	55%	60%

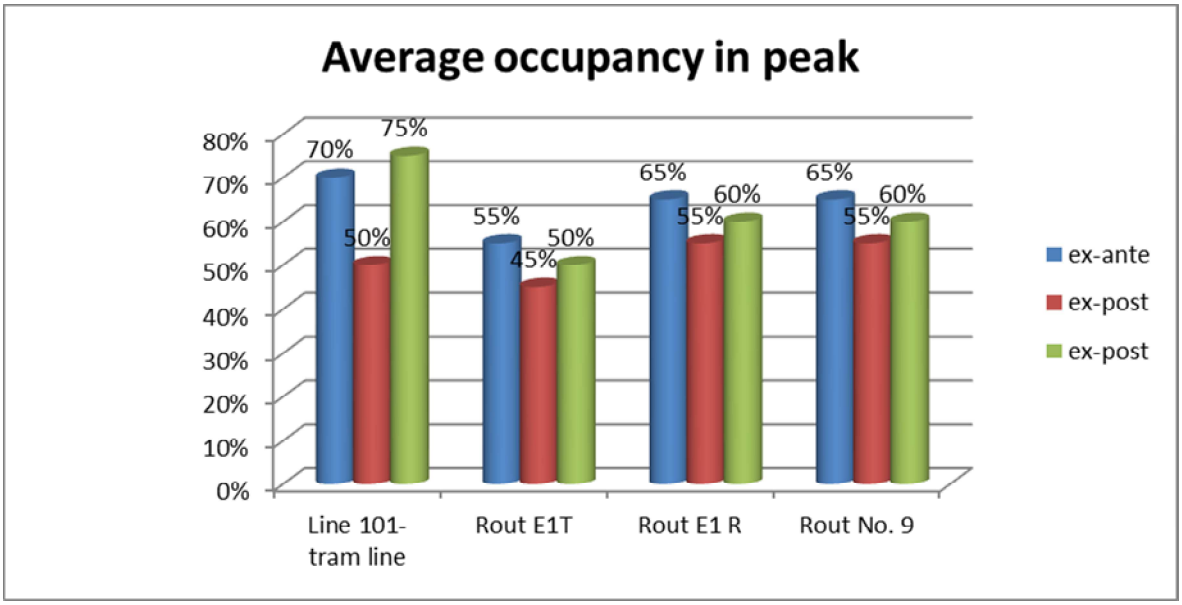


Figure C2.4.3 – Evolution of average occupancy in peak

In 2011and 2012, average occupancy decreased compared with 2010 because RAT cancelled some discounted season tickets . In 2012, average occupancy increased compared with 2011 but still remained lower than 2010, for buses routs.

For trams, average occupancy decreased in 2011 because of tram line interruption, during overpass construction, but it increased in 2012 more than 2010 and 2011. In August 2012, the construction of overpass finished and the trams operate on whole line, without interruption.

C2.5 Society

The survey was carried out on September 2012, using the same people surveyed for ex-ante evaluation (In agreement with them, their contact data were kept). The questioners were circulated by phone and e-mail and 115 feedbacks were received.

Quality of service

Questionaire content	2012 Ex-Post values
Public transport user	85 % yes 3 % No 12 % occasionally

Questionaire content	2012 Ex-Post values
What is your view about the waiting time in the stations?	
Less good	5 %
Good	82%
Very good	11%
Don't know	2%
What is your view about information panels placed in stations?	
Less good	0
Good	87%
Very good	11%
Don’t know	2%

What is your view about the waiting time in the stations?	2010 Ex-Ante values	2012 Ex-Post values
Less good	75%	5%
Good	20%	82%
Very good	3%	11%
Don't know	2%	2%

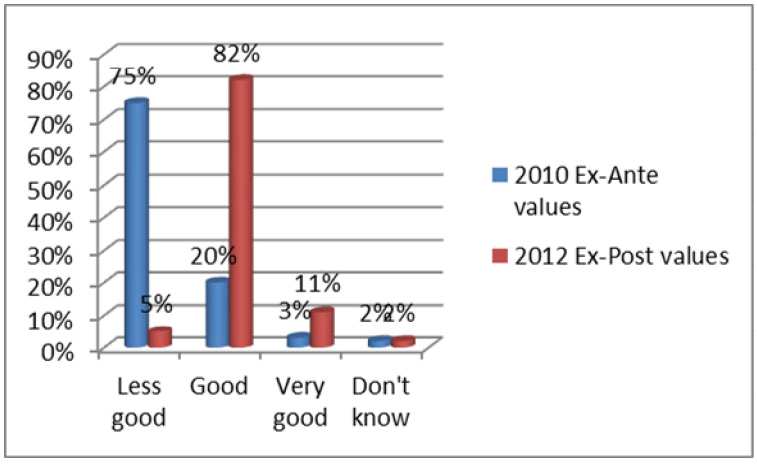


Figure C2.4.4 – Quality of service perception (related to waiting time)

What is your view about no information on vehicles arriving? (2010) What is your view about information panels placed in stations? (2012)	2010 Ex-Ante values	2012 Ex-Post values
Less good	98%	0
Good	0	87%
Very good	0	11%
Don't know	2%	2%

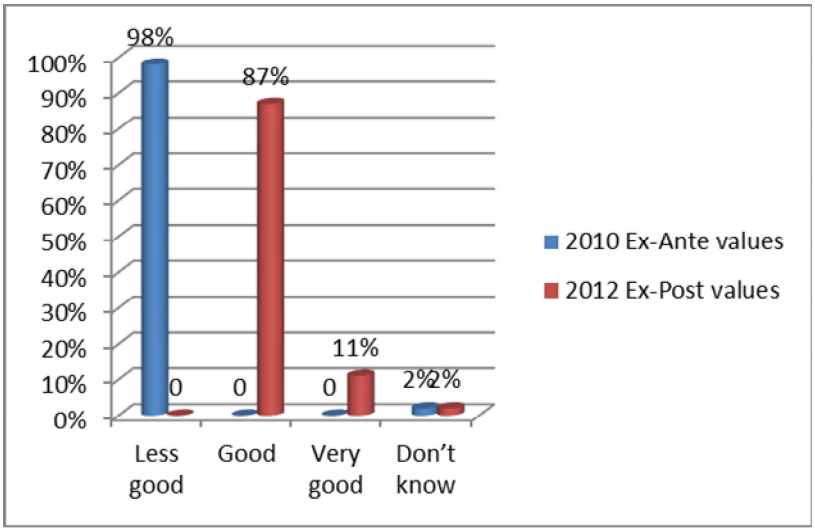


Figure C2.4.5 – Quality of service perception (related to information panels)

C3 Achievement of quantifiable targets and objectives

No.	Target	Rating
1	To endow 80 buses and 27 with GPS/GPRS system	★★
2	To install 20 digital information panels in main stations	★★
3	To improve the accuracy of time keeping by 15% Routs: E1T, E1R and No. 9 - Accuracy of time keeping increased by 25% Tram line- Accuracy of time keeping increased by 20%	★★★

No.	Target	Rating
4	To improve the average occupancy by 5% Average occupancy increased in 2012 by 5% for trams Average occupancy decreased by 5% for buses	★★trams O buses
NA = Not Assessed O = Not Achieved ★ = Substantially achieved (at least 50%) ★★ = Achieved in full ★★★ = Exceeded		

C4 Up-scaling of results

Subject to the availability of financial resources, RAT Craiova has the intention to gradually equip the entire fleet with GPS/GPRS tracking system and the stations with real time information digital panels, expanding the system to the entire fleet in order to provide users with comprehensive real-time information on bus schedules and to build up a more complete database that would improve the optimization results.

C5 Appraisal of evaluation approach

The evaluation of this measure focused on some indicators across the areas of economy, transport and society, which were to be measured in different ways and calculated.

In the evaluation period of measure, some indicators were cancelled for various reasons, such as: there were no available statistics data or these indicators were not relevant to assess the impact of the measure on transportation mode in Craiova. So, the Modal split indicator was cancelled because no ex-ante statistic data available. Also, the indicators related to fuel efficiency and emissions have been cancelled because they were no relevant for measure evaluation.

Finally, also the calculation of average operating revenues indicator was difficult, both before and after implementation of the measure, since RAT was unable to collect revenues separately by transportation modes and routes. For this reason also this indicator has not been considered in the evaluation exercise.

C6 Summary of evaluation results

The key results are as follows:

Key result 1 - capital costs – As expected, capital cost increased as result of the implementation of the measure

Key result 2 - operating costs/vKm- decreased by 41%; as result of measure implementation, some jobs, related to lines monitoring, were cancelated.

Key result 3 - Average occupancy- increased by 5 % for trams line but decreased by 5 % for buses routs.

Key result 4 – Quality of service:

- increased by70 % related to Perception on waitig time
- increased by 98 % related to Perception on information panels

Key results 5 – Accuracy of time keeping- increased due to the measure implementation, namely:

- Routs: E1T, E1R and No. 9 - Accuracy of time keeping increased by 25%
- Tram line- Accuracy of time keeping increased by 20%

In conclusion the new electronic integrated system which was implemented at RAT Craiova allows achieving outcomes as:

- Increasing the efficiency of urban transport activities;
- Saving material, human, financial and temporal resources; the system eliminates the manual monitoring activity and allows saving fuel and money offering the fuel consumption chart by each route.
- Increasing of the passengers satisfaction level (timeliness races, easy modalities to pay transport titles, information panels from stations, safe and punctual transport relying on the significant increase of vehicle movement adherence level at circulation graphics.

C7 Future activities relating to the measure

Subject to the availability of financial resources, RAT Craiova has the intention to gradually equip the entire fleet with GPS/GPRS tracking system and the stations with real time information digital panels, expanding the system to the entire fleet in order to provide users with comprehensive real-time information on bus schedules and to build up a more complete database that would improve the optimization results.

D Process Evaluation Findings

D.0 Focused measure

▪

1	The measure fits into the EU policy towards clean urban transport (five pillars of the EU Green Paper)
2	The measure fits into the city policy towards sustainable urban transport and / or towards sustainability in general
3	The expected impact on the transport system, environment, economy and/ or society / people is very high
4	The high level of innovativeness of the measure with respect to technique, consortium, process, learning etc
5	The measure is typical for a group of measures or a specific context
6	The possibility of carrying out a good Cost Benefit Analysis
7	Participation of a range of different actors
8	The high degree of complexity of managing the measure
9	The measure is regarded as an example measure
10	Other, *please describe????*

	0	No focussed measure
2	1	Most important reason
4	2	Second most important reason
8	3	Third most important reason

D.1 Deviations from the original plan

- **Deviation 1** – Implementation of the GPS/GPRS system on trams was delayed

6 months delay in implementation of the measure occurred because the GPS system providing company has not delivered in time the software for the 27 trams on-board computers to integrate them in fleet management system. The reason why this happened was t financial problems RAT had during 2011.

D.2 Barriers and drivers

D.2.1 Barriers

Preparation phase

- **Planning barriers**: Large number of producers, different technologies and system components made difficult to estimate the overall system price.
- **Financial barriers:** Delay of Municipality in introducing the RAT co-financing in their budget

Implementation phase

- **Institutional barriers**: Complexity of Romanian tender procedures led to the delay in implementation
- **Planning barriers:** The period for tender was very long because of contestations, so the implementation of GPS system was delayed.
- **Financial barriers**: Delay of Municipality in introducing the RAT co-financing in their budget.

Operation phase

- **Spatial barriers**: Lack of favorable technical conditions for installation of equipment foreseen in this measure due to segmentation of the transport with trams and of the trams fleet in two isolated sections. This operation was required during construction of an overpass on the path of the tramway.

D.2.2 Drivers

Preparation phase

- **Positional drivers:** Implementation team was supported by Brescia team concerning on info -mobility tools. So. research activities were made easier using similar experience from partners.

Implementation phase

No drivers have been encountered.

Operation phase

- **Organizational drivers**: Mobilization and professionalism of the RAT team to organize the work and to create the technical conditions necessary to diminish the delays.

D.2.3 Activities

Preparation phase

- **Institutional actions**, Measure leader, site coordinator and the manager of the project discussed with RAT's administration concerning to the importance of the measure implementation offering examples of other European cities.
- **Involvement / communication actions**, The measure leader organized round table with key stakeholders sharing different viewpoints. The measure leader and the team

organized face-to face interviews with potential producers of info-mobility tools components.

- **Organizational actions**, Meetings of the measure team with RAT top management to emphasize the importance of the measure to obtain their maximum facilitating support. The measure M02.04 and M08.02 and M 05.05 are implemented on the same vehicles and work as a integrated system
- **Technological actions**, The research team made use of city of Brescia experience to improve their knowledge on communication systems protocols in order to make easier the implementation of info-mobility tools in Craiova.

Implementation phase

- **Planning actions:** Evaluation team for offers tried to be very quick to recover the wasted time with tender procedures.

Operation phase

- **Institutional actions**: Several discussions and meetings of the top management and technicians of RAT aiming to establish the plan of action considering the line and trams fleet segmentation, so that the delay's effects on the project work plan to be as small as possible.
- **Organizational actions**: Organization of the workshop on the Eastern segment of the tramway to allow installation of equipment in optimal technical conditions.

D.3 Participation

D.3.1. Measure Partners

- **Measure partner 1 – IPA SA - Leading role**

IPA SA is a 47 years old Romanian industrial R & D company and is the Romanian national institute for research and development, engineering in energy, automation and IT, with a large experience in European projects in technology transfer and in information dissemination.

IPA was responsible for the dissemination activities and carrying out the research activity and technical studies in the measure. Since 2011 IPA took over the evaluation activity

- **Measure partner 2 – RAT- Principle participant**

RAT Craiova is main Public Transportation Company in Dolj county. It provides the citizen transportation by trams, buses and micro-buses. RAT Craiova was responsible for the technical specification, acquisition and installation of the GPS system, as well as the training of trams and buses drivers. Also, RAT managed the operation and monitoring activities.

- **Measure partner 3 – LCM – Occasional participant**

The Local Council of Craiova Municipality (Primaria Municipiului Craiova) was organized and functions according to Law No. 215/2001 regarding Local Public Administration with the subsequent modification and completion.

Municipality as local government institution has, under the conditions imposed by the public administration law, the decisional right in all matters of local interest: political, social, cultural, educational and technical. Through their structures, the municipality is a complex mechanism which can produce major changes in the quality of urban life under an effective management and coordination.

The competencies of these bodies related to the project covers both the services provided to the local community (i.e. Public transport service in various forms) and the technical interventions (the urban infrastructure, constructions) that together change the image of the city and bring added value to the quality of life in the areas where they act.

LCM was the coordinator of the project since 2009 and assumed the responsibility for the management activity in the MODERN project. Between 2009-2011, LCM carried out the evaluation activity in the project.

D.3.2 Stakeholders

Stakeholder 1 - Alien Concept Company – The company that provided, installed and tested the GPS/GPRS system. The Alien Concept SRL company specializes in designing automated solutions, thus a major part of its products is customized to the specific needs of each client.Their product portfolio includes:

- ticket and subscriptions slot machines;
- ticket validators;
- parking ticket slot machines;
- pedestrian and automotive access control systems;
- GPS tracking solutions for managing the transport fleet;
- embedded control systems of patrol;
- electronic information panels.

D.4 Recommendations

D.4.1 Recommendations: measure replication

- **Recommendation 1** – European cities good practices. Using other European cities good practices and experiences lead to achieve a successful implementation of the measure.

D.4.2 Recommendations: Development strategy of Municipality

- **Recommendation 1 -** Take into account the urban development strategy of Municipality to avoid the difficulties and delays in the measure implementation or operation period

Annex 1 – Cost calculation

	Cases for comparison	internet communication costs	energy costs	personal costs	maintenance and spare parts costs	other costs (indirect costs) 20 % of personnel costs	Supplies costs	Total costs (euro)
2009	CIVITAS measure	0.00	0.00	25116.00	0.00	5023.20	0.00	30139.20
	BAU	0.00	0.00	25116.00	0.00	5023.20	0.00	30139.20
2010	CIVITAS measure	0.00	0.00	25116.00	0.00	5023.20	0.00	30139.20
	BAU	0.00	0.00	25116.00	0.00	5023.20	0.00	30139.20
2011	CIVITAS measure	5804.00	0.00	9731.00	0.00	1946.20	0.00	17481.20
	BAU	0.00	0.00	25116.00	0.00	5023.20	0.00	30139.20
2012	CIVITAS measure	6294.00	0.00	9731.00	0.00	1946.20	0.00	17971.20
	BAU	0.00	0.00	25116.00	0.00	5023.20	0.00	30139.20
2013	CIVITAS measure	6419.88	0.00	9925.62	0.00	1985.12	0.00	18330.62
	BAU	0.00	0.00	25618.32	0.00	5123.66	0.00	30741.98
2014	CIVITAS measure	6548.28	0.00	10124.13	6718.60	2024.83	0.00	25415.84
	BAU	0.00	0.00	26130.69	0.00	5226.14	0.00	31356.82
2015	CIVITAS measure	6679.24	0.00	10326.62	6852.97	2065.32	0.00	25924.15
	BAU	0.00	0.00	26653.30	0.00	5330.66	0.00	31983.96
2016	CIVITAS measure	6812.83	0.00	10533.15	6990.03	2106.63	0.00	26442.64
	BAU	0.00	0.00	27186.37	0.00	5437.27	0.00	32623.64
2017	CIVITAS measure	6949.08	0.00	10743.81	7129.83	2148.76	0.00	26971.49
	BAU	0.00	0.00	27730.09	0.00	5546.02	0.00	33276.11
2018	CIVITAS measure	7088.07	0.00	10958.69	7272.43	2191.74	0.00	27510.92
	BAU	0.00	0.00	28284.70	0.00	5656.94	0.00	33941.63
2019	CIVITAS measure	7229.83	0.00	11177.86	7417.88	2235.57	0.00	28061.14
	BAU	0.00	0.00	28850.39	0.00	5770.08	0.00	34620.47

	Cases for comparison	internet communication costs	energy costs	personal costs	maintenance and spare parts costs	other costs (indirect costs) 20 % of personnel costs	Supplies costs	Total costs (euro)
2020	CIVITAS measure	7374.42	0.00	11401.42	7566.23	2280.28	0.00	28622.36
	BAU	0.00	0.00	29427.40	0.00	5885.48	0.00	35312.88

		No of buses and trams	Km traveled by 80 buses	Km travelled by trams fleet	Average cost/vKm
2009	CIVITAS measure	107	2945536	893497	0.0078507
	BAU	107	2945536	893497	0.0078507
2010	CIVITAS measure	107	3665503	819643	0.0067198
	BAU	107	3665503	819643	0.0067198
2011	CIVITAS measure	107	3681844	494251	0.004186
	BAU	107	3681844	494251	0.0072171
2012	CIVITAS measure	107	3264988	533341	0.0047313
	BAU	107	3264988	533341	0.0079349

Annex 2 - occupancy monitoring

Note relating to meaning the figures in the tables:

- The period 09:00- 10:00 is the period when the data were collected in the morning for off-peak period
- The period 19:00-20:00 is the period when the data were collected in the after-noon for off-peak period
- The period 07:00- 08:00 is the period when the data were collected in the morning for peak period
- The period 15:00- 16:00 is the period when the data were collected in the after-noon for peak period
- Routs monitored includes the following stations:
  - " Electroputere" station-"Piata centrala" station(2 Km lengt- tram line)
  - "Fabrica de confectii " station- "Stadion" Station(1 Km length – E1T rout)
  - "Stadion " station-"Park"station(1 Km length- E1R rout)
  - "Electroputere"station-"Lapus" station(1 Km length- Rout no. 9)
    - Maximum number of passengers means the capacity of vehicle:
      - 83 passengers for tram monitored
      - 105 passengers for bus (MAN LC type) monitored

The routs and tram line were monitored for 1 month – September 2010, 2011 and 2012

The passengers travelling between the stations before listed have been counted and the occupancy percentage was calculated as ratio between average number of passengers and maximum capacity of vehicle.

	Average occupancy off-peak hours			09:00-10:00			
Tram	Distance travelled " Electroputere" station-"Piata centrala" station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
Line 101	2	48	83.00	58%	We Sept 1st	Sept	2010
		52	83.00	63%	Th- Sept 9th		
		46	83.00	55%	Fr- Sept 17th		
		70	83.00	84%	We- Sept 22nd		
		48	83.00	58%	Th- Sept 30th		

	Average occupancy in off-peak hours			19:00-20:00			
Tram	Distance travelled " Electroputere" station-"Piata centrala" station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
Line 101	2	50	83.00	60%	We Sept 1st	Sept	2010
		48	83.00	58%	Th- Sept 9th		
		60	83.00	72%	Fr- Sept 17th		
		51	83.00	61%	We- Sept 22nd		
		65	83.00	78%	Th- Sept 30th		

	Average occupancy off-peak hours			09:00-10:00			
Line E1T	Distance travelled "Fabrica de confectii " station- "Stadion" Station (Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
MAN LC bus type	1	55	105.00	52%	We Sept 1st	Sept	2010
		52	105.00	50%	Th- Sept 9th		
		46	105.00	44%	Fr- Sept 17th		
		48	105.00	46%	We- Sept 22nd		
		60	105.00	57%	Th- Sept 30th		

	Average occupancy in off-peak hours			19:00-20:00			

Line E1 T	Distance travelled "Fabrica de confectii " station- "Stadion" Station (Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
MAN LC bus type	1	40	105.00	38%	We Sept 1st	Sept	2010
		62	105.00	59%	Th- Sept 9th		
		52	105.00	50%	Fr- Sept 17th		
		50	105.00	48%	We- Sept 22nd		
		60	105.00	57%	Th- Sept 30th		

	Average occupancy off-peak hours			09:00-10:00			
Line E1R	Distance travelled "Stadion " station-"Park"station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
MAN LC bus type	1	60	105.00	57%	We Sept 1st	Sept	2010
		55	105.00	52%	Th- Sept 9th		
		60	105.00	57%	Fr- Sept 17th		
		71	105.00	68%	We- Sept 22nd		
		68	105.00	65%	Th- Sept 30th		

	Average occupancy in off-peak hours			19:00-20:00			
Line E1 R	Distance travelled "Stadion " station-"Park"station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year

MAN LC bus type	1	70	105.00	67%	We Sept 1st	Sept	2010
		60	105.00	57%	Th- Sept 9th		
		68	105.00	65%	Fr- Sept 17th		
		58	105.00	55%	We- Sept 22nd		
		65	105.00	62%	Th- Sept 30th		

	Average occupancy off-peak hours			09:00-10:00			
Line 9	Distance travelled "Electroputere"station-"Lapus" station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
MAN LC bus type	1	73	105.00	70%	We Sept 1st	Sept	2010
		64	105.00	61%	Th- Sept 9th		
		60	105.00	57%	Fr- Sept 17th		
		68	105.00	65%	We- Sept 22nd		
		79	105.00	75%	Th- Sept 30th		

	Average occupancy in off-peak hours			19:00-20:00			
Line 9	Distance travelled "Electroputere"station-"Lapus" station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
MAN LC bus type	1	70	105.00	67%	We Sept 1st	Sept	2010

	67	105.00	64%	Th- Sept 9th		
	50	105.00	48%	Fr- Sept 17th		
	58	105.00	55%	We- Sept 22nd		
	40	105.00	38%	Th- Sept 30th		

	Average occupancy in peak			07:00-08:00			
Tram	Distance travelled " Electroputere" station-"Piata centrala" station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
Line 101	2	55	83.00	66%	We Sept 1st	Sept	2010
		52	83.00	63%	Th- Sept 9th		
		60	83.00	72%	Fr- Sept 17th		
		64	83.00	77%	We- Sept 22nd		
		57	83.00	69%	Th- Sept 30th		

	Average occupancy in peak hours			15:00-16:00			
Tram	Distance travelled " Electroputere" station-"Piata centrala" station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
Line 101	2	50	83.00	60%	We Sept 1st	Sept	2010
		53	83.00	64%	Th- Sept 9th		
		60	83.00	72%	Fr- Sept 17th		
		67	83.00	81%	We- Sept 22nd		

		65	83.00	78%	Th- Sept 30th		

	Average occupancy in peak hours			07:00-08:00			
Line E1T	Distance travelled "Fabrica de confectii " station- "Stadion" Station (Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
MAN LC bus type	1	62	105.00	59%	We Sept 1st	Sept	2010
		52	105.00	50%	Th- Sept 9th		
		58	105.00	55%	Fr- Sept 17th		
		53	105.00	50%	We- Sept 22nd		
		60	105.00	57%	Th- Sept 30th		

	Average occupancy in peak hours			15:00-16:00			
Line E1 T	Distance travelled "Fabrica de confectii " station- "Stadion" Station (Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
MAN LC bus type	1	56	105.00	53%	We Sept 1st	Sept	2010
		62	105.00	59%	Th- Sept 9th		
		52	105.00	50%	Fr- Sept 17th		
		57	105.00	54%	We- Sept 22nd		
		65	105.00	62%	Th- Sept 30th		

	Average occupancy in peak hours			07:00-08:00			

Line E1R	Distance travelled "Stadion " station-"Park"station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
MAN LC bus type	1	68	105.00	65%	We Sept 1st	Sept	2010
		62	105.00	59%	Th- Sept 9th		
		65	105.00	62%	Fr- Sept 17th		
		71	105.00	68%	We- Sept 22nd		
		74	105.00	70%	Th- Sept 30th		

	Average occupancy in peak hours			15:00-16:00			
Line E1 R	Distance travelled "Stadion " station-"Park"station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
MAN LC bus type	1	75	105.00	71%	We Sept 1st	Sept	2010
		60	105.00	57%	Th- Sept 9th		
		76	105.00	72%	Fr- Sept 17th		
		58	105.00	55%	We- Sept 22nd		
		73	105.00	70%	Th- Sept 30th		

	Average occupancy in peak hours			07:00-08:00			
Line 9	Distance travelled "Electroputere"station-"Lapus" station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
MAN LC bus type	1	73	105.00	70%	We Sept 1st	Sept	2010
		68	105.00	65%	Th- Sept 9th		
		65	105.00	62%	Fr- Sept 17th		

		75	105.00	71%	We- Sept 22nd		
		80	105.00	76%	Th- Sept 30th		

	Average occupancy in peak hours			15:00-16:00			
Line 9	Distance travelled "Electroputere"station-"Lapus" station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
MAN LC bus type	1	74	105.00	70%	We Sept 1st	Sept	2010
		67	105.00	64%	Th- Sept 9th		
		58	105.00	55%	Fr- Sept 17th		
		58	105.00	55%	We- Sept 22nd		
		60	105.00	57%	Th- Sept 30th		

	Average occupancy off-peak hours			09:00-10:00			
Tram	Distance travelled " Electroputere" station-"Piata centrala" station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
Line 101	2	35	83.00	42%	Th Sept 1st	Sept	2011
		45	83.00	54%	Mo- Sept 5th		
		33	83.00	40%	Tu- Sept 13th		
		38	83.00	46%	We- Sept 21st		
		34	83.00	41%	Th- Sept 39th		

	Average occupancy in off-peak			19:00-20:00			
Tram type	Distance travelled " Electroputere" station-"Piata centrala" station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
Line 101	2	37	83.00	45%	Th Sept 1st	Sept	2011
		41	83.00	49%	Mo- Sept 5th		
		38	83.00	46%	Tu- Sept 13th		
		40	83.00	48%	We- Sept 21st		
		33	83.00	40%	Th- Sept 39th		

	Average occupancy off-peak hours			09:00-10:00			
Line E1T	Distance travelled "Fabrica de confectii " station-"Stadion" Station (Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
MAN LC bus type	1	38	105.00	36%	Th Sept 1st	Sept	2011
		50	105.00	48%	Mo- Sept 5th		
		49	105.00	47%	Tu- Sept 13th		
		45	105.00	43%	We- Sept 21st		
		37	105.00	35%	Th- Sept 39th		

	Average occupancy in off-peak hours			19:00-20:00			

Line E1 T	Distance travelled "Fabrica de confectii " station- "Stadion" Station (Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
MAN LC bus type	1	39	105.00	37%	Th Sept 1st	Sept	2011
		47	105.00	45%	Mo- Sept 5th		
		44	105.00	42%	Tu- Sept 13th		
		42	105.00	40%	We- Sept 21st		
		34	105.00	32%	Th- Sept 39th		

	Average occupancy off-peak hours			09:00-10:00			
Line E1R	Distance travelled "Stadion " station- "Park"station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
MAN LC bus type	1	48	105.00	46%	Th Sept 1st	Sept	2011
		55	105.00	52%	Mo- Sept 5th		
		58	105.00	55%	Tu- Sept 13th		
		51	105.00	49%	We- Sept 21st		
		45	105.00	43%	Th- Sept 39th		

	Average occupancy in off-peak hours			19:00-20:00			
Line E1 R	Distance travelled "Stadion " station- "Park"station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year

MAN LC bus type	1	60	105.00	57%	Th Sept 1st	Sept	2011
		52	105.00	50%	Mo- Sept 5th		
		55	105.00	52%	Tu- Sept 13th		
		47	105.00	45%	We- Sept 21st		
		51	105.00	49%	Th- Sept 39th		

	Average occupancy off-peak hours			09:00-10:00			
Line 9	Distance travelled "Electroputere"station-"Lapus" station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
MAN LC bus type	1	56	105.00	53%	Th Sept 1st	Sept	2011
		60	105.00	57%	Mo- Sept 5th		
		52	105.00	50%	Tu- Sept 13th		
		58	105.00	55%	We- Sept 21st		
		42	105.00	40%	Th- Sept 39th		

	Average occupancy in off-peak hours			19:00-20:00			
Line 9	Distance travelled "Electroputere"station-"Lapus" station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
MAN LC bus type	1	52	105.00	50%	Th Sept 1st	Sept	2011
		57	105.00	54%	Mo- Sept 5th		

	50	105.00	48%	Tu- Sept 13th		
	58	105.00	55%	We- Sept 21st		
	40	105.00	38%	Th- Sept 39th		

	Average occupancy in peak			07:00-08:00			
Tram	Distance travelled " Electroputere" station-"Piata centrala" station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
Line 101	2	41	83.00	49%	Th Sept 1st	Sept	2011
		52	83.00	63%	Mo- Sept 5th		
		44	83.00	53%	Tu- Sept 13th		
		42	83.00	51%	We- Sept 21st		
		38	83.00	46%	Th- Sept 39th		

	Average occupancy in peak hours			15:00-16:00			
Tram	Distance travelled " Electroputere" station-"Piata centrala" station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
Line 101	2	38	83.00	46%	Th Sept 1st	Sept	2011
		42	83.00	51%	Mo- Sept 5th		
		44	83.00	53%	Tu- Sept 13th		
		41	83.00	49%	We- Sept 21st		
		37	83.00	45%	Th- Sept 39th		

	Average occupancy in peak hours			07:00-08:00			
Line E1T	Distance travelled "Fabrica de confectii " station- "Stadion" Station (Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
MAN LC bus type	1	40	105.00	38%	Th Sept 1st	Sept	2011
		50	105.00	48%	Mo- Sept 5th		
		40	105.00	38%	Tu- Sept 13th		
		53	105.00	50%	We- Sept 21st		
		43	105.00	41%	Th- Sept 39th		

	Average occupancy in peak hours			15:00-16:00			
Line E1 T	Distance travelled "Fabrica de confectii " station- "Stadion" Station (Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
MAN LC bus type	1	45	105.00	43%	Th Sept 1st	Sept	2011
		55	105.00	52%	Mo- Sept 5th		
		52	105.00	50%	Tu- Sept 13th		
		50	105.00	48%	We- Sept 21st		
		46	105.00	44%	Th- Sept 39th		

	Average occupancy in peak hours			07:00-08:00			
Line E1R	Distance travelled "Stadion " station-"Park"station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year

MAN LC bus type	1	61	105.00	58%	Th Sept 1st	Sept	2011
		60	105.00	57%	Mo- Sept 5th		
		55	105.00	52%	Tu- Sept 13th		
		55	105.00	52%	We- Sept 21st		
		60	105.00	57%	Th- Sept 39th		

	Average occupancy in peak hours			15:00-16:00			
Line E1 R	Distance travelled "Stadion " station-"Park"station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
MAN LC bus type	1	61	105.00	58%	Th Sept 1st	Sept	2011
		60	105.00	57%	Mo- Sept 5th		
		51	105.00	49%	Tu- Sept 13th		
		58	105.00	55%	We- Sept 21st		
		60	105.00	57%	Th- Sept 39th		

	Average occupancy in peak hours			07:00-08:00			
Line 9	Distance travelled "Electroputere"station-"Lapus" station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
MAN LC bus type	1	51	105.00	49%	Th Sept 1st	Sept	2011
		65	105.00	62%	Mo- Sept 5th		
		60	105.00	57%	Tu- Sept 13th		
		62	105.00	59%	We- Sept 21st		

		55	105.00	52%	Th- Sept 39th		

	Average occupancy in peak hours			15:00-16:00			
Line 9	Distance travelled "Electroputere"station-"Lapus" station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
MAN LC bus type	1	60	105.00	57%	Th Sept 1st	Sept	2011
		61	105.00	58%	Mo- Sept 5th		
		58	105.00	55%	Tu- Sept 13th		
		58	105.00	55%	We- Sept 21st		
		52	105.00	50%	Th- Sept 39th		

	Average occupancy off-peak hours			09:00-10:00			
Tram	Distance travelled " Electroputere" station-"Piata centrala" station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
Line 101	2	58	83.00	70%	Mo Sept 3rd	Sept	2012
		52	83.00	63%	Tu- Sept 11th		
		48	83.00	58%	We- Sept 19th		
		70	83.00	84%	Mo- Sept 24th		
		60	83.00	72%	Fr- Sept 28th		

	Average occupancy in off-peak hours			19:00-20:00			

Tram	Distance travelled " Electroputere" station-"Piata centrala" station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
Line 101	2	50	83.00	60%	Mo Sept 3rd	Sept	2012
		55	83.00	66%	Tu- Sept 11th		
		60	83.00	72%	We- Sept 19th		
		60	83.00	72%	Mo- Sept 24th		
		70	83.00	84%	Fr- Sept 28th		

	Average occupancy off-peak hours			09:00-10:00			
Line E1T	Distance travelled "Fabrica de confectii " station- "Stadion" Station (Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
MAN LC bus type	1	50	105.00	48%	Mo Sept 3rd	Sept	2012
		52	105.00	50%	Tu- Sept 11th		
		46	105.00	44%	We- Sept 19th		
		48	105.00	46%	Mo- Sept 24th		
		51	105.00	49%	Fr- Sept 28th		

	Average occupancy in off-peak hours			19:00-20:00			
Line E1 T	Distance travelled "Fabrica de confectii " station- "Stadion" Station (Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
MAN LC bus type	1	38	105.00	36%	Mo Sept 3rd	Sept	2012
		50	105.00	48%	Tu- Sept 11th		

		51	105.00	49%	We- Sept 19th		
		47	105.00	45%	Mo- Sept 24th		
		44	105.00	42%	Fr- Sept 28th		

	Average occupancy off-peak hours			09:00-10:00			
Line E1R	Distance travelled "Stadion " station-"Park"station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
MAN LC bus type	1	59	105.00	56%	Mo Sept 3rd	Sept	2012
		50	105.00	48%	Tu- Sept 11th		
		60	105.00	57%	We- Sept 19th		
		65	105.00	62%	Mo- Sept 24th		
		55	105.00	52%	Fr- Sept 28th		

	Average occupancy in off-peak hours			19:00-20:00			
Line E1 R	Distance travelled "Stadion " station-"Park"station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
MAN LC bus type	1	63	105.00	60%	Mo Sept 3rd	Sept	2012
		60	105.00	57%	Tu- Sept 11th		
		61	105.00	58%	We- Sept 19th		
		52	105.00	50%	Mo- Sept 24th		
		57	105.00	54%	Fr- Sept 28th		

	Average occupancy off-peak hours			09:00-10:00			

Line 9	Distance travelled "Electroputere"station-"Lapus" station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
MAN LC bus type	1	62	105.00	59%	Mo Sept 3rd	Sept	2012
		64	105.00	61%	Tu- Sept 11th		
		60	105.00	57%	We- Sept 19th		
		68	105.00	65%	Mo- Sept 24th		
		57	105.00	54%	Fr- Sept 28th		

	Average occupancy in off-peak hours			19:00-20:00			
Line 9	Distance travelled "Electroputere"station-"Lapus" station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
MAN LC bus type	1	61	105.00	58%	Mo Sept 3rd	Sept	2012
		60	105.00	57%	Tu- Sept 11th		
		50	105.00	48%	We- Sept 19th		
		58	105.00	55%	Mo- Sept 24th		
		40	105.00	38%	Fr- Sept 28th		

	Average occupancy in peak			07:00-08:00			
Tram	Distance travelled " Electroputere" station-"Piata centrala" station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
Line 101	2	64	83.00	77%	Mo Sept 3rd	Sept	2012
		52	83.00	63%	Tu- Sept 11th		
		60	83.00	72%	We- Sept 19th		
		64	83.00	77%	Mo- Sept 24th		
		70	83.00	84%	Fr- Sept 28th		

	Average occupancy in peak hours			15:00-16:00			
Tram	Distance travelled " Electroputere" station-"Piata centrala" station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
Line 101	2	61	83.00	73%	Mo Sept 3rd	Sept	2012
		53	83.00	64%	Tu- Sept 11th		
		60	83.00	72%	We- Sept 19th		
		67	83.00	81%	Mo- Sept 24th		
		70	83.00	84%	Fr- Sept 28th		

	Average occupancy in peak hours			07:00-08:00			
Line E1T	Distance travelled "Fabrica de confectii " station- "Stadion" Station (Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
MAN LC bus type	1	58	105.00	55%	Mo Sept 3rd	Sept	2012
		52	105.00	50%	Tu- Sept 11th		
		55	105.00	52%	We- Sept 19th		
		53	105.00	50%	Mo- Sept 24th		
		50	105.00	48%	Fr- Sept 28th		

	Average occupancy in peak hours			15:00-16:00			
Line E1 T	Distance travelled "Fabrica de confectii " station- "Stadion" Station (Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
MAN LC bus type	1	50	105.00	48%	Mo Sept 3rd	Sept	2012

		60	105.00	57%	Tu- Sept 11th		
		52	105.00	50%	We- Sept 19th		
		50	105.00	48%	Mo- Sept 24th		
		49	105.00	47%	Fr- Sept 28th		

	Average occupancy in peak hours			07:00-08:00			
Line E1R	Distance travelled "Stadion " station-"Park"station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
MAN LC bus type	1	58	105.00	55%	Mo Sept 3rd	Sept	2012
		62	105.00	59%	Tu- Sept 11th		
		65	105.00	62%	We- Sept 19th		
		65	105.00	62%	Mo- Sept 24th		
		60	105.00	57%	Fr- Sept 28th		

	Average occupancy in peak hours			15:00-16:00			
Line E1 R	Distance travelled "Stadion " station-"Park"station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
MAN LC bus type	1	68	105.00	65%	Mo Sept 3rd	Sept	2012
		60	105.00	57%	Tu- Sept 11th		
		71	105.00	68%	We- Sept 19th		
		58	105.00	55%	Mo- Sept 24th		
		67	105.00	64%	Fr- Sept 28th		

	Average occupancy in peak hours			07:00-08:00			
Line 9	Distance travelled "Electroputere"station-"Lapus" station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
MAN LC bus type	1	67	105.00	64%	Mo Sept 3rd	Sept	2012
		68	105.00	65%	Tu- Sept 11th		
		65	105.00	62%	We- Sept 19th		
		70	105.00	67%	Mo- Sept 24th		
		63	105.00	60%	Fr- Sept 28th		

	Average occupancy in peak hours			15:00-16:00			
Line 9	Distance travelled "Electroputere"station-"Lapus" station(Km)	average no of passengers	maximum number of passengers	Average occupancy	day	month	year
MAN LC bus type	1	65	105.00	62%	Mo Sept 3rd	Sept	2012
		60	105.00	57%	Tu- Sept 11th		
		58	105.00	55%	We- Sept 19th		
		58	105.00	55%	Mo- Sept 24th		
		60	105.00	57%	Fr- Sept 28th		

Annex 3- Survey

Instructions

This survey is part of an European project - MODERN (Mobility, development and reducing energy consumption) and aims to collect your experiences in traveling by buses and trams

This measure aims to implement GPS/GPRS systems on 80 buses and 27 trams.

GPS/GPRS System consists of:

- monitoring system for 80 buses and 27 trams

- 20 digital panels with real time information

Your answers will be treated confidentially.Thank you for your participation!

Ex-ante questionnaire

M08.02 INFOMOBILITY TOOLS FOR FLEET MANAGEMENT IN CRAIOVA

1. Gender: F ☐ 35% M ☐ 65 %

2. Age:

Up to 15	15-24	25-45	45-54	55-65	over 65
5%	25%	20%	25%	10%	15%

3. Background (the last education institution graduated):

· faculty	· secondary school	· primary school
35%	60%	5%

4. Labor market status:

employed	unemployed	pensioners
60%	25%	15%

5. Public transport user

	80%		5%		15%
yes	☐	no	☐	occasionally	☐

Quality of service

6. How do you evaluate the quality of public transportation in Craiova?

- What is your view about the waiting time in the stations?

Less good	good	Very good	Don’t know
75 %	20%	3%	2%

- What is your view about no information related to vehicles arriving?

Less good	good	Very good	Don’t know
98 %	0	0	2%

Instructions

This survey is part of an European project - MODERN (Mobility, development and reducing energy consumption) and aims to collect your experiences in traveling by buses and trams

The purpose of the measure was to implement GPS/GPRS system on 80 buses and 27 trams.

GPS/GPRS System consists of:

- monitoring system for 80 buses and 27 trams

- 20 digital panels with real time information

Your answers will be treated confidentially

Thank you for your participation!

Ex-post questionnaire

M08.02 INFOMOBILITY TOOLS FOR FLEET MANAGEMENT IN CRAIOVA

1. Gender: F 46% ☐ M 54 % ☐

2. Age:

Up to 15	15-24	25-45	45-54	55-65	over 65
3%	30%	25%	26%	6%	10%

3. Background (the last education institution graduated):

faculty	secondary school	primary school
30%	67%	3%

4. Labor market status:

employed	unemployed	pensioners
67%	20%	13%

5. Public transport user

yes ☐ 85% no ☐ 3% occasionally ☐ 12%

Quality of service

6. How do you evaluate the quality of public transportation in Craiova?

- What is your view about the waiting time in the stations?

Less good	good	Very good	Don’t know
5 %	82%	11%	2%

- What is your view about no information related to vehicles arriving?

Less good	good	Very good	Don’t know
0	87%	11%	2%

Estimation of sample size

Variables name and explanations		Variables values
n	The sample size	119
t	z-score: the abscissa of the Normal distribution for probability α (consisted of 1.5+0.03 from the table-standard normal probabilities)	1.53
α	**confidence level**, is a percentage and represents how often the true percentage of the population who would pick an answer lies within the **confidence interval** (margin of error).	87.50%
P	percentage of your sample that picks a particular answer.	0.85
Q	(1-P)	0.15
d	**confidence interval** (also called margin of error)	0.05
N	population total (if N is enough large the term in the denominator tends to 1 and the formula is reduced to the numerator)	300000