

The demand responsive transport services: Italian approach

C. Bellini, G. Dellepiane & C. Quagliarini

*CIRT, Centro Interuniversitario Ricerca Trasporti, University of Genova,
Italy*

Abstract

The dial-services are an excellent connection between classical forms of collective and private transport; they are the answer to the development of transport demand from homogeneous travels (home/office, home/factory, home/school in limited areas and periods) to not homogeneous travels (short continuous travels toward many different destinations); they are also the answer to the growing need of travels from specific consumers' classes such as disabled, elders and students.

It is a new transport form more oriented to meet the consumers' requirements.

It is possible to identify four operative levels of the DTRS (Demand Responsive Transport Services).

Level one: fixed itineraries and fixed stops with possibility of access through booking.

Level two: fixed itineraries with possibility of detours within specific boundaries and fixed optional stops.

Level three: service with free routes between fixed points.

Level four: service with free routes between free points.

This paper aims at describing the above-mentioned transport systems and at analysing their efficacy, productivity and consumers' opinions, providing some examples experienced in Florence (PersonalBus) and in Genoa (DrinBus).

1 Definition and general features

The concept of demand responsive transport was first formulated in the USA around 1990 as a solution to the rising disaffection of potential users, in particular during the night.

This phenomenon, also growing in Europe in spite of traffic limitation for private cars is essentially caused by the growing demand for higher quality service with higher satisfaction of the specific and individual consumer needs.

The first analyses and studies were effected in Denver, Colorado: the planned system was called "Demand Responsive Transport Service" (DRTS) denomination adopted later in the USA and then in all the Western Countries.

The research of innovative transportation systems aims at replacing the use of private cars with a system, preferably collective, able to preserve some car advantages and to remove disadvantages completely or partly. These systems are considered more and more as a flexible service, a modern and adequate answer to all the social mobility needs both in urban and rural areas. These needs are not satisfied by a regular service with fixed timetable and itineraries.

The main features of these systems and their advantages are the following: first, the "door-to-door" transport, secondly the quite totally absence of waiting times, of itineraries on foot and of vehicle changes.

This particular service is usually carried out by small vehicles and can effectively solve transport problems in low demand areas e.g. during the night. It is a valid answer also for people with mobility problems as disabled or old people.

The dial service is the solution chosen by the most operators in order to improve and optimise public transport. Even if it originates from low demand areas, it is nowadays carried out successfully also in areas with a high density of population, characterised by difficult accessibility: with appropriate means of transport, it is possible to cover narrow streets, to get areas which are not served by transport services or areas with difficult accessibility, to pick up users who probably would use private cars or taxis.

The complete flexibility of this service allows a real integration with traditional services, favouring the improvement of the whole transport system.

The users' satisfaction for a high quality service reinforces the operators' efficiency in optimising their resources because these means of transport move only when and where they are necessary, and, consequently, they can organize the transport service also for areas where a traditional one is not possible.

There are four operative levels of DTRS:

- First level: fixed itineraries service. It is based on fixed itineraries and fixed stops. Users must book the service. Sometimes transit timetables are fixed too and buses make trips only if these are reserved.
- Second level: fixed itineraries with detour possibility. In this case, itineraries and timetables are partially fixed; they can be changed on user demand with detours possibility within some fixed points, integrating the whole itinerary with fixed optional stops. In some cases this service is called "Corridor Service" just to point out the spatial detour limit that the trip can have.
- Third Level: service with free itineraries within fixed points. It is possible to identify:
 - Zonal Service, based on transfer itineraries towards fixed public interesting points as exchange parking, railway stations ("many to few" mode);

- Area-wide Service, operating on usually wide areas, with full flexibility in times and free itineraries within fixed stop points “many to many” mode);
- Fourth level: free itinerary service among unspecified points. It has free itineraries among unspecified stops; it works like a taxi service (“door-to-door” mode).

Among these new systems, operating on short distances, dial bus is the most used in Italy. This system carries out a service which is halfway between a traditional bus and a taxi: it is a “door to door” transport system based on phone call. Users communicate departure and destination points to a call-centre. A computerised system assigns vehicles for the requested service in the fastest and best way. The bus picks up the user at the fixed time and brings him to destination making the necessary detours to pick up other passengers.

The call-centre must be connected to an operative management centre which arranges in real time the trip in order to satisfy user requirements by minimizing wait and trip times: at the beginning the planning was effected manually, nowadays through specific software.

Timetables are not fixed: they are often concentrated during daily hours on working days, but it is possible to have night services too.

According to their function, dial systems must be adapted to the reality where they operate. Their flexibility allows the starting up of heterogeneous services replacing or integrating traditional ones.

In particular:

- for urban transport in large cities, suburbs or small towns;
- for extra-urban transport in rural and mountain areas or “low density lines”;
- for specific services addressed to particular users such as disabled, old people, students;
- for particular services, i.e. transport from and to railway stations, theatres, hospitals, shopping centres, airports or any other place of public importance.

The employed vehicles are usually small so that they can get into areas with an unfavourable road network; however there are cases where normal size buses are used. In order to make this service attractive for the target that normally uses private means of transport, vehicle equipment is particularly careful and accurate, much better than for traditional tyre services. They are also characterised by a technological equipment which has systems for satellite location and for communication with the service management station.

2 European projects

2.1 SAMPO e SAMPLUS

SAMPO (System for Advanced Management of Public transport Operations), later followed by SAMPLUS, was a European project about telematics applied on transport and financed within the 4th EC Program. The main purpose of SAMPO was to value the potentiality and the functionality that the application of telecom technologies could bring to transport demand services in order to improve the

public transport service both in rural and urban areas and to enhance mobility of particular users, as disabled or old people.

Testing areas were situated in 5 European Countries: Seinajoki and Tuusula-Kerva-Jarvenpaa in Finland; Hasselt in Belgium; Kilkenny region in Ireland; Florence and Campi Bisenzio in Italy; Goteborg in Sweden.

2.2 INVETE

INVETE, INtelligent in-VEHicle TErMinal for multi-modal flexible collective transport services, is a European co-operation project aiming at design, implementation and demonstration of an innovative In-Vehicle Terminal (IVT) for different transport modes, including regular Public Transport, Demand Responsive Transport, door-to-door special services, shared taxis. INVETE take into account interoperability issues by providing a modular, multi-service IVT able to operate in different Intelligent Transport Systems environments (AVL/AVM, GSM, Private Radio Network,...).

INVETE will validate the achieved end products through real-life demonstration projects in two sites in Italy and Finland, and by through a study developed in Belgium.

The evolution of modern transport systems - particularly the progressive development of flexible, Demand Responsive Transport services - is creating the needs for modular, adaptable and multi-service IVTs. The terminals currently available on the market are standalone and do not fulfil the different needs of flexible services.

Furthermore, the increased use of telematics in collective transport vehicles results in a wide variety of devices and displays, which has a negative effect on the behaviour of the driver, on operation management and on maintenance.

The INVETE project addresses these basic needs designing, developing and field testing an innovative IVT based on identified user needs.

Specifically, the INVETE IVT:

- provides a platform for in-vehicle information management and services in a number of different collective transport service modes, including regular, line-based public transport services, demand-responsive bus services, individual and shared taxi services;
- supports multiple system and communication environments;
- can be integrated and interoperable with other on-board telematics equipment;
- is modular and open to allow easy integration of additional and future applications.

2.3 FAMS

FAMS project started in May 2002 as a consequence of the results and experience of preceding European projects (Sampo, Samplus, Invete): the active services obtained a great success, but they still remain isolated experiences of the complex and variegated transport chain.

Actually DRT Systems are often directly managed by a single operator (the Transport Company) which uses only one transport scheme connected with the conventional transport net and does not use any integration level with other collective conventional transport services working on the same area and/or managed from other transport operators.

These experiences show that it can be possible to extend DRT concepts and models in order to cover the set of dial-services, starting from technological instruments already existing and integrating them with rising services such as e-commerce and e-business.

The creation of an "Agency" considered as a centre for booking, coordination and management of intermediate services, seems also prospectively possible according to the recent new regulations and laws about public local transport. They actually provide a transport service liberalisation, leaving though unsolved questions such as the service level to be offered in "weak situations" (both with regard to demand and to social-economic and territorial peculiarities), where a transport service with fixed timetable and fixed itineraries is not possible.

The results of DRT experiences demonstrate that information technologies and telecommunications, supplemented with e-work tools and with e-commerce services, can be decisive factors both to give users easy service accessibility (especially in the link between users and management / distribution service centre) and to achieve an efficient operative service coordination (optimisation of the itinerary-planning, integration of the different vehicle typologies to be used, coordination of different operators, and so on).

FAMS involves two trial sites: the first in Italy (urban area of Florence) and the second in Scotland (Angus region).

This project is coordinated by ATAF (Azienda Trasporti Area Fiorentina) and has started in March 2002: it foresees 20 months with the first results in May 2002.

3 Italian applications

3.1 PersonalBus ATAF Florence

ATAF dial service experience started in 1995 with the creation of a disabled people service: it was made up by 5 buses on the all road-network of Florence with a timetable from 7.00 AM to 8.00 PM. and a demand system which replaced the traditional line service in the zone of Porta Romana. They were both managed by hand.

In June 1997, a new service, called PersonalBus, was introduced in the town of Campi Bisenzio.

It was gradually extended until it covered the complete town area in September 1998, reaching 185 bus stops. So, Campi Bisenzio has become one of the first European realities where all the town area is served by a public transport service, totally organised by a demand system.

Softeco Sismat S.p.A. of Genova carried out the homonymous software product for the management service. It is a tool which helps operators during the programming of dynamic trips without fixed limited timetable, with available vehicle at bus stops only if necessary and with no trip bounds: the original and

destination bus stops, departure and destination timetables and the trip itself are all determined by users request.

Vehicles have an apparatus for the flow monitoring and localisation and they use a private radio-net, GSM or GPRS for the messaging management with the driver.

During the different realization stages of the project, a continuous analysis has been performed about the service trend: the system development has been encouraged and stimulated by positive results.

In particular, on one hand, a valuation of the covered km and of passengers has been made, on the other hand passengers and citizens have been interviewed in order to value the estimation of real and potential users about this kind of service. Uniform increase of passengers and general users satisfaction for this service have been recorded.

The development and success of this kind of service have been favoured by regional urbanisation,

characterised by residential and industrial expansion, as a consequence of correct town planning particularly suited for demand services.

Since 2000, ATAF has introduced this service in other towns of the Florentine urban area: in Scandicci (an industrial town in Florence peripheral area which has 50 thousand inhabitants), demand service has been introduced in order to replace a traditional bus line from Scandicci to the hamlets of Badia a Settimo and San Colombano. This new service has got trips all defined from user requests; in Calenzano and Sesto Fiorentino (two towns in the north peripheral area of Florence on the border with the province of Prato), two particular services have been activated : the user demand causes the “detour” of the fixed bus run.

ATAF manages requests and coordination of resources (vehicles and drivers) placed by other transport Companies of the Florentine urban area: Li-nea, a private Company, carries out the service in the town of Porta Romana Scandicci e Sesto Fiorentino and CAP, the public transport company of Prato carries out the service in Calenzano.

3.2 RadioBus ATM Milano

In 2001 ATM (Azienda Trasporti Milanesi), has introduced a personalized DRTS which is accessible through booking service, called RadioBus. It allows users to be picked up at home and to be taken where they want without waiting in the central zone of Milan (San Babila, Cordusio, Porta Lodovica, Famagosta, Barona, San Siro e Fiera).

Reservations must be made with a phone call to a ATM calling centre, soon also by the

Internet, both some days before the travel and immediately before it.

To use the RadioBus service, passengers must have a normal travel document with a specific additional charge or pay the complete fare on the bus.

RadioBus was born in order to guarantee much more safety to people who live in peripheral areas but desire to move during the night. Nowadays it is active only from 21.00 p.m. to 2.00 a.m.

Vehicles are carriages only 7 metres long, air-conditioned, with 16 seats, space for disabled people and a telecom system for routing.

The innovation, compared with other European and Italian experimentations in other towns, is just that vehicles itineraries are established through GPS satellite system which chooses every time the fastest run.

Technical characteristics of the RadioBus control and management telecom system allow:

- to guarantee radio conversation with the driver;
- to localise the vehicle using a GPS satellite system;
- to book a trip by a single consumer;
- to work out in real time the optimised bus trip, considering the already made reservations;
- to transfer trip information to the driver using a special video interface which is continuously updated in real time;
- to communicate passengers the time when they will be picked up, with 5 minutes leeway.

The initiative is quite all projected by the Milanese Company which invested 14 billion in this project. The experimental phase has lasted six months and this service has obtained so much success that it has been extended to other next peripheral areas.

3.3 StradiBus province of Cremona

In order to call for biddings for transportation services assignment, Province of Cremona has completely re-examined the provincial service network, advancing project hypothesis for the service offer rationalisation and to find solutions for low mobility demand areas. This is the reason why Province of Cremona has found the Demand Bus as the most suitable service.

The StradiBus, the bus of Stradivari land, is a small vehicle with only 25 seats that will replace the line bus during the soft low demand hours of the day.

The purpose is to divert users from private to public transportation, in particular for the internal mobility among the most important towns of the Province (Castelleone, Soresina, Pizzighettone, Formigara, Piadena) and to give a DTR System to these areas which nowadays have no traditional transport service and also, to integrate and to supply alternatives to the rail service.

The Provincial Council for transportation thinks that it's a social duty to guarantee services looking at the request that is becoming more and more personalised and based on the principle of sustainable mobility.

It does not make sense to have enormous buses which travel without passengers; it is right to introduce a differentiated offer. The service has to reconcile a rational use of resources with the offer wide spreading by intercepting the most potential users.

It is a highly innovative service for which important efforts on communication will be done, so that people get accustomed to the idea that it is possible to "wait" for a bus, but, if you want, it is possible to "call" it too. The Provincial Council for transportation is encouraged by the positive consensus obtained by the

interested towns and by the results that this kind of service has already obtained in other places.

3.4 ProntoBus ATC Bologna

A.T.C. (Azienda Trasporti Consorziali) of Bologna manages the ProntoBus linking up towns on the extra-urban lines of plain with the Bentivoglio hospital with the aim of improving links between hamlets and chief towns. The existing rail interchanges with the trains from and to Bologna have been kept (the so called Ferrobuss service) and better link possibilities with Bologna, also thanks to the interchange with suburban lines, have been introduced.

Prontobus ATC network is made up by 7 lines and each one has hourly trips every working day, except August. With a phone call at the ATC call centre it is possible to book the trip: it must be made at least 30 minutes before the departure at the bus stop and there are no additional costs, only the price of the phone call.

During the booking, users must supply information about: the line number, departure and destination bus stop, timetable departure and run number, how many people have to be carried and possible other days when transport must be done. Users must also give their telephone number: it is a necessary precaution both to inform about possible service anomalies and to reject false reservations.

The bus run leaves only if it is booked, but the bus can also pick up passengers without reservation who are waiting at the bus stops.

The service is implemented by minibuses with 16 seats and the ticket costs is a normal extra-urban transport line ticket. There is an additional charge for people who buy the ticket on the bus.

3.5 DrinBus AMT Genova

In April 2002, AMT (Azienda Mobilità e Trasporti) of Genova presented a testing dial-bus service called DrinBus. It is active in two town areas (Pegli and Quinto) where traditional buses cannot travel.

It is a service flexible both in time (every working day from 7.00 p.m. to 8.00 p.m.) and in space, so that it is possible to personalise it: users choose departure and destination of their moving within appropriately fixed bus stops of their zone; they decide departure or arrival time and book their run with a free phone call at the call-centre.

The booking confirmation will be immediate in the case when the trip is on the same day of the confirmation. Otherwise, the trip is confirmed by a phone call the day before it. It is possible to use this service also without reservation, but only if free seats are still available and according to the planned itinerary.

For this kind of service it is possible to use tickets of the urban network supplemented by an additional charge. A ticket lasts all day long starting from the time stamping and it is possible to buy it on the bus.

Minibuses are used equipped with 8 seats and utilities that improve their comfort (for example air-conditioning system), and are easily recognised from the outside. For environmental issues methane traction is used that guarantees low pollution.

During the first months, this transportation system has registered good levels of use and users satisfaction; some changes have been made in order to extend bus stops also in areas which are not served yet.

4 Conclusions

Demand Responsive Transport Systems can represent the ideal answer to mobility request in areas with low population density or with difficult infrastructural access.

The success of these systems is due to the following factors:

- adaptability to users requirements about timetables and itineraries;
- flexibility of vehicle fleet management, which permits drive-staff saving;
- Application of new technologies for vehicle localisation, service planning in real time and information transmission from and to the vehicles themselves;
- choice of the best DTRS mode to match demand;
- integration with traditional transport systems;
- service competitiveness as comfort and cheapness compared with public and private means.

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