CiViTAS
Cleaner and better transport in cities
MIMOSA

CASE STUDY

INTELLIGENT TRANSPORT SYSTEMS FOR BETTER URBAN MOBILITY

TRANSPORT TELEMATICS

In dense urban areas, public space is an important resource that often a source of conflict between different users. In recent years, the Municipality of Bologna has deployed a mobility strategy strongly focused on the use of intelligent transport systems (ITS) for traffic regulation and enforcement. These are considered fundamental for an effective implementation of mobility policies. A new platform has been introduced to collect, integrate and elaborate data coming from ITS infrastructure in the city, transmitting information in real time on the traffic situation to citizens. Such systems have also been used at traffic lights to control the abuse of red light crossings, with a dramatic reduction of accidents and injured people. Another useful application of this technology has been to reduce instances of double parking of vehicles, especially in the arterial roads fundamental for the public transport.

Municipal context

Bologna is the capital of the Emilia Romagna region in Italy. The town, 140.85 km^2 in size and with 380,000 inhabitants, is located in the centre of the country. Surrounded by plains, hills, woods and the Apennines Mountains, the city has developed around a historic centre dating from the Middle Ages. The city centre is characterised by very narrow streets with their famous arcades, or porticoes.

Even though this layout makes road space particularly cramped, the centre is still the focus of much public, commercial and cultural life.

The high demand for transport in the city and surrounding areas results in a high level of pollutant emissions with a low diffusion rate. As such, Bologna experiences high levels of air pollution, particularly fine particulate matter. The city centre's narrow streets further complicate the matter.

In June 2007, Bologna approved its Urban Traffic Master Plan. This outlines a strategy to address *inter alia* improving the circulation of traffic, road safety, reducing environmental and noise pollution, and achieving energy savings.

MUNICIPAL PROFILE

LOCATION
Bologna, Italy

POPULATION
380,000

LAND AREA
140.85 km^2

CIVITAS BUDGET
Five partners were involved in the implementation of CIVITAS MIMOSA measures in Bologna. The total cost of the 19 measures is 6,596,648.12 € (with the requested EC contribution: EUR 4,071,283.59 €)

BOLOGNA IN CIVITAS

Bologna (Italy) participated in CIVITAS MIMOSA, an innovative collaboration between the cities of Bologna (Italy), Funchal (Portugal), Gdansk (Poland), Tallinn (Estonia), and Utrecht (Netherlands). The motto of the project is "Making Innovation in MObility and Sustainable Actions."

CIVITAS MIMOSA

With cities drawn from a range of geographical and economic situations, MIMOSA cities implemented a range of 69 activities, aimed at guaranteeing mobility to all citizens without burdening the environment or weakening the cities' economy. Shaping a new mentality where conscientious behaviour is perceived as rewarding rather than a sacrifice was at its heart. This effort was reinforced by a host of technical and physical measures. It ran from 2008-2012.

READ MORE AT:

www.civitas.eu/display-all-projects

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Introduction

Intelligent transport system (ITS) instruments can provide concrete and efficient solutions to many traffic problems. Before the start of CIVITAS, Bologna had already introduced a number of ITS technologies to improve control and management of urban mobility. The Municipality decided to expand these actions within CIVITAS in order to test the feasibility and the effectiveness of regulatory action implemented via ITS instruments.

Specifically, the Municipality of Bologna saw the necessity to integrate a set of instruments for traffic planning, control and monitoring. The solution was an integrated platform in a distributed environment called the Cisium traffic control centre. This platform connects and integrates the municipality's ITS systems. It controls the majority of the traffic lights in the city and influences traffic communications in the whole metropolitan area, in order to achieve optimal real-time traffic management. The main functionalities are:

- Centralised traffic light control through sensors and traffic light equipment;
- Integration with the limited traffic zone/bus lane control gates;
- Integration with the real-time bus control centre for bus prioritisation;
- Information through the more than 40 variable message signs;
- Transmit real-time traffic information via web, SMS, email, satellite GPS, and car navigation systems.

Through CIVITAS, the opportunity arose to complete and fine tune Cisium and to produce and disseminate information related to traffic in the city to the public.

ITS can also be useful in reducing traffic congestion and boosting road safety. Before CIVITAS, illegal double parking was not efficiently controlled in the city. This strongly inhibited public transport and the circulation of private and freight vehicles, not to mention cyclists and pedestrians. The narrow streets of Bologna compounded the issue. This attitude needed to be changed in order to better regulate the normal parking on offer and to leave the road more available for circulation. Illegal on-street parking has been reduced via electronic mobile enforcement.

An innovative system based on ITS, has been tested to evaluate its effectiveness as an automatic enforcement system to reduce accidents, injuries and fatalities at junctions with traffic lights.

Taking a closer look

The innovative solutions carried out through the implementation of the Cisium platform is based around integrating and improving control of real-time traffic situation, access restrictions and critical event management.

The new system receives online traffic data from the sensors and calculates the optimal algorithms for dynamic variation of traffic light phases and prioritisation of buses. It also takes into account congestion events or accidents to generate redirection paths and suggest to citizens alternative solutions to car use (Park&Ride, bike paths, etc) especially for areas protected by enforcement cameras. This

Enforcement cameras in place

framework is complemented by a database of statistical data giving the technicians of the municipality an online vision of the traffic evolution and the real use of the permits to access limited traffic zones. The information helps refine access policies for the city.

In order to improve the platform's efficiency, it was necessary to fine-tune traffic models and scenarios, conduct an evaluation analysis and launch a dissemination campaign for road users. Essentially, the system has been improved by means of software refinement, extensive testing and bug fixing, as well as configuring data relating to cartography, traffic light topology and indicators, subsystem integration, variable message signs and public transport travel times.

Traffic monitoring and parameter fine-tuning was carried out through the use of a new mathematical algorithm for congestion detection implemented in Cisium. It is based on modifications of data provided by the bus control centre and by traffic lights.

Dissemination activities were largely performed through a new dedicated webpage launched to provide the public with real-time information on traffic conditions and traffic events. A press conference was also held to explain the features of the system.

Expanding on digital synergies, Bologna signed an agreement with Google to provide traffic data for publication on the Google traffic service, becoming the first city in Italy to do so.

One of the main causes of traffic congestion in Bologna, illegal on-street parking also hinders the circulation of public transport vehicles. To discourage this behaviour, within CIVITAS an automatic enforcement system named Scout was further improved. This system is based on the use of cameras equipped with GPS location devices to support municipal police officers in issuing fines for illegally parked vehicles that obstruct public transport routes and speed up the enforcement process. The process consists of:

- taking a photo of the cars illegally parked;
- automatic number plate recognition and fine process activation from picture detection;
- a GPS satellite application on board allows the exact position of the vehicle to be determined, in order to avoid dispute when the fine has been issued.

Launching the Scout system to detect illegal parking

Another instrument, Stars, is a technological system for red light crossing control and automatic enforcement. A camera is placed within a protective device close to a junction. It then detects and issues a fine to vehicles that jump red lights.

Such photos are then sent to the municipal police department, where agents check and validate the information. Fines are automatically sent to transgressors. Photos are stored for eventual legal complaints and statistical evaluation.

Results

With the introduction of the Cisium platform, a more general technical framework has been put in place, which allows technicians to better understand the evolution of the whole urban mobility scenario. Citizens also benefit through up-to-date information which helps them make choices. The system also guarantees bus prioritisation at traffic lights, so that when a bus is approaching the junction, the traffic light aims to turn green if possible. There has been a general improvement in traffic conditions, with bus drivers now noticing the difference.

The introduction of the Scout system has provided encouraging results. In areas controlled by the system, illegal on-road parking is down by 55 percent. Traffic congestion has reduced, while bus regularity has increased.

Since STARS has been introduced, an increase in respect of the traffic code has been observed. In terms of accidents and the related amount of severely injured persons, a considerable reduction has been registered since the programme was activated. All in all, accidents and severe injuries have decreased by 45 percent.

Lessons learned

The ITS-based measures implemented in Bologna are very complex in terms of the software and technology used. The system records different types of data, which are not always comparable. The effort required in terms of technical testing and fine-tuning of the systems often involved greater input than scheduled, both in terms of money and time.

Implementing the traffic control centre took quite a long time and required much effort, in terms of analysis, testing and developing algorithms. However, this extensive work made it possible to study all aspects of the system in depth and to focus on particularly important details.

The implementation process showed that the daily work of internal personnel is fundamental and cannot be replaced by contributions from consultants or other third parties. Numerous occasions occurred where internal technicians were able to provide the software company with a logical solution. In-depth knowledge of

the local traffic context was often essential in solving puzzles.

Another aspect that is often underestimated when considering ITS deployment is the impact of maintenance both of the systems themselves and also of the on-street equipment. This activity, though necessary, is very resource demanding. Furthermore, it is an indispensable activity throughout the systems' life.

To manage the maintenance of all ITS installations, Bologna created a specific department, which was a major contribution in making the measure successful.

A vital and important step was to include the citizen in the decision making process. The municipality had to consider cultural and social acceptance of the proposed mobility policies and ITS. Essentially, a dialogue among different views present needed to be created to ensure maximum effect. This work, also involving political support, is decisive for the success of the measures.

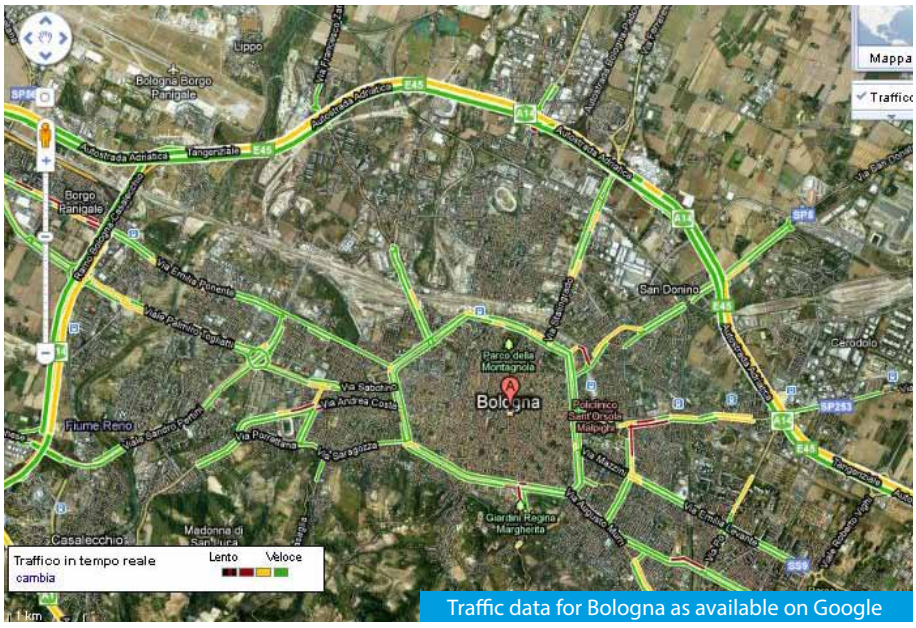
Upscaling and transferability

The scale of ITS coverage has already been extended to all urban areas in Bologna. Cities interested in ITS-based measures should consider in advance that a large portion of the urban network must be involved in the project in order to obtain significant benefits. Furthermore, such measures could be replicated in other cities due to the positive cost/benefit ratio. Compared to the investment, operation and maintenance costs, it is possible to achieve significant results.

In terms of the CISIUM platform, the next step will be to perform stronger integration and roll-out new capabilities in data mining and geographic analysis of traffic phenomena, using business intelligence tools. This better understanding of traffic and parking demand/supply will allow the city to plan new activities with more scientific criteria. It will also facilitate clear and useful communication with citizens.

Due to the success of the measure, the Municipality of Bologna would like to extend the STARS system. The risk involved is that up-scaling this measure (installing cameras on more crossroads) could challenge acceptability of the system and damage the municipality's reputation. This question is still open and depends on political support.

Cities interested in this kind of intervention must focus their attention on communication, as financial sanctions are easily interpreted as simply a way for the administration to earn revenue through fines. Public administrations must demonstrate how fines are simply a last resort when incorrect behaviour persists.



Traffic data for Bologna as available on Google

Key contacts

Mauro Borioni
Municipality of Bologna
[mauro.borioni@comune.bologna.it]

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COMUNE DI BOLOGNA

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Series editors

Ciara Leonard
Sean Carroll
Gloria Spezzano (ICLEI)

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Stephan Köhler (ICLEI)