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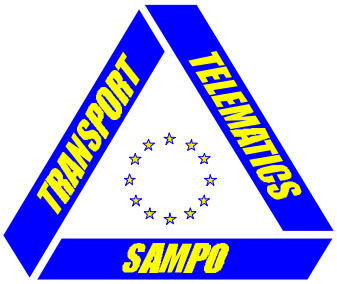

Recommendations concerning the market, operation, organisation and business case of DRTS

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Title	**Recommendations concerning the market, operation, organisation and business case of DRTS**
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EXECUTIVE SUMMARY

The Deliverable D9 has been developed as strategic guide for the implementation of Demand Responsive Transport (DRT) with particular emphasis placed upon the use of Intelligent Transport Systems (ITS) for technical support and management. The issues reported here are based on the experiences and results received during the SAMPO project.

D9 is not a summary of the previous SAMPO work packages and deliverables but a document giving general recommendations and suggestions. Detailed information concerning SAMPO can be found in previous deliverables and are not reported in D9:

- D3 reports the user needs
- D4 reports the systems architecture and functional specifications
- D5 reports the technical issues of SAMPO
- D6 reports the verification process and results
- D7 describes the demonstrations in the SAMPO sites
- D8 reports the evaluation plan
- D8.2 reports the results of the evaluation

During the D9 development process the comments from the Peer Reviewers have been taken into account and thus valuable opinions from the Peer Review Reports have been added to D9.

In DRT the passengers book their trips in advance from the Travel Dispatch Centre (TDC). The transport service is planned and provided based on the passengers' needs. In SAMPO the following concepts have been tested:

- partially predefined timetable and route with deviations to predefined stops
- stops in a region (predefined stops on demand)
- points in a region (door-to-door)

The main SAMPO test-sites are located in four European Union Member States:

- Belgium (Flanders)
- Finland (Town of Seinäjoki and Keski-Uusimaa area)
- Italy (Florence and Campi)
- Sweden (City of Gothenburg)

These sites were selected to represent different kind DRT environments; rural, urban, special user categories, single mode, multi-modal etc. In addition Kilkenny in Ireland is a contributing site. UK has participated the work by providing external horizontal specialists for the project.

The SAMPO project started in the beginning of 1996. SAMPO is an acronym for '**S**ystems for the **A**dvanced **M**anagement of **P**ublic transport **O**perations'. The aim of the project is to assess the potential and effectiveness of the use of ITS technologies for the implementation and operation of DRT services. The focus of the project has been upon the use of ITS, but SAMPO has also considered transport policy and institutional, organisational and juridical issues, all of which have im-

portant implications in the implementation of any telematics-based DRT Service. One of the key issues in DRT is the flexible booking and dispatching service, which in SAMPO has been arranged by the establishing Travel Dispatch Centres (TDC), using appropriate telematics to provide the services.

The results of SAMPO show that DRT and related telematics applications and technologies are accepted by dispatchers, operators and end-users. The telematics system works and helps to integrate the demand and supply of transport services. DRT can be profitable concept with reasonable patronage levels.

Chapter 1 of this deliverable provides an introduction to the deliverable. It gives an overview of the activities carried out during the WP09, General Conclusions and Recommendations and reports the main objectives of the SAMPO project. DRT and related telematics.

Chapter 2 describes the transport context and outlines the challenges faced by society which can potentially be met by DRT. These challenges are common not only to the countries involved, but also to other countries across Europe. It also describes the link between mobility and transport services, the need for additional transport supply, the role of DRT supply and challenges in providing DRT.

Chapter 3 reports key results and findings from the SAMPO project providing an overview of organisational barriers and institutional issues involved in the implementation of DRT services. In addition, this section reports upon user acceptance of the technologies used in the SAMPO demonstrations. It also discusses implementation issues and the business case for telematics-based DRT. For these issues the analysis covers what is critical/essential, what works, what is risky, what barriers are faced etc.

Chapter 4 describes the impacts of DRT and ITS on different actors including local authorities, public transport operators and special interest groups.

Chapter 5 reports upon future actions identified as a result of the SAMPO project related to further demonstrations of technical, organisational and operational ideas, overcoming risks and barriers, dissemination, industry awareness and training and support. DRT works well but those who start to develop the new concept need some advice and instructions in the development work. For this reason

Chapter 6 provides a checklist of recommended actions for the development work involved in implementation of telematics-based DRT services.

Chapter 7 summarises the conclusions and recommendations resulting from the SAMPO project.

It is obvious that demand responsive concept has enormous potential in Europe and also outside Europe. However to make DRT to work profitably a lot of marketing, training etc. must be given and arranged. Based on the evaluation results of SAMPO, people have taken DRT mainly positively. For those people who had

not used DRT services the main not to use was the lack of information, they did not know enough of the new DRT service concept.

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GLOSSARY OF TERMS

Acronym	Meaning	Explanation
AVL	Automatic Vehicle Location	Vehicle location that happens automatically with the help telematics tools
DRT	Demand Responsive Transport	Transport services that are offered to the customer based on their individual needs, using a central dispatching system and providing services with flexible routes, route deviations etc.
GIS	Geographical Information System	
GPS	Global Positioning System	Satellite based positioning system
GSM	Global System for Mobile communication	Mobile phone system, ETSI standard for mobile phones
HMI	Human Machine Interface	The human-machine interaction mechanism including the set of inputs, outputs and dialogue procedures
ITS	Intelligent Transport System	A group of techniques, using information technology and telecommunications in vehicle and infrastructure, supporting or performing services intended to improve transportation from the point of view of safety, efficiency, comfort and environment
OBU	On-Board Unit	In vehicle equipment; on board computers etc.
POI	Point Of Interest	
TDC	Travel Dispatch Centre	Dispatch centre with a central dispatching system and integrating the demand and supply of DRT services objectively based on the passengers' needs.

1. INTRODUCTION

Chapter 1 presents the SAMPO project and its objectives, the countries and contributors and the work carried out within the scope of SAMPO.

In EU Member States there are over 300,000 buses on inter-urban, local and rural market, an even greater number of taxis, and a potential telematics market over 3.0 Billion ECU in the period to the year 2005. There has, however, been very little investment in intelligent transport systems (ITS) in this sector so far. The SAMPO project addresses many issues related to the sector. SAMPO started its work in the beginning of 1996

Demand Responsive Transport (DRT) services are transport services that are offered to the customer based on their individual needs, using a central dispatching system and providing services with flexible routes, route deviations etc.

The importance of SAMPO and DRT services can be seen especially for those living in the areas where there are no proper conventional public transport services available, where there is a threat of losing or decreasing public transport services for some reason (for instance because of the lack of funding) or where there is a need for a special kind of public transport service for special user categories, such as the disabled and the elderly. As stated for instance in the European Commission's Green Paper on Citizens' Networks the public transport services must be designed also to be accessible for those millions of European citizens who have to deal, permanently or for some period of their lives, with reduced mobility and who are dependant on the public transport services

There may be no other way to provide such services for the citizens in the future but by developing new solutions and service concepts like DRT. The fact is that these new concepts cannot be created without advanced telematics systems. That is the core issue in the SAMPO project..

The results of SAMPO show that DRT and related telematics applications and technologies are accepted by dispatchers, operators and end-users. The telematics DRT system works and helps to integrate the demand and supply of transport services. DRT can be profitable concept with reasonable patronage levels and fares. This has been noticed in the SAMPO demonstrations.

In SAMPO organisations from five different countries; Belgium, Finland, Ireland, Italy and Sweden have studied the needs of the different user cate-

gories, developed solutions for advanced transport telematics in DRT, verified these systems, implemented and demonstrated them in the test-sites and evaluated the results of the demonstration test. UK has also participated the evaluation work and horizontal activities.

The institutional and administrative issues and problems are to be addressed, when creating new public transport service concepts and related telematics, especially in the multi-modal and multi-operator environment. These issues are often much more difficult to overcome than technological challenges, however SAMPO has been a telematics project and thus concentrated mostly on ITS.

In the SAMPO project it has become clear that telematics applications cannot be developed without taking into account the surrounding world and especially:

- national and European level transport policy
- institutional and administrative issues
- organisational aspects and barriers
- legislative issues
- needs of the various user categories

During the SAMPO project it has become obvious that there are some important issues to be taken into account in the development of DRT services and related telematics. Those may be summarised as follows:

- the development work should be based on the EU, national and local transport policy and strategy, in some cases there will be a need to develop national transport policy and strategy for public transport
- all the parties in the development work should be committed, willing and allowed to co-operate, especially in the multi-operator environment
- the organisational barriers are often bigger than technological barriers, a lot of preliminary work and negotiations are needed with all the parties involved (authorities, transport operators, technology providers etc.) in good time before introducing the new concepts
- in some cases the existing legislative framework may prevent the realisation of all ideas related to the DRT, the existing regulations are to be respected, but there has to be possibility to re-evaluate the existing regulations, if/when needed
- DRT and related telematics have to be integrated with the existing service concepts and telematics systems, there is a need for standardised solutions and applications with open interfaces and a high degree of interoperability
- the importance of informing, teaching, training and marketing should never be underestimated

One of the key issues in DRT is the flexible booking and dispatching service, which in SAMPO has been arranged by the Travel Dispatch Centres TDC), using appropriate telematics to provide the services. The telematics tools to be used in DRT operations and services are e.g.:

- communication structure and services for voice, data and standard or short messages
- vehicle location and monitoring hardware and software
- network design and optimisation
- static and dynamic scheduling
- automated booking and trip notification systems
- dynamic systems for management and optimisation of DRT
- smart card technology for payment and passenger travel permit validation
- systems and equipment for passenger information inquiry and display
- information management and data analysis systems
- on-board computers

The work in SAMPO has been carried out by highly respected authorities (municipalities, provinces, ministries), public transport associations (bus and taxi sector) and operators, technology providers (hardware and software), universities, telematics consultants and engineers etc. from all the participating countries. The users have also been involved in the process.

2. THE TRANSPORT CONTEXT AND CHALLENGE

Chapter 2 describes transport context and the challenges for the future development of DRT. It shortly describes:

- **the link between demand for mobility and supply of transport services**
- **the need for additional transport supply**
- **the role for DRT Supply**
- **challenges in providing DRT**

2.1. The link between demand for mobility and supply of transport services

Public transport services are needed at all levels of society to allow people to participate in their communities and beyond. Europe has experienced substantial change in patterns of urban and regional development, of employment, and of shopping and leisure. Linked to this are evolving family and societal structures.

The support services of the communities, including transport, have also evolved. For some citizens, the changes in the transport services have been quite sufficient. Either they have access to personal transport for their travel needs, or they are in an area where mass transit or collective transport supply meets their mobility needs.

Still, many citizens find their mobility severely reduced because they do not have access to adequate transportation systems with reasonable costs. This can be for a number of reasons, of which the most noticeable are:

- not having access to a car
- available services on low density areas are of low frequency or do not serve where the citizens need to go because low density of population makes services non-viable and too expensive
- available services are of low frequency, or don't serve where the citizens need to go
- age or disability restricts their ability to use available services
- lack of integration with other transport services
- concerns about safety and/or personal security

The lack of adequate transport services means that citizens do not fully participate in their community, or that they face major barriers to do so. As a result, not only does the citizen suffer disadvantage, but also rural com-

munities are faced with difficulty in retaining population and competitiveness. Their daily activities are dependent on private cars. Urban areas on the other hand are unable to maximise the mode shift from private cars to public transport.

2.2. The need for additional transport supply

Many areas in Europe already have well structured transport supplies. In urban areas, this can include heavy and light rail systems, metro, trams, ferries and scheduled bus services. In rural areas, inter-urban and local scheduled buses, long-haul rail services and local taxis provide the collective transport supply.

However, there are also areas which do not have adequate transportation services. This is experienced in three main ways :

1. The general transport supply is insufficient for the citizens, normally because of insufficient business to support conventional services at local, regional and national levels. This usually means low frequency and inefficient services on perhaps just one route. Across the EU, the level of affordable supply usually relates to the national or regional policy towards financial support and subsidies.

2. Certain citizen groups (such as elderly and disabled) are unable to reach and use the general transport supply. This is either because of unsuitable vehicles and equipment, or unsuitable destinations.

3. Public and private operators and modes compliment each other in the supply of services. They also compete against each other. This competition has two levels; the passengers and the public funding. When there are too few passengers, the need for available funding is crucial for the operators. However the public and private operators are not always treated equally.

In cases of type 1. there is a need for innovative transport services which can achieve relative viability. For cases of type 2. there is a clear need for additional transportation supply to complement the existing modes. Cases of type 3 present more dramatic problems and do not support the spirit of fair competition.

2.3. The role for DRT Supply

DRT Services meet these needs of users for additional transport supply. The use of flexible transport services, where routes, departure times, vehicles and even operators, can be matched to the identified demand allows a more user-oriented approach to transport supply.

Normally, DRT plays a complementary role to the existing transport supply. The services can be offered through a range of vehicles including :
regular service bus:

- mini- or midi-bus
- maxi-taxis
- buses and taxis adapted for special needs
- taxis

The ability to adapt the transport service to the actual demand allows cost savings to the operator, greater flexibility to the user, wider range of destinations, and increased opportunity for mode shift. However, effective DRT systems need effective support, both in terms of the operations, and in terms of integration with other transport supply.

DRT normally has a limited range of operation, and it is therefore more cost-effective to transfer users to other fixed-route vehicles for the longer sections of the journey. Thus they can play a valuable feeder and distribution role, as well as the primary local service role.

As mentioned earlier DRT is particularly important for those living where there are no proper public transport services available, where there is a threat of losing or decreasing public transport services for some reason (for instance because of the lack of funding) or where there is a need for a special kind of public transport service for special user categories. The growing number of disabled and elderly people should be offered proper transport services in the future both in urban and rural areas. The services should be seamless and integrated so that the users have access and can use transport services easily and comfortably.

2.4. *Challenges in providing DRT*

Although DRT systems have considerable potential, it must be remembered that they are usually introduced in areas or low demand periods which have been unable to support conventional services (at least within acceptable financial support levels). Thus, the design and operation must be done carefully. This also applies the use of telematics.

The SAMPO project examined the user, industry, authority and community needs through an intensive User Needs Analysis in Deliverable 3 (Finn et al., 1996). This identified the key challenges to be faced in providing a successful DRT system, which effectively requires balancing the needs of the different interest parties. The critical needs are :

End-Users	***Operators***	***Authorities***
• reliable transport service • range of destinations • known pick-up time/place • easy booking procedure • ability to book return trip • information about delays • facilities for special needs • connection to other services • reasonable pricing structure	• viable services • efficient dispatch centre • dependable technologies • clear pick-up and/or set-down orders • framework for participation • integration with other modes • develop new markets • ability to accept also non-booked passengers • short market build-up time	• maximum mobility for given support budget • cost efficiencies in service provision • safety and quality of transport supply • open and fair framework for transport supply • mobility for disabled and elderly • population retention and rural redevelopment

Table 1: The critical needs of different user categories

The User Needs are considered in more detail in Annex C.

3. KEY FINDINGS

Chapter 3 reports the key findings of the SAMPO project. These findings can be categorised into the following issues:

- **institutional and organisational**
- **operational**
- **technical/technology**
- **business case**
- **user acceptance**
- **implementation**

For each of these issues the following analysis have been made:

- **what is critical/essential**
- **what works, good practice**
- **guidelines**
- **what's risky, or has failed**
- **what barriers are faced**

3.1. The institutional and organisational issues

The SAMPO project found out that there are different kinds of institutional frameworks and issues affecting the development of DRT concepts and related telematics. Obviously DRT will offer a good tool for the future, if the institutional issues and especially barriers are taken into account.

Legal framework and national transport policy

From the institutional point of view it is important that EU legislation is respected in national legislation. The development work of DRT should be based on the legislative guidelines. On the other hand the legal framework of regulations should, if possible, be developed so that DRT could be offered to the users effectively.

In each Member State there needs to be a national transport policy and strategy, following the framework given by the Common European Transport Policy. The national development of transport policy and strategies should be respected in the development work of all public transport modes, also integrated DRT services. Transport policy should take into account the policies of other agencies and authorities for whom transportation is essentials for achieving their objectives.

At an institutional level, the main need is a normative law. On the one hand it should aim at grouping the different resources currently spent by different

sectors for this kind of services and on the other hand it at setting up an agency which could manage the services in co-operated manner and could co-ordinate the different operators/providers.

Legislative issues have to be taken into account when arranging the organisational issues and eliminating barriers. Existing legislation is to be respected and abided by. However, potential changes to the legislation may be suggested, when needed. This is especially the case, if the national legislation violates the European level legislation. On the other hand, when technologies develop, there may/will be pressure to change the regulations to meet the new opportunities and challenges.

Developing DRT services is an institutional challenge in cases where different authorities have jurisdiction over their own type of tax-subsidised transport service. The public transport system may well be for example its own entity with its own board and budget while special transport services for the disabled and the elderly or medical transport may be run by their own entities. School transport and special school transport for mentally retarded children are often also separate entities. The lack of co-ordination makes it difficult to provide an efficient service.

For these reasons the Swedish government in 1995 for instance proposed to mandate legislation for such co-ordination and in October 1997 the parliament enacted a new law to encourage voluntary co-ordination by substantial financial incentives. A total of about 160 MECU will be available for 50 % matching of investments which supports co-ordination and improves accessibility in the public transport and special transport sectors. The funding will be available over a five year period and can be used for purchase of accessible vehicles (such as low floor mini-buses) or for establishing TDC and various telematics applications.

Partnerships, co-operation and monopolies

Based on general trends and experiences from previous projects it may be suggested that very strong public-private partnerships should be used in the development work. Of course the partnerships have to be carefully planned and there should be common rules for co-operation.

It is to be remembered that there needs to be fair competition in the field of public transport, including DRT. The monopolies with subsidies should be carefully considered. It should be guaranteed that all public transport modes could participate the development work and running the DRT services on equal terms. DRT must not favour any transport mode or organisation. The municipal and regional decision making processes and co-operation could and should be developed so that the municipal and regional borders do not prevent the development work and implementation of DRT.

Organisational issues

In the development phase of DRT and related telematics there should be a strong and clear leader organisation (preferably a detached organisation) to keep the development work under control. All the public transport modes should participate in the development work and running of the demand responsive services. Issues related to technology and to the needs of various user categories have to be taken into account at the earliest possible stage.
The organisational arrangements are very important, when developing working concepts for DRT. Since there are many stake holders and organisations involved in the planning, development and operational aspects of DRT it is necessary to set up dedicated organisations for implementing these services. If only one authority can be made responsible for all types of transport (where society partly or in full subsidises the operations), implementing DRT will be easier.

When many authorities still are responsible for various aspects of DRT there is a need for an umbrella organisation, an integrated service provider, with a joint steering committee for all stake holders. This organisation would be responsible for all the implementation aspects and could be housed in the facilities of one of the stake holders or be totally separate from those. Another alternative is to procure this whole service provider function on a competitive basis.

The contractual issues related to the DRT services/operation and the use/development of telematics should be agreed upon and developed in good time before the service starts. This has proved to be very important since there are a lot of things to be done before the service starts such as training and education, equipment installations, marketing etc. that cannot be done properly before the contractual issues have been taken care of. There must be accepted rules for all participants to abide by. The more operators and other actors are involved the more important these rules become.

With regard to the relationship between the service and the telematics applications, it is clear that telematics cannot be developed separately from the surrounding world i.e. without the negotiations with organisations participating in the public transport activities. Open discussion is needed.

The organisations involved must also negotiate and inform each other of their plans. In the multi-operator, multi-modal environment the importance of open information exchange is extremely important.

Based on the experiences and international trends it can be stated that public-private partnerships are very important for the successful development work of DRT. Obviously, DRT also needs political support and acceptance.

Travel Dispatch Centres (TDC)

Since the TDCs are new actors in the field of public transport, their role is to be further examined and developed. This is important especially, where DRT are being offered to the users in a multi-operator, multi-modal environment. The TDC must be an impartial unit to co-ordinate the demand and supply of the transport services.

TDCs are the 'dynamos' of the DRT. They co-ordinate and integrate the supply and demand of public transport services. This presents a challenge to TDCs. Thus it is important that the role and authorisation of TDCs be defined properly in advance.

As the integration of different public transport modes with the help of TDCs is essential for DRT, the formal and informal barriers and obstacles violating effective co-operation should be identified, discussed and removed before DRT is introduced. The role of the *dispatch* centres could be further developed so that they would, at least in some cases, be more like *co-ordination* centres.

The service provider may house the TDC functions and then purchase the actual traffic service from private operators. But it can also procure the TDC functions from one or several suitable vendors (e.g. taxi or bus companies) who already have staff available at a call centre.

Wide scale DRT is very difficult to provide if there are barriers preventing effective co-operation between operators, municipal authorities etc. Based on the experiences from the SAMPO project it can be said that the regional co-operation between municipalities should be encouraged. This may, however, be rather difficult in cases, where municipalities are rather independent in their decision making and where the municipal democracy is strong and the economic situation is rather weak. In these cases the municipalities are not always interested in using their municipal budgets to support regional services.

As stated earlier, operational monopolies, if such exist, should be given careful consideration. Fair competition should be encouraged, no operator should be subsidised to help it compete against other operators.

3.2. Operational issues

Co-operation and co-ordination

The general mobility problems to be faced in European towns, cities and metropolitan areas need a new approach based on co-operation and co-ordination of the different initiatives carried out by each transport service provider (public or private) operating on the same network. The new general objective of the national authorities could be the realisation of a flexible network of public, private and no-profit operators (providers) which act in

co-ordinated manner to optimise resources (currently very low) and at the same time provide effective solutions to the citizens' transport needs.

Integration of DRT and fixed line services

DRT and existing fixed line services should be integrated so that they can co-operate. There should not be major overlapping in the services. The end-users should experience a seamless public transport. From the DRT point of view those areas that do not have existing public transport services have more potential for piloting purposes. DRT software should address the issue of timed transfers at interchange points.

Rules for service provision

From the operational point of view the most important precondition for DRT is that service to the customer is guaranteed and delivered quickly as agreed. This of course requires effective telematics tools. The passenger is not interested, in the technicalities of the concept or what kind of telematics is being used. The only thing that matters is the service and good operation of DTR services.

This means that there have to be clear rules for the service provision. For instance in the multi-modal and multi-operator environment the rules for allocating vehicles to the routes etc. have to be planned carefully in advance so that TDC can offer proper and fair services impartially both from the operators' and passengers' point of views.

Dispatchers and drivers

The dispatchers in TDC and the drivers of the vehicles have to be trained well in advance to understand the service concept, its interfaces and links with the other public transport services, the equipment needed and the use of the telematics applications. For instance taxi drivers are used to telematics, but the equipment and applications differ somewhat from what they are used to. This may cause unintentional misuse of the system. There are also drivers who have never used telematics before and the need for training is obvious. It is also necessary to clearly specify the detailed requirements for a driver profile e.g. service minded, calm and friendly with the customers, but perhaps also technical skills if the DRT service includes telematics functions with a PC in the vehicle.

The dispatchers have normally used ADP applications and telematics before. However, in the SAMPO project there were also dispatchers who had not used computers before. This kind of user needs time to get acquainted with the dispatching system. The human machine interface (HMI) has to be user friendly. In this sense there is still room for improvement of TDC applications.

The dispatchers should familiarise themselves with the operating area and get to know the drivers personally, if possible. This means that the dispatchers should regularly visit the operational area. If the operating areas are big, it may be difficult to learn to know them properly. One solution is to provide very good geographical information system (GIS) to guide the passengers in the booking procedure. The dispatchers should also use the DRT vehicles and get to know their suitability for transporting users with special requirements etc.

The drivers should visit the dispatch centre and get to know the dispatchers. They could also familiarise themselves with the idea of the dispatching system and its use. These kind of visits proved to be very successful during the demonstration period. It is also useful to invite drivers and dispatchers to meetings and sessions to clarify relevant issues.

Informing, marketing and training

To ensure that the concept is accepted and utilised, the end-users of the service must be informed regularly and in advance. They have to be informed of the new concept through the media and seminars, informal events etc.

Marketing is extremely important when implementing a new service. This can sometimes be frustrating in a demonstration context, since you want the technology to be very reliable before you go out with heavy promotion. If you promise much more than you can deliver there will be a back lash and it will be difficult to regain customer confidence. The issue of proper verification is extremely important. However the demonstrations have shown that pilots can also be attractive and benefit the customers.

The contracts of the DRT service between authorities and operators have to be negotiated in time so that the operators can be prepared for future changes. It is not only question of starting the service and driving the vehicles. There is a lot of preparatory work to be done.

The drivers have to be chosen and trained, the vehicles have to be equipped with on-board units, the meeting points have to be marked, leaflets and brochures have to be printed and distributed to the end-users etc. The chosen drivers should be service oriented with training for special user categories.

Time-table management

During the SAMPO project it became clear that time-table management (in real time) is an enormous challenge in multi-modal and multi-operator environment and it should be investigated and developed as a separate project. SAMPO could not concentrate on this issue. However, it was noted that the maintenance of the time-table information requires a lot of work, if all existing regular services and connections are included in the time-table

data-base. There is a need to investigate this issue thoroughly, but it cannot be done within the SAMPO project time scale.

Bookings

When DRT is firstly introduced, the end-users have not been used to making bookings by telephone when using public transport services. This is particularly noticeable in the cases, where the passengers have to communicate with the dispatchers and give them information concerning the service they wish to have. The evaluation results show that the advance reservation has often caused the major negative attitudes among users. There is a need to provide proper information, train and change the attitudes of the passengers. It may feel complicated to make a telephone call, especially for the disabled and the elderly. New methods for booking are needed. For instance booking automates in public places, where one could order the return trip using smart cards or magnetic cards, would be interesting to further develop.

During the project it was also found out that Internet offers new possibilities for booking and additional information. In addition to booking information Internet could be very helpful in describing how DRT system works. There are several ideas that could be carried out by using Internet in DRT services.

Fares

The fare the passenger has to pay for the demand responsive trip should be reasonable, but in several cases higher than for normal public transport. The passenger should understand that he/she is paying a little bit more for much more.

On the other for instance in Belgium the DRT services are a part of the total public transport concept and the fare is the same as in conventional public transport. DRT is introduced in many cases to replace former classic and inefficient services. The fare has been kept the same since people have no alternative for former public transport services that have abandoned.

Voluntariness

It has become also clear that the needs of special user categories must be taken into account and respected. These categories should not be forced to use the service at all, if their needs and wishes are not respected. If the special groups whose trips are paid by society feel that they are forced to use the services, their attitudes to DRT will be most likely negative. Motivation to utilise the services should be derived from positive changes. This has been experienced for instance in Sweden where good service and friendly drivers caused voluntarily choose of DRT service.

Stops, meeting points and positioning

From the operational point of view the target of DRT should be the best possible service with optimal resources and effective co-operation. Short walking distances to the stops and/or meeting points favour disabled and elderly. Therefore adequate number of bus stops need to be provided.

Vehicles

Experiences from the SAMPO sites where there has been special emphasis on service for the disabled and elderly show that the vehicles used are a significant element of DRT. There is a need for vehicles that are specially designed for easy access of physically impaired persons e.g. low floor, proper seating, room for wheel chairs etc.

The vehicles should be designed for their operation area, the residential areas and rural areas may set different requirements for the vehicles. The driver environment should also be planned properly, when introducing telematics equipment in the vehicles.

Location

Based on the experiences from the SAMPO demonstrations it is not always easy for the passenger and/or dispatcher to define the location of the departure point and especially the destination point. This is apparent, when the operational area is large and the passenger is not totally sure where he/she exactly is going. If the dispatcher is not familiar with the DRT area, the booking may take rather long. The use of a proper GIS database will help in defining the location.

DRT initiatives should also recognise other public transport development activities and projects and be integrated with them. However, the time schedules of DRT projects should not be tied too closely with other projects since the delays in the other projects should not effect the DRT projects.

3.3. Technology issues

DRT development is very closely connected to the development of telematics and related technologies. Technology should be seen as tool for DRT. Telematics applications cannot be developed without regard to the external environment. This fact was noticed and experienced in the SAMPO project. Even though SAMPO was a telematics project, it was affected by conceptual, political and juridical issues and vice versa. However, several of the issues have been beyond the scope of SAMPO.

At a technological level the rapid and consolidated development of technologies (vehicle positioning and navigation, communication network, real time booking, optimisation modules, on-board units, dispatching software

etc.) offer a real support for realising DRT architecture. As a matter of fact to offer DRT services telematics tools are essential. The DRT architecture realised in SAMPO showed that different technological approaches can be used for giving effective answers to real-life transport needs

Generally speaking the development project of DRT should start from the non-technical matters such as institutional, organisational and legal issues. As mentioned earlier, this unfortunately could not be done in SAMPO as thoroughly as hoped, because of the tight time-schedule and lack of funding.

The SAMPO system and applications developed have been very challenging from the technological point of view, especially in the multi-modal and multi-operator environment where competing public transport operators have been involved.

The SAMPO work from the technology point of view went well considering the tight schedule. The ITS systems and applications developed worked well in most cases, and the evaluation results were good. However, the experiences show that improvements can be made and will be demanded after the users adopt the technologies as part of their every day work and the level of knowledge grows.

The DRT systems and application should be modular and based on open and scaleable architecture following the SAMPO functional specifications and guidelines defined on European level during the project. These issues were reported as a result of the WP04, 'Architecture and Functional Specifications' in Deliverable 3 (Engels et al., 1996). The open standard systems are also essential from the integration point of view.

The communication links between TDC, vehicles and other parties have to be investigated and developed thoroughly. In the SAMPO project the main technological problems were very often related to the communications. There is a need for high quality mobile data communications between TDC and the drivers. Frequent problems with shadowed areas within the Mobitex and GSM communication has raised the question 'how should communication be structured in order to best support these kinds of data intensive mobile applications?'

The off-the-self speech synthesiser is not a very good solution in delivering route information and/or other long messages. Generally speaking the mobile phones have not proved to be as good as drivers' on-board units for receiving long messages. The use of Short Message Service (SMS) should be investigated and further developed. So far the preliminary experiences of using SMS have been rather promising.

TDC utilises telematics in every day operation and thus the dispatch systems have to be reliable. The dispatchers need proper training and instructions. HMI has to be easy to learn to understand and to use. The speed of

the booking and dispatching is critical. The digital map has proved to a very useful and illustrative tool. They have to be accurate and the location of the customer has to be easy. In this sense there are still improvements to be made in the TDC systems. Additional attention should be paid to getting the street names, points of interest (POI), public and well known buildings etc. included in GIS.

In some cases the vehicle installations may cause problems, which are difficult to solve. The same installation procedures may work in the laboratory environment, but not in the vehicles in field trials. This means that vehicle installations are to be planned and done very carefully. Some unexpected and difficult-to-solve problems related to the vehicle installations were experienced in the SAMPO trials.

In some cases boarding is allowed without pre-booking. The booking may then be done by the driver in the vehicle. The bookings when boarding the vehicle take place too late in order to accommodate any trip-notification for already booked passengers near the end-terminal. Thus the driver have to figure out a suitable route to drop off the non-booked passengers without delaying any pre-booked passengers. To avoid these problems, it is important to develop simple on-line booking functions in public places, e.g. in or near the end terminals, where customers easily can book their return trips 10-15 min before departure. Then route planning can be done to also consider trip notification of already booked passengers.

It is also obvious that adequate training will eliminate several technological problems. In SAMPO there were some problems that finally were not technological, but due to lack of training and instructions. There should always be enough time for good training and practise, when introducing new technological tools for users.

It is to be remembered that SAMPO has been a pilot project and the applications and technical solutions developed have thus been pilots. The big challenge and at the same time a problem has been the fact that testing and demonstrating of new technological innovations has been carried out using real services and customers.

3.4. Business Case

It is not easy to determine the economical results of the SAMPO project on a wider scale, since it has been a pilot/demonstration project. Before-after situation has been in some cases difficult to arrange. The demonstration period has been far too short to make comprehensive conclusions. The users are just learning to use the concept and the near future will show better the real potential of DRT. SAMPO participants estimate that at least two years of operation will be needed to make the business conclusions. However, the DRT in the demonstration phase showed that there is good economic potential in DRT, when the geographical area is chosen correctly, the infor-

mation activities are taken care of, the institutional and organisational barriers are eliminated and telematics for DRT is developed and used wisely.

SAMPO proved that the potential business is very much dependant on the patronage levels, which in some cases were very good/high in SAMPO, but then again in some places lower than expected. In some cases the customers were not used/willing to make telephone calls to order public transport trips, since normally they do not need pre-booking. On the other hand the elderly sometimes find it difficult to order/book the trip.

DRT and related telematics should be integrated with the total public transport concept so that DRT would form a complementary module for the public transport as a whole. This should be done not only within one mode or one operator but multi-modally and between several operators. Most likely this will be the future trend.

It is essential to get at least some level of authority/governmental (for instance political) support to make DRT profitable business. The support has of course be in line with EU regulations and laws.

The operational costs have in most cases been a problem when implementing DRT services. The unit costs have tended to be comparatively high and closer to those of individual than of mass transport. There is potential for increased efficiency in operations thus lower unit costs. This has in some cases been demonstrated in SAMPO even though the demonstration period was rather short and there still is a lot of work to be done along the DRT strategies. There seem to be clear indications that DRT is a cost-effective alternative as an alternative to expensive special transport services for special user categories and to replace or complement in-profitable existing public transport services.

3.5. User Acceptance

Teething problems are inevitable, when setting up a new telematics based DRT system. It is generally a new concept for operators, public transport users and TDC operators alike. However, the demonstrations and the evaluation process have shown that people have generally accepted the technologies, and found booking easy. Continuous monitoring of the systems and their acceptance by the users is essential, particularly early on in the operation of the system so that any teething problems can be ironed out.

Evaluation work done has been done in WP08 and based on the results presented in Deliverable 8.2 (Nelson et al., 1997) a short summary of user acceptance by country can be listed:

1. In the Belgium on-board survey, almost 90 percent of the customers felt that making a reservation was easy. Excellent figures were achieved for service reliability. In general, the Belgian DRT findings validate the

sound structure of the revised public transport network in the Belgian site. Inefficient existing services now provide direct and fast intercity links: local DRT initiatives take care of the lower level 'errand' traffic.

2. The Finnish behavioural evaluation of DRT in Seinäjoki and Keski-Uusimaa consisted of an on-board survey and a postal doorstep survey. The responds to a variety of attitudinal statements very positive.. However, it appears that exit and entry arrangements for the elderly need to be improved. In some cases there is a need for personal assistance when entering and/or exiting the vehicles. Most of the doorstep sample had never used SAMPO before. They cited reliance on their cars and lack of knowledge about SAMPO as the main reasons. It seems there is a need for better publicity, particularly in the Keski-Uusimaa region of Finland.

3. The Italian PersonalBus service, which provides for 40% of the Campi municipality, is much in demand since most of the respondents do not have access to a car, and work away from home. The Campi on-board survey found that the majority of the sample (55%) thought Personal-Bus was 'good'. In the on-board sample, 64% were on a pre-booked trip (via the TDC), and the TDC had a call rejection rate of just 0. 1%.

4. The Swedish FlexRoute service in Gothenburg came out very favourably in a survey of elderly and disabled users. It was rated as 'very good' by 80% of the sample. One prominent result is that the users have a great affinity with the drivers, with 89% rating the drivers as 'very

Generally the operators as users of telematics have mostly taken the trials positively and co-operatively. However, among drivers the technical problems have sometimes caused frustration, if/when they have not been solved quickly enough. The drivers should be able to trust the telematics system.

Some operators have been worried about loss of income because of DRT. On the other hand there has been a lot of support from the operators, such as investments in the new vehicles. The operators have realised that there is a need for new kinds of service concepts and they are committed to develop their business to meet the changing needs.

From the passengers point of view proper service is the key factor. There are some very satisfied users, and also those who think that the concept should be further developed.

Very often the problems that the passengers have are not related to telematics, but are due to the institutional and organisational issues or lack of proper training among the service providers. However, the end-user is not interested in the reason for poor service. If the service is not good enough, even though the reason may be elsewhere than in telematics, the user may feel that DRT is not working well and the telematics systems are useless.

On the other hand the users need adequate information, training and support. It is thus important that an extensive advertising campaign is undertaken prior to the implementation of a telematics based DRT service.

The passengers are not very used and/or willing to make telephone call orders when using public transport. The higher the telephone call fee is, the more reluctant passengers are to call. This is understandable in those test-sites where passengers are allowed to use DRT also without pre-booking. The special user categories may find it more difficult to make the telephone bookings.

Based on the evaluation results it seems that the passengers would like to have the same driver on the DRT route/trips, to offer personal level service.

The drivers and the dispatchers do not yet fully trust telematics. Sometimes there have been good reasons for this such as problems in communication. They very often lead to problems in the service.

Generally speaking the users have to feel that their opinions are taken into account, when developing DRT. Otherwise the concept will not be approved. Users do not like to be forced to use DRT. A carrot is preferable to the stick. The technological improvements must overcome such problems and restore confidence.

3.6. Implementation

There should be a thorough testing of the DRT concept before implementing it. SAMPO was piloting with real customers and end-users and this may sometimes be risky, especially, if the service concept does not work properly for one reason or another. Implementation should take place only when the verification and demonstration phases have proved that all pieces of the concept are working as they should and that they can be trusted.

Demonstration should not take place with on-off situation; the existing service should not be replaced solely by a new service concept, but there should be a gradual transfer between the service concepts. In the demonstration phase the fine tuning would be done with a limited amount of real passengers who understand that the concept is being taken into use and may cause many kinds of questions and problems to arise. Experiences from SAMPO show that this kind of approach can be successful.

Implementation should take place only when the demonstration phase has proved that all pieces of the concept are working as they should and that they can be trusted.

Demonstration phase should include enough time for marketing, training, education, maintenance and follow-up. The feedback from the actors involved should be taken into account and the necessary changes done as

soon as possible. The implementation is very challenging especially in the multi-modal and multi-operator environment.

In retrospect it can be said that the whole SAMPO project would have benefited greatly from having a substantially increased budget for specifications and development of existing and new functions and an extra year for the implementation.

The success that anyway was achieved is due to hard work on the part of the project members and the fact that the service concept in most applications is so strong that the users are willing to endure the effects of some of the technical shortcomings of the system. In other words there seems to be an enormous potential for the future

4. IMPACTS ON ACTORS

Chapter 4 describes the impacts o DRT and ITS on different actors including local authorities, public transport operators and special interest groups.

The SAMPO demonstration period was rather short making it difficult to properly assess and measure the impacts on the actors. DRT means new kind of concept and thinking for all the actors involved, for instance:

- authorities
- operators
- drivers
- passengers

In public transport, according to the operators experiences, the shortest time of testing new ideas that will result is six months and the measurable results are available after one year's time.

4.1. Impacts of DRT

Especially in the multi-modal and multi-operator environment DRT changes the existing public transport significantly. The institutional and organisational issues, including the legislative framework and regulations have to be carefully studied and modified, if necessary, to meet the challenges set by DRT. In DRT operators will, instead of competing, in several cases co-operate with their competitors to be able to offer seamless, integrated public transport services. The DRT fleet is different from that in the conventional public transport. The operators have introduced and will in the future introduce more so called multi-purpose vehicles (maxi-taxis, mini-buses) that are specially equipped and can meet the needs of the end-users more flexibly than the conventional fleet.

When administrators, municipalities, provinces etc. understand the idea of DRT as means to provide viable public transport services for the citizens, then they will show new ways for the future. Co-operation across the municipal and regional borders brings the best results. However, local and regional authorities are often very cautious about developing new concepts requiring investments, even though these investments might be profitable in the future. This is due to the fact that many municipalities have for instance financial problems.

Since it is obvious that DRT could be viable in the future, more information should be provided to authorities to explain the potential benefits of DRT

concepts. It is important to stress the need for co-operation across the municipal borders. DRT will cause changes in the field of public transport and operator contracts. These contracts need careful planning. They should be accepted by the operators so that they can feel motivated to contribute to DRT. The new concept involves a lot of education and training, both regarding the concept and service and especially telematics applications. The drivers will have to follow rules and use new technologies. For some drivers DRT will involve working with new end-users e.g. disabled and elderly. This is not always the easiest thing to learn. They have to be aware that the special user categories may have totally different kinds of needs than user of ordinary public transport. This means that the drivers should adopt a new service mentality towards passengers. Drivers have to get used to the idea of flexible DRT routes and schedules, based on the 'real-time' needs of the passengers.

The TDCs are in many cases totally new organisations set up to integrate and co-ordinate demand from passengers and supply from operators. The work of TDCs is very demanding, especially in the multi-modal and multi-operator environment. The TDC has to be fair to the operators and at the same time offer the best possible solutions for each passenger. TDC personnel have to be trained to know the concept, the operative rules and regulations, geography of the service area etc. The personnel should be informed immediately of any changes concerning the operations in the target areas. Changes in the time-tables of the fixed line services should be updated immediately so that TDC can provide the passengers with the latest correct information.

Achieving satisfied passengers is crucial for the success of DRT. It is clear that there is a lot of training, marketing and informing needed to explain to passengers the idea of DRT. They should be able to understand the meaning of the booking calls, walking down to the meeting points in time, the idea of TDC (at least on some level) etc.

For the passengers it is essential that the agreed service arrives on time and as ordered. The idea of moving some of special needs users from individual transport services paid by the community to DRT where there may be more passengers to share the same vehicle, may for some passengers be a big step. There may be mental barriers to accept this new concept. Therefore simple instructions are needed. On the other hand, based on the experiences on DRT, some passengers have considered the DRT trips as social events, where they will meet and make friends.

4.2. Impacts of ITS

From the transport telematics viewpoint DRT means new kinds of technologies to be used in the service concept. This applies to all actors involved; operators, customers/passengers, dispatchers, authorities etc. Particularly in the multi-modal and multi-operator systems the role of telemat-

ics is important and DRT will succeed only with the help of ITS. Each actor will be using telematics applications one way or another.

The operators/drivers use radios, mobile phones or on-board units with computers. It is obvious that the best way to communicate is to use on-board computers. Mobile phones are not good enough when using speech synthesisers. The messages may be difficult to understand and to remember and the quality of synthetic speech is not clear enough.

There have been communications problem in SAMPO that have occasionally caused the drivers difficulties. There may be shadows in the coverage. Sometimes the connection suddenly disappears and it is difficult both for the driver and the dispatcher to assess the situation and the latest status of the orders etc. However, some advanced on-board units are needed in DRT. The drivers have to be reachable easily and reliably.

Very often the problems are not technical, but knowledge-based. The drivers may not have had enough training and not learned to use the equipment (as tools) during the demonstration period. Telematics may be a new thing for the drivers and they have to have time to learn.

However, telematics will not be the major bottleneck in providing DRT services. The tested technologies have proved to work satisfactorily, when used properly. .

Mostly the dispatchers have used the TDC systems as tools and been satisfied with them. In cases, where the dispatchers have used telematics systems previously, the step to start using the SAMPO system has not been too great.

From the passengers' point of view the telematics is connected to the telephone calls to and from the TDC. Even though it may appear to be a minor matter to order a trip by phone, people are not used to calling when using public transport services. They are reluctant to call for many reasons. They may not want to decide in advance when to use public transport.

The special user categories may be suspicious and/or afraid to call. They are also often very worried about the confirmation call or may forget it totally. Normally people are used to call a taxi. They could learn that the idea in DRT is very similar - to access personal and flexible service you have to call.

The unwillingness to call can be noticed in the areas, where existing fixed line public transport services are replaced with DRT. The passengers try to use the new system as they have done earlier. Here new attitudes and new thinking is needed - passengers should learn to understand, that they cannot be guaranteed the trip/service unless they book it.

Passengers should also learn to wait for the confirmation calls, if that is part of the service concept. This makes the service better and reminds also the passenger that it is time to get ready to leave.

5. NEEDS FOR FUTURE ACTIONS TO BE DONE

Chapter 5 presents ideas for future actions concerning the further development and dissemination, risks and barriers and training related to DRT.

5.1. Further demonstrations

Generally taken there is a need to establish DRT services in the implementation policy of industrial programmes of EU.

Based on the positive experiences of SAMPO the DRT concept should be further tested and demonstrated in various environments. It should be implemented and taken into full use when the demonstration results are positive. This means that there should be new contracts for the operators to guarantee the continuation of the service.

The telematics applications related to DRT should be disseminated and transferred to other potential sites on the national and on the European level. Active marketing is needed to exploit the results of SAMPO.

The integration of DRT and other public transport should be further developed both conceptually and telematically. DRT should be an essential part of the new seamless public transport.

There should be a stronger understanding of the business case in different operating environments. There is a need for further assessment of travel and/or transport policies and modal shift impacts. Also further assessment of societal, community and economy impacts in rural areas are important.

The indicators used during the demonstration for the evaluation of DRT and related telematics should obviously be further developed to better understand and measure the actual DRT.

There is still need for improved optimising algorithms with trip notifications and fixed arrival times. Also improved booking functions for easy booking particularly for return trips should be further developed.

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The positioning of origins and destinations of the passengers/trips should be further developed. Easier pinpointing would benefit the booking process in TDC.

The utilisation of GPS-positioning of the vehicles should also be further developed as an essential element of the DRT. New emerging communication links and on-board units should be introduced to support effective DRT services.

The use of time-table databases to support dispatchers have proved to be a big challenge, especially in the multi-modal and multi-operator environment. The development work concerning this challenging issue should be continued.

5.2. Overcoming risks and barriers

The suggestions and guidelines given by EU (both juridical and conceptual) should be followed nationally. The Green Book on the Citizens' Networks should be implemented. By following its suggestions and guidelines, the risk of developing closed systems with no European level value or interest can be avoided. There should also be national transport policies and strategies, respecting the Common European Transport Policy in each Member State.

The co-operation and development work between different transport modes and operators should be encouraged and supported by the authorities. DRT as a part of seamless public transport chain will be at its best in the multi-operator, multi-modal use. However, this is also the most challenging and difficult environment with most risks, especially when should services complement each other. DRT should be integrated with other transport services like fixed line services etc. There is a potential risk of conflicts, when DRT serves as feeder or distribution service or even replaces some fixed services.

The operator contracts including financial issues should be agreed upon and they should give the rules and guidelines for the DRT service provision and funding needed.

Co-operation between different authorities on the governmental, provincial and municipal level is needed to overcome institutional barriers preventing the development of DRT. The government should support the co-operation and development work together with provinces. Municipal co-operation is also essential when the DRT is regional and covers more than one municipality. Open discussion and information exchange is clearly needed.

Based on the SAMPO experiences the reliability of TDC software and communication links between TDC and vehicles/drivers form a risk that has to seriously be taken into account. Proper verification and testing is a key issue in confirming reliability.

Establishing TDC is also a risk. Some cities/towns are more than eager to establish a TDC, some are reluctant. On the other hand some transport

modes have their own 'monopoly dispatch services', some transport modes are willing to co-operate etc.

The attitudes, if not taken into account properly, may cause risks. Thus it is to be remembered that there should be intensive efforts to guarantee that the attitudes towards DRT will become positive. This does not happen automatically. All the actors may have different attitudes; operators, drivers, local, provincial and national authorities, school children, commuters, housewives, the disabled and the elderly (especially when made to change their travelling habits from fixed services to DRT service).

5.3. Dissemination and industry awareness

The results of the SAMPO project should be disseminated regionally, nationally and on the European level. The DRT concepts have to be modified case by case based on opinions and needs of all user categories. Each concept will differ from the others.

There should be national support from the various authorities to disseminate the results. In this sense effective public-private partnerships are important.

The results of the SAMPO project should be disseminated to representatives of the public transport industry as many ways as possible ways. The big problem has been the lack of information among the operators.

The open architecture solutions and applications developed by the SAMPO project should be commercialised in the near future.

5.4. Training and support

DRT requires more training and support than anticipated. This concerns all parties involved. Each actor needs specially tailored training and support. It would be useful to arrange events to which all the potential users and/or their representatives are invited.

Training and support for special user categories seem to be especially important. The introduction of new telematics equipment and applications requires more preparatory efforts than normally assumed.

6. CHECKLIST

Chapter 6 presents the checklist for the development work and activities related to DRT.

When it is intended to start a project or development work of DRT and related telematics, several issues should be considered. A checklist or preferably a set of checklists for the development work is described in this chapter. The checklist follows the structure from chapter 3.

Institutional and operational issues:

1. checking the EU legislation and national legislation and respecting them, preparing for changes
2. checking to find support for the project from the national transport policy and strategy
3. ensuring the needs/possibilities for public-private partnerships, verifying their pros and cons
4. verifying the actual justification of potential/actual monopolies
5. checking the participation of all the public transport modes and organisations on equal terms
6. involving all the public transport organisations
7. getting the commitment of the municipal and regional decision makers
8. planning the operational framework carefully
9. paying attention on the robust/solid organisation of the development project, setting a clear leader organisation
10. agreeing upon the contractual issues in advance before the service starts
11. getting acceptance of rules from all the participants
12. arranging in advance negotiations, discussions and information exchange between the actors involved
13. understanding the possibilities and consequences of legislative initiatives, preparing for long procedures
14. defining the role and mandate of TDC in advance
15. encouraging the integration of different public transport modes
16. identifying the barriers and obstacles violating effective co-operation in advance
17. encouraging regional co-operation between municipalities

Operational issues:

1. defining the level of quality of service offered to the customer
2. defining the objectives from the point of view of the DRT service provider
3. guaranteeing and providing the agreed service to the customer
4. planning the rules for allocating vehicles to routes
5. training dispatchers and drivers well in advance
6. setting up a DRT system which provides as much as possible support on all levels to the operators and drivers
7. familiarising the dispatchers with the operational area, preferably regularly
8. familiarising the drivers with the dispatch centre
9. informing the end-users of the new concept via the media and by arranging seminars, informal functions etc.
10. negotiating the operator contracts of the DRT in time
11. ensuring the availability and update of time-table information
12. supporting the integration of DRT and existing line based services
13. encouraging the end-users to get used to make bookings, reservations and cancellations by phone
14. negotiating and agreeing upon the fare for the trip (reasonable, but higher than in normal public transport)
15. guaranteeing the best possible DRT service with optimal resources and effective co-operation
16. carefully planning positioning of the departure and destination points
17. respecting the needs of special categories, they should not be forced to use the service
18. recognising and co-operating other public transport development activities and integrating the efforts with them
19. clearly marking DRT stops and /or meeting places
20. including all relevant points of interest, public offices and buildings, agencies, local names etc. in GIS database.
21. agreeing upon the walking distances to the stop
22. checking the availability of low floor vehicles and other specially equipped vehicles
23. adjusting the pre-notification times to allow passengers leaving home in time
24. agreeing upon clear regulations about passengers boarding without reservations and informing both drivers and passengers

Technology issues:

1. understanding that technology is being used as a tool to help DRT
2. arranging non-technical issues first (institutional, organisational and legal)
3. understanding the technical challenges for the TDC software, especially in the multi-modal and multi-operator environment and ensuring that the software can manage the situation
4. confirming the use of open and scaleable system architecture structures for TDC software
5. making sure that the communication links work at all times and throughout the operational/DRT coverage area
6. planning the use OBUs, bearing in mind that the normal mobile phone used stand-alone is not a very good driver terminals
7. being aware that digital mobile phones are better than analogue phones, when using automated speech
8. verifying that the time-table database of existing fixed line services is integrated with the TDC system
9. using standard solutions and modules for instance if smart card is introduced
10. verifying the integration of technologies (openness and use of standard solutions)
11. checking the possibilities to use the digital map, arranging the update and maintenance
12. arranging the test environment to be similar to the real environment
13. arranging proper training to eliminate (several) technical problems
14. remembering that pilot systems are not final products and that demonstrating with real customers is very sensitive
15. being aware that when linking your activities with other projects, the possible delays in these other projects may cause problems in your own work

Business case:

1. ensuring adequate before-data availability prior to the demonstration
2. making every effort to achieve adequate patronage levels, which in return are the basis of potential business case
3. encouraging the passengers to make telephone calls to order DRT service
4. integrating the existing transport planning procedures with the DRT/TDC system to create a seamless public transport planning and management system
5. defining logical and attractive fare structure for DRT
6. ensuring adequate level of authority/governmental support to make DRT a business
7. remembering the importance of skilled professional drivers, dispatchers and marketing people

User acceptance:

1. identifying and avoiding the potential technical problems, that will always cause frustration among passengers dispatchers and drivers
2. guaranteeing the proper DRT service is the key factor
3. undertaking an extensive pre-advertising campaign and series of related functions
4. secure the high standard of training
5. understanding the fact that the users are not used to making telephone bookings, when using DRT and need time to get used to the idea
6. listening to the users' voice, to make the concept approved
7. remembering not to force the users to use DRT
8. making sure that users can trust telematics, especially communication
9. remembering that the end-user is not interested in the reason for poor service; for the user DRT is one wholeness

Implementation:

1. testing and demonstrating the DRT concept thoroughly before implementing it, piloting with real customers and end-users are sometimes risky
2. having time enough for training, education, maintenance and follow-up during the implementation phase
3. exercising great care and sensitivity when replacing existing services with DRT services

7. SUMMARY/CONCLUSIONS

Chapter 7 summarises the conclusions and recommendations resulting from the SAMPO project.

This deliverable is a strategic guide for the implementation of DRT with particular emphasis placed upon the use of Intelligent Transport Systems (ITS) for technical support and management.

The main SAMPO test-sites are located in four European Union Member States:

- Belgium
- Finland
- Italy
- Sweden

In addition Kilkenny in Ireland is a contributing site. The UK has participated in the work by providing external horizontal specialists for the project.

The results of the project show that there is enormous potential for DRT services in Europe. The question is not, whether we want to develop DRT, but the need to discover new ways of dealing with the problems and challenges the public transport services are facing.

There are several important issues to be taken into account in the development of DRT such as:

- European level and national transport policy
- legislative framework and needs for changes in regulations
- organising the development work
- breaking the monopolies
- effective co-operation between the actors within DRT
- basing the development on the users needs
- using standard software and hardware
- efficient and reliable communication links
- proper training and information for the actors within DRT
- reasonable fare/service ratio
- motivated personnel to provide DRT services
- marketing and public relations

One of the key issues in DRT is the flexible booking and dispatching service, which in SAMPO has been arranged by establishing Travel Dispatch Centres (TDC), using appropriate telematics to provide the services.

Inevitably two years is far too short a time period for developing DRT services and related telematics, in a green field situation, to work technically and at the same time to take into account the different objectives of all the actors involved.

However, based on the results of SAMPO since the beginning of 1996 there are a lot of potential and promising views in DRT and related telematics. DRT should be further developed and the results of the project should be disseminated among the public transport industry, administrators and authorities, end-user categories, technology providers etc. throughout Europe.

Annex A: SAMPO project

SAMPO PROJECT

SAMPO is an acronym for '**S**ystems for the **A**dvanced **M**anagement of **P**ublic transport **O**perations'. The main goal of SAMPO is to assess the potential and the effectiveness of the introduction of advanced telematics technologies in the provision of Demand Responsive public Transport (DRT) services. This goal has been evaluated in a European demonstration project, developed at test sites in four European Union member states:

- Belgium
- Finland
- Italy
- Sweden

In addition Kilkenny in Ireland is a contributing site. UK has participated the work by providing external horizontal specialists for the project.

DRT services are undertaken on a variety of modes i.e. buses, coaches, taxis, so called invataxis (specially equipped vehicles for mobility impaired persons), mini-buses, maxi-taxis and feeder services for both tram and rail services.

Services can be integrated between different modes or free-standing. The aim of DRT services is to provide services 'on demand' from the passenger. Telematics-based systems are based upon organisation via Travel Dispatch Centres (TDCs). TDCs use booking and reservation systems which have the capacity to dynamically assign passengers to vehicles and optimise the routes. Vehicles require location systems in order to provide real-time information on the status and location of the fleet for the route optimising software. Integrated DRT services are achieved when multi-modal options can be generated and managed for passengers. Case studies of telematics-based DRT services may be found in Australia (Radbone et al, 1994) and the USA (White, 1995).

It is perceived that small communities are increasingly demanding adequate mobility levels as they see their ability to attract, or even retain, their citizens being eroded. The growing numbers of elderly, disabled people and other special groups who demand full integration within the activities of their communities, have created a strong set of travel needs. In Europe these potential markets have largely not been met by transport services because a cost-effective means of meeting such demand has not yet been found. Operators and communities increasingly believe that if these technical barriers can be overcome, the transport market for DRT services will accelerate.

To date, new technical innovations and solutions (both hardware and software) have been developed to make it easier to introduce applications to support the demand responsive multi-modal public transport services. These are in the domain of application independent technologies such as vehicle-

location systems, communications and network facilities. Although some products have been developed for managing the DRT services, they are few, and have not been tested widely. They have generally been developed for specific operators or functions and have not typically been designed for integration within the multiple functions of the operator.

There is therefore a very strong potential market for products to support DRT services technologies. The main customers for such products will be the public transport operators, regional authorities and system integrators.

The mix of technologies they seek will depend on the operational and financial strategies they wish to implement. SAMPO has evaluated the various strategies adopted at each test site and assessed their potential for effectively operating a DRT service, in an attempt to meet the demand that exists in the market place, in both urban and rural areas.

The telematics tools to be used in DRT operations and services are e.g.:

- communication structure and services for voice, data and standard or short messages
- vehicle location and monitoring hardware and software
- network design and optimisation
- static and dynamic scheduling
- booking and reservation systems
- dynamic systems for management and optimisation of DRT
- smart card technology for payment and passenger travel permit validation
- hardware and software systems for passenger information inquiry and display
- information management and data analysis systems
- on-board computers, meters and display systems

The specific objectives of the SAMPO project may be summarised as:

- to identify the relevant user categories and to determine their transport related needs.
- to design and develop and assess DRT services
- to develop functional specifications for advanced telematics technologies products to support DRT services/ Integrated DRT services.
- to validate the DRT services and the telematics products through verification and demonstration.
- to evaluate the user behaviour, travel impacts and social impacts.
- to determine the business case for DRT services, and the added value of using advanced telematics technologies within DRT services.
- to disseminate the SAMPO results to the transport industry and the R&TD community.

Annex B: Technologies

Technologies

The DRT concept

The DRTS concept is not new. After initial investigation during the sixties and seventies in North America and Europe, it is now regaining the attention of public transport (PT) operators thanks to improvement and reduced cost of ITS technology. The implementations made possible by current ITS products allow more efficient use of transport resources in a manner which is viable to the operator and which will reduce the need for external financial support.

Demand responsive services are characterised by specific choices concerning the stops, routes and timetables in accordance to which the service is operated. Based on such choices, the flexibility of the DRTS can be largely different. The PHOEBUS project has investigated the DRTS concept and defined four reference scenarios of application. Such scenarios are also assumed by SAMPO and can be outlined as follows.

Scenario 1: the closest to conventional PT services, is based on transit lines characterised by completely fixed routes and timetables. Such services can be operated either on demand or on a regular basis.

Scenario 2: is characterised by routes and possible deviations to serve predefined stops on demand. The timetable can be partially predefined.

Scenario 3: is defined by lines serving predefined stops on demand, with either predefined or varying departure times. The stops represents “meeting points” at specific locations in a certain area, which are linked by routes completely determined by demand. Departure times are either predefined or varying.

Scenario 4: represents the most complex and flexible case. here public transport services are supplied on demand among all possible request points in a given area (i.e. door-to-door service) in a way similar to taxi services.

SAMPO ITS technologies

Within SAMPO, a wide range of ITS products are used to support the DRTS applications implemented in the various sites, and this is one of the key innovative features of the project. The adopted ITS product are used to implement basic functional requirements of DRTS systems such as: reservations management, travel planning and scheduling, operations management, communications, passenger support.

Looking at all the SAMPO sites, the technologies implemented in the demonstrators cover almost all base and ITS options for DRTS systems, including:

- Automatic Vehicle Location system
- PSTN, ISDN data communication
- GSM voice and data (SMS) communication
- GIS and mapping software
- service scheduling and route optimisation software
- mobile (i.e. in-vehicle) computers and data terminals
- mobile personal terminals
- card-based data storage and transfer media

The extent to which the various technologies are applied in the sites is diverse as well as varied is the situation as for the kind of technologies available before SAMPO and those which will become available with SAMPO. Also, the various demonstrators follow different stages for the introduction of technology in the sites. This reflects, in part, local design and implementation choices and, partly, the different experience and DRTS technology already available in the different sites.

However, besides such differences, the various sites reveal also commonalties with respect to some of the ITS technologies used. This results from some underlying common choices at the architectural level as well as from some emerging common solutions concerning the technologies adopted to implement the various ITS functions the five DRTS architectures are comprised of.

The SAMPO system architecture

In the SAMPO system architecture, the following remarks are stressed.

- a full straight forward system architecture framework can also be useful to describe an existing system in a harmonised and standardised way, facilitating the comprehensibility of all system architectures
- in a creative process as a basis for new system developments, feedback movements are necessary especially in the first phase of the process: new solutions and approaches must be developed using the technical possibilities instead of just computerising an existing way of operation
- the SAMPO partners all had different experiences and levels of implementation with DRT, and as such aimed at divergent development objectives within the overall project. Some partners started with a so-called ‘green-field’ situation, and had to integrate DRT from the beginning, other partners already were performing a form of DRT, telematics supported or not. Together with the fact that other telematics tools were already available within the demonstration sites, the system architecture and specifications descriptions may show different focuses in this deliverable;
- in a practical development stage, one clearly concludes that availability of some DRT technologies, be it supportive or core applications, and contacts with expertise manufacturers, influence the approach towards describing and identifying the system requirements and architectures.

The system requirements are globally similar as they all intend to specify the qualities and characteristics of a DRT system. The functional requirement description, illustrating the target proceedings of a DRT, cover almost the same issues. Every partner expects the system to support the operator and transport provider with the operational management of DRT. This implies required functions like assistance with reservation and booking, advanced automated journey calculations, communications and statistics management and such.

Minor differences within the functional requirements concern specific partners' needs, as a result from divergent approaches on DRT, expressed in the introduction requirements. Mostly, institutional, financial and social conditions and requirements are pointing the functional requirements in other directions. For example, one thinks of the specific policies on user groups restrictions, whether the DRT is a mere special transport service or a full public transport service. Also, different national approaches towards the transportation market affect the structure of the transport providers and their relation towards the clients.

These differences clearly stress the divergent issues each partner is focusing on, the consequent SAMPO targets and detailed development objectives.
Regarding the geographical context, one sees a full range of applications for DRT. Although perhaps in the line of expectations, these geographical and morphological variations have no major effect on the detailed system requirements. This implies that all requirements on DRT are valid for most type of regions currently in the project. Still, some specific demands on the part of the vehicle could be stressed here, as well as the availability of some low-end communication means.

The intrinsic quality requirements do not differ between the partners. As these parameters are not actually variable, this comes as no surprise: every well-thought system architecture will need these specific qualities to obtain an ensuring viability.

In the context of the performance requirements, the descriptions may vary among partners. Globally, one summarises the common qualities, being that the system will run fast, alert and fail-safe. However, some specific conclusions must be drawn, based upon the varying policies.

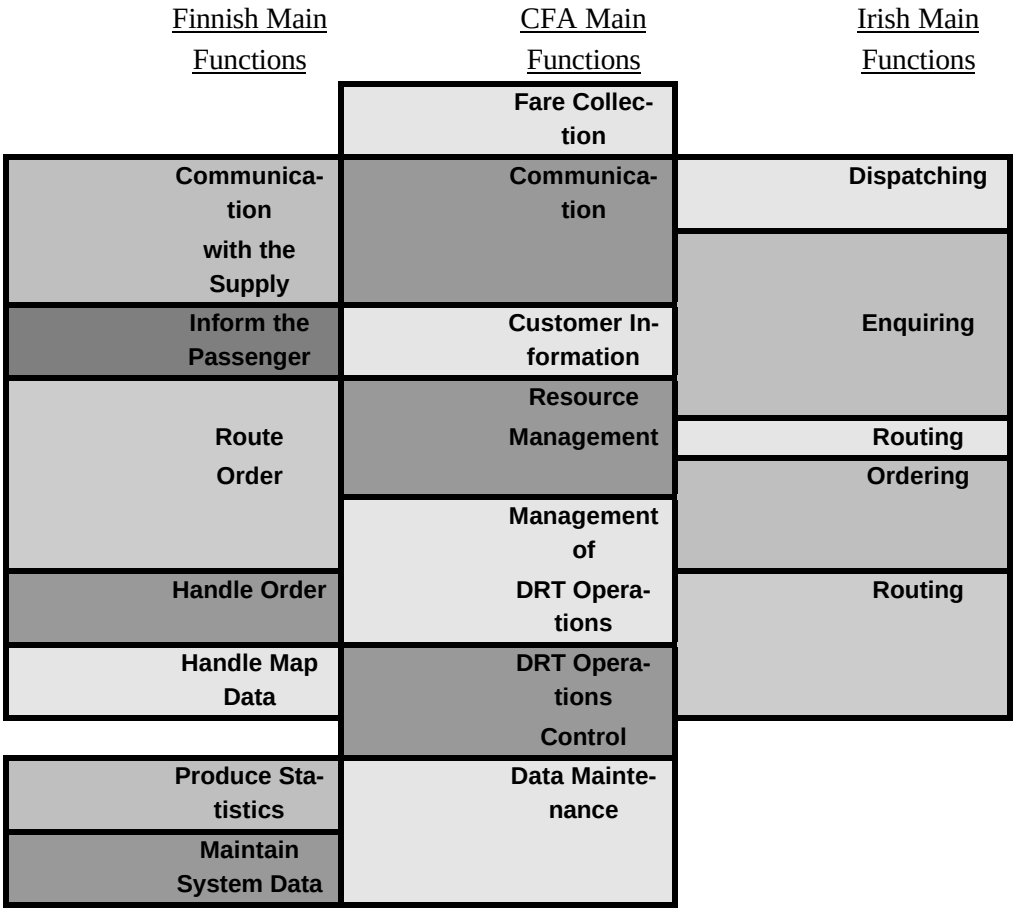
A major issue in DRT schedule processing lies with the optimisation methods one is using. An on-line schedule optimisation offers the advantage of an immediate and correct reply towards a booking customer, however imposes some safety restrictions on the actual optimisation method which result in a less efficient schedule. On the other hand, optimisation after registration of all reservations offers an optimal direct and efficient vehicle schedule, however often requires a trip notification before the run. This issue poses specific requirements, firstly on the schedule processing speed, which needs to be very high with on-line optimisation, as well as on the obvious trip notification procedure in the other case. Also, this poses extra

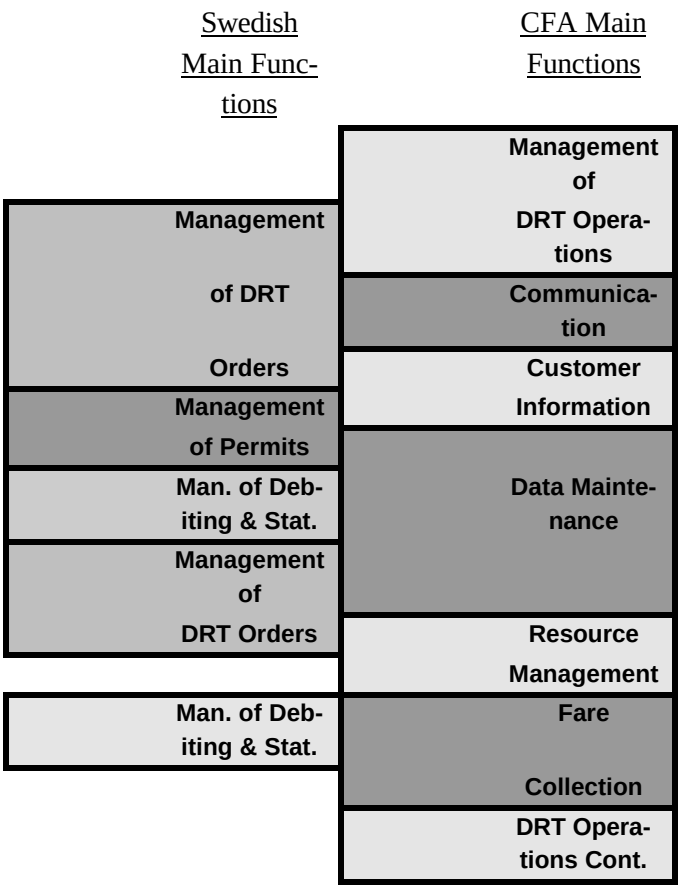
conditions on the reservation time restraint and consequently on the data communication performance : a reservation constraint of one hour in advance does not pose that tight requirements on the communication time opposed to real-time aberrations on the route.

Also, different expectations on the use of automated vehicle location, result in an appropriate accuracy of the GPS applications. For mere monitoring purposes, the positional accuracy does not need to be as high as with automated interconnection monitoring or even automated real-time schedule adjustments. In this context also, the geographical characteristics aforementioned still poses their requirements on automatic vehicle location.

The following tables give a schematic overview of the local main functions and their respective coverage of the seven common main functions: the contents of respectively the partners' main function on the one hand, and the common main function on the other, architecture compared and lined up next to each other.

<table>
<tr><th>Italian Main Functions</th><th>CFA Main Functions</th><th>Belgian Main Functions</th></tr>
<tr><td></td><td>Resource Management</td><td>Man. of DRT Scheduling</td></tr>
<tr><td rowspan="2">Control of DRT Operations</td><td>DRT Operations Control</td><td>Operations Cont. & Monit.</td></tr>
<tr><td>Communication</td><td>Vehicle Communication</td></tr>
<tr><td>Management of DRT Request</td><td>Management of DRT Operations</td><td rowspan="2">Management of DRT Scheduling</td></tr>
<tr><td>Inform Customer</td><td rowspan="2">Customer Information</td></tr>
<tr><td></td><td>Data Maintenance</td><td rowspan="2">Public Transport DataBase</td></tr>
<tr><td>Control of DRT Operations</td><td>Fare Collection</td></tr>
</table>


Finnish Main Functions
CFA Main Functions
Irish Main Functions
Fare Collection
Communication with the Supply
Communication
Dispatching
Inform the Passenger
Customer Information
Enquiring
Route Order
Resource Management
Routing
Ordering
Management of DRT Operations
Handle Order
Routing
Handle Map Data
DRT Operations Control
Produce Statistics
Data Maintenance
Maintain System Data


Swedish Main Functions
CFA Main Functions
Management of DRT Orders
Management of DRT Operations
Communication
Management of Permits
Customer Information
Man. of Debiting & Stat.
Data Maintenance
Management of DRT Orders
Resource Management
Man. of Debiting & Stat.
Fare Collection
DRT Operations Cont.

Differences on a lower level, as well as the different focuses applied between the partners, are a logical result of specific requirements based upon institutional, organisational, exploitation, etc. conditions, which demand slight variations towards the expected functionalities of a DRT system.

However, major generic functions are clearly the functions to handle reservations, be it via telephone and operator, driver or automated, as well as extended algorithms and procedures to process the service journey, all based upon the objective to keep the route as direct as possible and to increase the ride-sharing.

Furthermore, every partner focuses on the communication between TDC and vehicle, as well as on the assembling of essential statistical data. Differences lie in the degree of integration of operations control and monitoring, as well as in the optimisation procedures, where a clear distinction is made between the on-line optimisation, and the optimisation after all bookings are assembled. This latter process often demands a trip notification shortly before the actual vehicle run.

Moreover, the different approaches towards the assignment of DRT vehicles implies its distinctive variations in the functional descriptions. Some partners have a TDC acting as a distributor of trips to third party public transport providers, and consequently have a more elaborate functional description worked out towards the vehicle assignment and fare collection and distribution. Other partners have an own exploitation structure where reserved vehicles are continuously available and performing the DRT.

Core application within all physical and communication architecture is a central reservation handling and routing facility, most often in a server-client terminal combination. The respective terminal platforms do not require high-end computers. In order to maintain user-friendliness and familiar user-interfaces, these units run under an easy to use Windows-environment or alike. The main central computer, as a server, requires higher performance, like all SAMPO-systems illustrate. Every TDC logically integrates a LAN, Ethernet or Token-Ring, to connect other PT-facilities. If not integrated in the DRT server, all systems implement a central database and communication server.

Essential in the DRT system is the DRT data transfer to the vehicle. This mostly concerns the service journey, schedule and passenger information. Most systems have a specific application managing this communication, which itself often uses the GSM data communication or GSM/SMS. Occasionally, one uses a, commercially exploited or private, radio network.

Other applications are clearly a practical implementation of specific partner's needs. This concerns the trip notification facility, automated or not, as

well as the extensive use of AVL and automated interconnection monitoring.

An automated reservation module is not used by all partners, although the need for this is clearly felt, and as such expected in a near future. However, all system architectures prove to possess enough flexibility and modularity to easily include this type of technology whenever appropriate.

As all partners have defined an aforementioned open structured architecture, these proposed systems have a high degree of independence of specific manufacturers, which clearly improves the opportunities and expectations of the SAMPO demonstrating systems.

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Annex C: User Needs review

USER CATEGORIES AND RELATIONSHIP TO DRT

User Categories and Relationship to DRTS

The need to identify the different users

Transport services are an integral part of the community which they serve. There are many interested actors in the community with different, and sometimes conflicting needs. The success of a transport service will be related to its ability to meet the needs of at least some of the users in its area of coverage. Obviously, if the transport services are designed with the user needs in mind, they will have a higher chance of generating business and becoming economically sustainable.

Generally, the service provider will base decisions on a historic knowledge of the target area. This will be based on the demand for existing or former transport services, supplemented by some understanding of expressed travel needs. For demand responsive transport services, this approach is not really satisfactory. As the services are innovative, they will be capable of generating new business and their impact is more difficult to predict.

If the provider of the service wishes to understand the market, there is a clear need to first define who are the users, or the potential users, in the area of coverage of the transport service. When the users are known, then their needs can be more clearly identified and this will feed into the network, schedule and pricing design.

From the European perspective, there is a need to identify the potential users associated with DRTS for three core reasons, and this is a key contribution of SAMPO project to the European objectives :

1) DRTS will contribute significantly to the improvement of mobility in rural areas, in areas of low demand, and for people with special needs. There are many gaps in the current global public transport offer, and DRTS has the potential to complement the existing services. This will facilitate the implementation of Transport Policy at local and European levels as described in Chapter 2 of the main report.

2) Technologies to support DRTS need to be suitable for widespread use. The provision of DRTS is likely to be cost-sensitive, so many service providers will not be willing to purchase expensive systems that have been designed specifically for their needs. The use of generic technologies for communication and location functions will help. Of even greater importance is the development of a range of tools specifically for DRTS. These need to be "generic" as far as DRTS is concerned, but with user configurable aspects for the nature of the services or customer-support features offered. Suppliers need a global understanding of DRTS possibilities so that they can develop the needed technologies for the market.

3) Operators and transport authorities throughout the European Community (and indeed world-wide) will become interested in implementing DRTS, and in employing supporting technologies. Each community or target area has its own characteristics, and the availability of a "check-list" of users and their associated needs will assist them in designing services.

Identifying the User Categories

A structured, iterative approach has been taken to identify the different potential users of a DRTS system. The structured approach can be summarised in the following steps :

a) Identification of four main User Groupings who have an interest in demand responsive transport services in either urban or rural areas.
b) Identification of the different User Categories within the User Groupings. These User Categories are the *potential* interested users, and only some are relevant at any given site.
c) Rating of the relevance of each User Category to the provision of DRTS, as viewed by the sites within SAMPO.
d) Selection of the User Categories to be investigated in-depth by the SAMPO project, and the methodology to be used to determine their user needs in relation to transport services.

The results have been achieved in an iterative manner. A workshop was held on 1-2 December 1995 in Helsinki, in which the main actors from all five SAMPO demonstration sites developed the User Types and User Groupings. The output from the workshop was then considered in detail by each of the sites, taking into account their prior work, their plans for user needs assessment, and their local context. During January 1996 the sites provided inputs to a revision and consolidation of User Types and Categories.

The SAMPO level output is presented to the Transport for Telematics program through the Concertation process, both as a dissemination activity and to seek responses from other projects. This will ensure a broader platform on which the User Needs Analysis is based, and a greater degree of harmonisation with the other activities of the program.

Four User Groupings

A two-level approach has been taken in the categorisation of users. This has been done both for reasons of classification, and for clarity in the process.

Normally when the term "users" is employed, consideration is only given to the "end-users" of the service - in other words, the people who travel on the services. In fact, there are many other categories of users in the sense of actors who have a direct interest in the commercial, social, infrastructural or transport impacts of the services. The SAMPO project uses the concept of

User Groupings to make clear that these different actors exist, and that they have validity within the design and assessment processes.

In addition, it was also found that the different sites each have a different focus which reflects the political, business and social demands of their environment. This suggests that there is a different balance among the user categories, and probably the user groupings in each site. It is therefore needed to develop an appropriate framework in which all of these possibilities can be represented, as well as other schemes from sites outside the SAMPO project.

Following the iterative process described above, four User Groupings were determined :

a) End Users : The End-User is a direct customer, or potential customer of the provided transport service. (S)he can also be described as the "passenger" or "consumer".

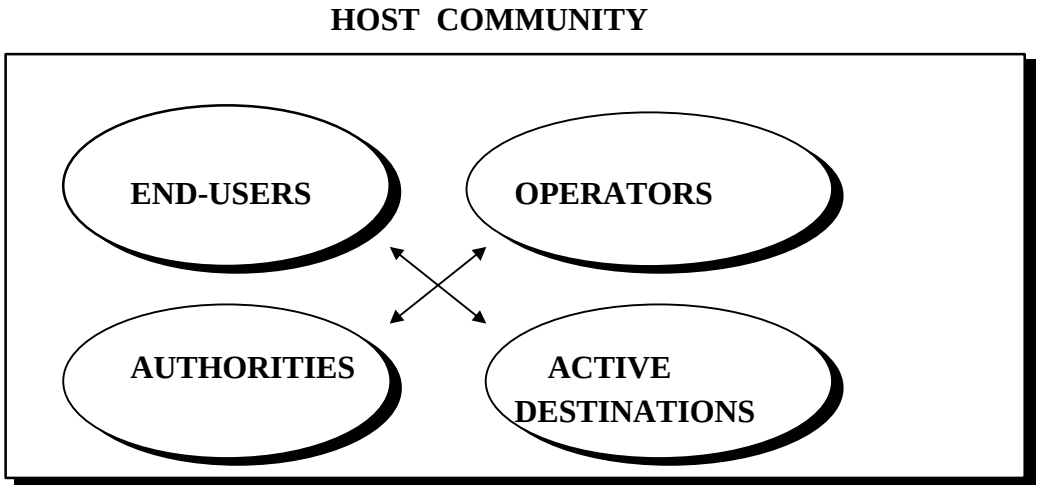
b) Operators : The Operator is directly involved in the provision of the transport service to the End-User by providing some or all of the elements of the vehicle, driver and support services.

c) Authorities : The Authority has statutory or delegated responsibility for the provision or regulation of transport services in the target area.

d) Active Destinations : Certain destinations may play an active role in the organisation of transport. For example, they may supply information to the operator about trips to the destination, they may act as a travel broker, they may assist the operator in planning the services, or they may bring co-operate with the operator to provide an inclusive price for the travel and the destination activity.

Two other possible groupings were considered - Time of Travel and Community type (scale, urban/rural). After discussion, it was considered that these were relevant to market and pricing segmentation, but that they were not good discriminators in terms of users. The associated needs would be adequately described in the consideration of the main four User Groupings.

It can be considered that the host community for these services consists of many different actors, some which are individuals, others which are organisations or entities. They are interlinked for many purposes within their community, transportation being one of those needs. The key feature to be remembered about the transportation need is that it is always linked to another functional need of the individual.



User Categories

Within each of the identified User Groupings, there is a range of User Categories. Each Category has a set of distinguishing features which allows the users within that category to be defined and to be treated as a set with common characteristics. This does not imply that the users within that set are homogeneous - in fact, they may also be capable of a further layer of classification. It does, however, provide a sufficiently detailed set of entities for carrying out the analysis of user needs and for market segmentation. It also provides a basis for comparing and contrasting the opinions and activities of the five SAMPO sites, and of other sites outside the SAMPO project. This latter activity, the comparison with sites outside the SAMPO project should be achieved through an industry User Group or other such mechanism.

The iterative process described in section 1.2 above was also followed for the definition of the User Categories. After some iterations, it has been possible to provide a listing of the categories considered relevant to DRTS within the four User Groupings. This is based on an aggregation of the opinions of the sites. It should be recognised that the perspective of DRTS in urban areas is, in many ways, different from that in rural areas. This framework aims to be inclusive.

The ranking system used in the tables in this section are established as follows :

Relevance to DRTS Generally : The partners and experts involved in the sites were asked to give their opinion on the relevance of the different User Categories to DRTS in general - i.e. to the conceptual services. A collective rating of the relevance of the User Category to a ‘typical’ European DRTS system is formed based on the different responses received.

Relevance to the SAMPO sites : The partners and experts involved in the sites were then asked to describe the extent to which the User Categories

were relevant to the DRTS application(s) being introduced in their specific site. A score of '2' was attributed for each site which considers the User Category as a core target for the proposed service of the site. A score of '1' was attributed where the User Category was considered as significant, but not core. Summing the scores over the five sites provides a 0-10 scale.

It is recognised that these ratings are not based on a scientific method, but they do allow a sense of perceived relevance and importance to be communicated to other interested operators and authorities. The SAMPO project considers that a high priority should be given to creating a broader base of sites and users for a more rigorous version of the work described in this User Needs Analysis report. The value of such work would be to provide a benchmark for the industry

User Categories for the End-User grouping

The categories within the End-User Grouping have been ranked by relevance to SAMPO sites and by relevance to DRT generally as follows :

Category	**Relevance to DRTS generally**	**Relevance to SAMPO sites**
School children	Moderate	6
Students	Moderate	6
Disabled	High	8
Elderly	High	8
Healthcare *patients*	Very high	10
Accompanied adult	Low	2
Workers	Moderate	6
Shift workers	Low	4
Leisure/Cultural	Moderate	4
Shoppers	High	8
Groups	Low	4
Tourists	Moderate	6
Sports trips	Moderate	5
No-car/non-driver	High	6
Car-driver (choice user)	Low	3
Administration	Low	2

User Categories for the Operator grouping

The categories within the Operator Grouping have been ranked by relevance to SAMPO sites and by relevance to DRT generally as follows :

Category	Relevance to DRTS generally	Relevance to the SAMPO sites
Association	High	6
Co-operative	Moderate	5
Municipality	High	5
Company	Very high	9
Sole Operator	High	3
Foreign Operator	Low	1
Drivers/personnel	High	8
Dispatch centre	Very High	10
Adminstration/owner	Moderate	4
PT Planning/Management	Moderate	1

User Categories for the Authority grouping

The categories within the Authority Grouping have been ranked by relevance to SAMPO sites and by relevance to DRT generally as follows :

Category	Relevance to DRTS generally	Relevance to the SAMPO sites
European	Moderate	3
National	High	5
Regional	High	5
Local	Very High	9
Community Groups	High	7
Politicians	Moderate	2
Legislature	High	6
Police	Low	3
Traffic Authorities	Moderate	5
Funding Agencies	High	5
Manufacturers	Moderate	1

User Categories for the Active Destination grouping

The categories within the Active Destination Grouping have been ranked by relevance to SAMPO sites and by relevance to DRT generally as follows:

Category	Relevance to DRTS generally	Relevance to the SAMPO sites
Healthcare	Very High	9
Education	High	5
Daycare	High	6
Shopping Centre	Very High	7
Leisure/cultural	High	6
Administrations	Moderate	3
Other transport modes	High	8
Workplace	Moderate	4
Tourist Centre	Moderate	5

Institutional frameworks in SAMPO sites

The institutional framework is relevant to the establishment of the DRT systems in both the SAMPO sites and in general. The 'institutional framework' describes the relationships between the different authorities, agencies and operators within the system. This will certainly determine the regulatory framework and it may determine who is permitted to offer services. If there are financial dependencies provided, then it will determine also where the funds are generated and who are the beneficiaries.

It is considered relevant to provide examples from the SAMPO sites as it may assist the reader to understand why, for
example, certain User Categories are accorded a higher priority than some of the End-Users. It will also help the reader to interpret why needs are expressed as critical factors by users in one site which are not even mentioned at another site. The SAMPO project strongly recommends that further investigation is carried out into the relationship between the institutional framework, the users' needs, and the willingness of operators to offer services. The institutional framework for all of the sites - Finland, Belgium, Ireland, Italy and Sweden are represented in this section.

Overview of methodology for establishing user needs analysis

The SAMPO project has taken a structured approach to the determination of user needs. In the previous sections there has been a clear definition of the transport context, the nature of demand responsive services, and the user categories to whom DRT services may be relevant in different environments.

The user categories are now examined in greater detail to establish their individual needs. In order to carry out the User Needs Analysis, a range of methods are employed. These are tailored to the nature of the user category, and the practicality of obtaining information from them.

Generally within the SAMPO project, the aim has been to establish a set of needs which are related to the individual user category. In most cases these are not determined in a statistically precise manner since the resources required to do so would have been excessive in the context of the current project. Where sites have been able to carry out statistically relevant analysis, this is reported. The core objective, however, has been to establish the nature of the user needs. It is then a matter for the promoter of DRT systems to carry out an in-depth market analysis to quantify and segment the
users, and to obtain precise values for the relevant parameters. Within SAMPO, data collection is carried out within the Evaluation process rather than in the User Needs Analysis.

The methods employed within the SAMPO project have been very much oriented towards using the experiences of the user categories. A high reli-

ance is placed on representatives of the User Categories, and on prior studies in relation to transport needs where available. The main methods employed have been :

- Structured one-to-one Interviews with representative organisations or individuals from the target User Category
- Structured Discussion Groups to elicit the needs from a sector of users
- Local Reference Groups (see below) to facilitate user needs from multiple user categories
- Surveys

Local Reference Groups

Local Reference Groups (LRG) have been established at all five demonstration sites. These groups consist of interested and relevant actors in the area of the demonstration site. The Local Reference Group is intended to last for at least the duration of the SAMPO project, and meets on a basis agreed locally. The majority of the members of the LRG are not members of the SAMPO project, but are in some way interested in the nature of the services and their impacts.

The Local Reference Groups have been established to achieve some or all of the following objectives at the five SAMPO demonstration sites :

- To provide a platform of relevant local actors who can help express the various needs of the area
- To act as a "sounding-board" (i.e. from their experience within the local community provide opinions and comments on developments and proposed activities) throughout the project.
- To provide support to the project as the services are being established or enhanced, and to participate in the evaluation and impact assessment activities.
- To act as one layer of the local dissemination activities
- To provide a platform of actors who, if the evaluation validates the benefits of the ATT-supported DRT, can promote and influence the widespread deployment of such services

Methods for establishing user needs at the individual sites

The methodology used at each site is described here in brief. It should be noted that this provides a concise summary of the actions taken specifically for the SAMPO project purposes. In addition to the actions described here, each site has its own ongoing market analysis for either commercial or social purposes (depending on the basis for service provision).

Each site has described the more particular features of its work, so that there is a useful description of the range of methodologies which can be studied by other sites as examples. Each site has already, or will publish in

its own country and language more detailed reports to be considered by the authorities and/or operators at the site.

Methodology employed at the Belgian test-site

DRT has been integrated in smaller areas in South-Limburg since June 1995. Therefore, one needs to make a distinction between the DRT-experienced end-user on the one hand, and the potential future user in other areas.

To address the current DRT user, an elaborate survey was performed on the current services, by handing out an inquiry-form to the passengers by the driver. Besides data on personal characteristics, this inquiry resumed a small evaluation part on DRT as an introduction towards the further specified user need analysis. On the vehicles, no specific support by an interviewer is offered except for some help by the driver if needed. This interviewing support was estimated as unnecessary as the customers are being addressed with a survey for the third time in about one year, and have consequently build up some inquiry-experience.

Supplementary interviews by phone were taken in order to enlarge the sample size. This procedure was triggered by the DRT-operator when taking a reservation-call; customers willing to co-operate were called again by an extra interviewer at the dispatching centre.

Potential future users were addressed at a municipality where DRT was to be introduced in June 1996. As the specific attention goes out towards the trip purpose of Administration, Healthcare and Commercial trips, a survey was focused on the weekly market, as well as at the town hall and a hospital in the concerned area.

These surveys were performed by experienced interviewers from the marketing department of De Lijn. Again, a first part of the survey informed on the customers' personal characteristics and mobility-patterns. User needs were analysed via an inquiry on the users' expectations and requirements on DRT.

All surveys on the current as well as potential end-user are based on a part with simple straight-forward questions on DRT commercial qualities on the one hand, and a more qualitative analysis via a subjective evaluation of different propositions on DRT. This evaluation is measured via a subjective ranking of qualities by the interviewed person. This gives more reliable information on the specific accents on and importance of different DRT qualities.

A Local Reference Group was assembled based on an existing Council of Advice, integrating the most relevant user-groupings and DRT-concerned people. One of their regular meetings was focused on the DRT aspects in order to assess their specific user needs. The marketing department intro-

duced a short presentation on DRT and the objectives of the user needs analysis in the SAMPO-Project. An elaborate discussion was set up and conducted via some specific points of interest on DRT. In addition to the mere commercial and external qualities of DRT, further aspects were treated, such as the role and importance of DRT within the framework of De Lijn.

Again, a qualitative analysis was conducted via the ranking proceedings of specific propositions.

DRT and regular PT drivers as well as the current DRT operators were addressed via specific group-sessions. As these people have already gained some experience with the DRT services, global and more practical results and comments were easy to filter throughout these sessions, which were lead by the marketing department.

The concerned persons within the company, being the departments of exploitation, planning and marketing as well as the management level, were gathered in an extended workshop and parallel brainstorming session.

Four major and important issues were treated :

- Opportunities and role of DRT within the PT offer of De Lijn
- User-friendliness, external quality
- DRT System functionality's and handling-ease, internal quality
- System efficiency, cost efficiency

This workshop was guided via important key-issues, guaranteeing the useful outcome of the brainstorm.

Methodology employed at the Finnish test-site

The survey for the User Needs Analysis also acts as the "before" survey at the Finnish test-site. This was mostly carried out before Easter 1996. The basic survey was postal, with 2 000 letters to families (household), 1500 in the Tuusula area and 500 in Seinäjoki. The sample size was chosen based on an expected 35 % return of accepted (good quality) answers. The sample in the Tuusula area was directed so that central areas (City and municipality central) had 231 (approx. 59 000 inhabitants), semi-rural areas 754 (24 000) and sparsely populated areas 515 (8 000). In Seinäjoki the sample was evenly spread. The survey included a travel diary and questions of families, persons and opinions. The survey was carried out by Suomen Gallup Oy.

The second part consisted of interviews of pre-structured user category groups, and this involved about 10 groups. With them, a real interview (panel) was made in groups. The interview consisted of a discussion and the completion of a questionnaire. The questionnaire aimed to get the opinions from the potential users (passengers or persons who are making the travel booking) and operators of DRT. Each group was between 8 ... 15 persons.

The number of groups was relatively large compared to other SAMPO sites, because of the distance between the two geographical areas
within the Finnish test site (nearly 300km). The two local groups do not meet.

A very important question for user groupings is the economic viability of the DRT. Here it is easy to find two different views: The price of a single trip for an individual and the price of transport services for that purpose (or the total amount of services to be bought) for those who are paying but possibly not travelling. The second view is for those who are providing the transport service. It is a question of the costs and income of a single trip and the economy of transport as a whole. Special questions at least for discussion purposes should be in the discussions.

The second survey will be made during the demonstration time with some post demonstration extensions. It will be included in the Evaluation Process. It may include in-vehicle study and the sample will be smaller than in the User Needs Analysis. The post-demonstration post survey will preferably include the same families.

The aims of the survey have been defined as follows:

In the SAMPO project the survey will identify the user groups :

- to identify the needs of user groups
- to get a right and suitable product in demonstration and
- to find right ways for information

The Finnish user groupings are:

1. ‘Alternative for a car’. These are the ‘common end users’. They are extremely important, because of the lack of ordinary public transport service over wide geographical areas. Especially, this group includes the feeder traffic to trunk lines, full tariff (paying for self) passengers on SAMPO buses, shopping trips, work-base trips and hobby (sport, theatre, music etc.) and escort trips. This group is possible to access through a random sample questionnaire. Private firms and public authorities/communities. This will be divided into two categories for the purposes of the analysis is so far as some bodies are interested in optimising the desired service, whereas other bodies simply pay the bill for the services.
2. Disabled and elderly. A lot of the members of this group are the members in groups 1 and 4. It is important to examine them separately because their transport-related costs are rapidly growing in the budgets of municipalities. All members can be found from the registers of social services, and a sample is taken.
3. Health care trips (A part of the groups "end users", "operators" and "authorities"). Most passengers of this group are in other groups, but in Finland the usage of public money is so great for this travel, that special attention is needed. This group will be handled through group interview.

The second target group is those users who pay some (or most) of their travel costs.

4. Active Destinations (shopping centres, sport halls, theatres) added with transfer points (park and ride, bus stations, railway stations).
5. Operators. The biggest need is for information and evaluation purposes. Some rail and bus operators are chosen, as well as a sample of taxi operators.

Methodology for establishing user needs at the Irish test site

The Irish User Needs Analysis was primarily based on group discussions and interviews with both organisations and representatives of the different User Categories.

A Local Reference Group (LRG) was established in early 1996 in the general test site area of Kilkenny. The composition of this group included representatives of end-users, the main authorities and agencies in the region, operators, industry and social/leisure organisations. The objective was to ensure that the LRG was representative of the region, that it could provide the needed input to the project and could offer a mechanism for discussing the concepts of DRT and SAMPO within the community in which it will be implemented. This approach has been considered very successful and will be replicated in other regions where DRT services are planned.

Two full meetings of the LRG took place during the User Needs Analysis process and these took the form of Discussion Groups. The LRG was subsequently briefed on the outputs of this exercise. In addition, numerous meetings took place of sub-groups of the LRG to discuss the needs for specific sectors (e.g. operators, regional development, end-users).

It was decided at an early stage that all data collection for User Needs Analysis would be gathered on the basis of such discussions. The reason for this being the time and cost factors involved in pursuing other avenues of data collection which may in the end prove to be quite limited and statistically unreliable. The derived needs are therefore ‘subjective’ as they are the result of dialogue. There is however a structured basis to the selection of the user category, of the representative, and to the discussion. However, the results are not ‘scientific’ in that the LRGs have not been selected
using procedures which would avoid unbiased representation. The Project Team and the LRG have undertaken to consider doing statistically valid work in the future.

In most cases, the user needs were obtained through discussions with representative bodies or organisations which were in a position to express the needs of the appropriate category. There is a certain risk that the outcome of this analysis may result in the needs of the administration being prioritised rather than those of the user. The structure of the discussion groups is designed to balance this by ensuring that there is broad community represen-

tation. Everyone within the group is a user in a way other than what they formally represent, and this allows enhancement of the view of the individual representative.

In addition, a large number of one-on-one interviews were held with organisations, with representative users, and with targets whose needs were not fully explored in the Discussion Groups. (It was recognised after running the Discussion Groups that some individuals did not participate fully, some for personality reasons and some due to their relationship with other group members).

One message coming from the feedback from the local community is that the overall level of involvement, the openness of process, the provision of consultation and the perceived accuracy of the analysis are not typical of the transport or many other sectors. Because of this positive experience with the local agencies and politicians it is a process which is worth replicating elsewhere.

Methodology for establishing user needs at the Italian test site

The following methods for establishing user need have been determined:

informal interviews with city administration and healthcare authorities representatives (before and after; Florence, Campi);
informal interviews with city administration representatives (before and after; Siena);

- informal interviews with tourists (Siena);
- survey of all disabled people requirements, from application forms filled by applicants (Florence);
- questionnaire surveys (before, current users of scheduled service in Campi; after, in Florence and Campi);
- O/D matrix from 1991 Census (Campi);
- interviews with operators (before and after, Florence, Campi, Siena);
- car and coach parking statistics (Siena);
- passenger counts (after, Florence, Campi, Siena);
- interviews with drivers, dispatchers (before, after; Florence, Campi, Siena).

Methodology for establishing user needs at the Swedish test-site

The Swedish test site has established a significant effort for the definition of the User Needs Analysis.

The greatest effort has been made for the scientific determination of the needs of the End-Users - i.e. the passengers. This has focused on the users of the Special Transport Services and the potential users of the new service, FlexRoute. These are mostly Elderly people, although there are some persons under the age of 65 who are also entitled to these services.

A market analysis was carried out with a postal survey in Högsbo (activity district in Gothenburg) in December 1995 covering 100% of the eligible STS users and other elderly people (a total of about 5 300 persons). The response rate was 60%. From this survey, a further sample of 300 persons (which had shown an interest in the FlexRoute service) were selected for a more detailed analysis in September 1996 as a part of the pre-demonstration data collection for evaluation purposes. This will later be used for updating and strengthening the UNA as it is presented in this report.

A similar survey (as the one to be done in Högsbo in September) was carried out in February 1996 in another in another district, Biskopsgården, with a postal survey to a 300 person panel which are assumed to have the same basic needs as the residents of Högsbo. About half of the sample was current STS users and half were other potential users of the new FlexRoute service. The response rate was 80% although some individuals did not complete all questions.

Special exercises with group discussions and testing of an early prototype end-user interface for automated bookings of trips was carried out with three groups of end-users (a total of 18 people).

In addition to the scientific study of the end-users, Group sessions have been held with all the relevant actors within the total system :

- at the 'political' end : the Special Transport Authority, Travel and Traffic Authority and City District Board
- at the 'executive' end : Health Care Administration, Special Transport Services, Public Transport Administration, City District Administration, Housing companies and merchant associations
- at the 'operational' end : Transport Company, Travel Dispatch Centre, Dispatchers and Drivers.

Primary user needs for DRT

This section examines some of the primary user needs which have arisen from the work in the individual sites. Each site has adopted its own methodology, within the general SAMPO framework, so the outputs from each are not directly comparable. It requires a further exercise to synthesise a global set of user needs. Part of this further work will take place through the Evaluation process within SAMPO, and additional work will be done through interaction between the SAMPO project and other projects and Users within the public transport industry.

The user needs are considered under four main topics :

- transport policy
- core needs of the users
- potential conflicts
- critical factors for DRT

<u>Transport policy</u>

Transport policy is relevant to three main groupings :

1. At European and national level there is a need to develop and implement effective measures to achieve modal shift as part of the effort to reduce the impacts of private car travel. This relates to needs for energy saving, emission reduction, congestion reduction, and economies. Flexible transport service are seen as providing a further element in the transport supply.

2. At national and regional level, citizen issues such as mobility, quality of service, the required level of public service involvement in provision of transport services and funding and local development become most relevant as there is the direct political accountability for the offered transport supply.

3. At local level ensuring the provision of transport services to citizen groups such as the elderly, disabled and people in low-demand areas becomes the priority transport policy issue. At this level, the main actors are the municipalities or county councils, and the functional agencies.

Core needs of users

The core needs of the users focuses on the two main user categories involved :

1. the 'end-user' or customer : the main motivation for the end-user is to have adequate access to a range of activities and locations to which (s)he chooses to travel. This means having suitable transportation of acceptable quality.
2. the operator : the main motivation of the operator is to generate business which covers the operating costs and provides surpluses for either profits or reinvestment.

The main needs consistently expressed across the sites for these two groups are shown in the following table :

End-Users

- Wide range of destinations/coverage
- Easy access to services (walk, wait)
- Responsive to personal needs
- Accessibility of complete, reliable information
- Ease and speed of booking
- Last-minute booking
- Reliability of service and arrival time
- Assurance of the return journey
- Minimum deviations/delays on the route
- Ease of boarding and space for luggage, shopping
- Access to other modes, but minimise transfers
- Maximum operating hours
- Reasonable pricing structure

Operators

- Viable, sustainable services
- Maximise patronage
- Develop new markets
- Cost efficiencies in service provision
- Maximise occupancy/minimise dead running
- Quick start-up period for new services
- Suitable/improved technical support systems
- Integration with other modes/routes
- Effective/efficient Travel Dispatch Centre
- Fair allocation of work, costs and revenues
- Freedom to continue to develop own business
- Ability to expand coverage area
- Ability to accept non-booked passengers

Conflicts

Generally speaking, the responses from the User Needs Analysis exercises at the different sites has been very positive all round. In most cases, the different user categories can all see benefits from the proposed means of implementing the DRT. This suggests that the actual response in practice will also be very positive.

In a few cases, however, potential conflicts have been identified. Some of these may be a matter of perception, or may be reduced by fine-tuning after implementation. It is still worthwhile to list these issues and the concerns that the different groups appear to have:

- Regular passengers of the previously fixed-route service may now experience delays and uncertainty about arrival times of the service, although the new users may be very happy about the changes.

- Users who have become familiar with an existing system are faced with either a new task, or a modified task in having
- to book the service. They may perceive that there is no new benefit for them in the change of the system.
- The providers of the DRT require the user to make a telephone call. There can be conflict about who should pay for the call, either having it toll-free, user-pays, or included in the service price.
- Ideally the service-provider would like the end-user to make fully automated bookings. The end-user however still prefer to speak to the call-taker / dispatcher.
- DRT services will give people in rural areas and villages better access to shopping, leisure and other facilities over a wider range of destinations. Owners of local shops, pubs, etc. fear that they will lose their core 'local' business, and that they will finally have to close. This may actually leave villages without any facilities. On the other hand especially in rural
- areas, the scattered local business are accessible with marginal effort and at very reasonable fare.
- Service providers seek to achieve economic efficiencies through using DRT. It is expected that this will allow a greater quantity of service for the same resources. Drivers and contracted operators fear that in fact the same amount of service will be provided using less resource. This would impact on the number of jobs on the sector, and perhaps also on the salaries.
- Users of the high quality Special Transport Services (shared-ride taxi in Sweden) may see the introduction of a more route oriented concept (FlexRoute) as an unacceptable service drop. This raises the policy question if a parallel STS option should still be available when Flex-Route is introduced in a district / region.

Critical factors for DRT

It is only possible to speculate at this stage which are the critical factors for success of DRT. The limited experience of the existing services in Belgium, Italy and Sweden give some practical indications, and the expressed user needs from the five sites give further suggestions. It will be a key element in the evaluation process of the demonstrations to determine which are the critical factors involved.

The experiences to date suggest that the critical factors include :

Preparatory

- accurate understanding of the market, the users and their needs in the implementation site
- good local groundwork, planning and preparatory actions
- development of the right product according to the user needs (see above)
- provision of suitable image and customer communication

- awareness and ease-of-use for customers of information about the services
- provision of acceptable booking and notification procedures for the return trip
- support/interest of the relevant transport operators and framework for co-operation

Implementation

- assurance of finance over the start-up period
- development of sustainable market within a reasonable time period
- establishment of user acceptance for the new product
- ability and willingness to adapt and fine-tune the service
- retention of most users of existing services while generating the new business
- efficient communications and optimising technologies
- support services for the user
- personal marketing concepts

Although pricing has been mentioned by the users, it does not appear to rank as a critical factor in the success of the services. This needs to be examined in the demonstrations.

Annex D: Results of extended User Needs Analysis

Extended User Need Analysis - Gothenburg site.

Objectives

The purpose of the extended UNA is to investigate the need and opportunities for a cost-effective flexible public transport service which could be performed with Demand Response Transport (DRT) in Gothenburg, Sweden. Other opportunities to be explored are to increase the personal security and to reduce the environmental effects of public transportation.

Method

The study is based on interviews and group discussions around the subject 'DRT-new user opportunities'. Politicians, civil servants, passengers and vehicle operators have been interviewed in November 1997. The questions discussed where as follows:

- are there any unfulfilled needs regarding public transport in Gothenburg?
- for whom ?
- what kind of trips does this involve ?
- what time of the day does this concern ?
- which areas of the city does it involve ?
- can DRT service fulfil some of the needs ? when, where and how?
- how much are we willing to pay for the service?
- how should the reservation-system (i.e. the request for service) be organised ?
- how much variation in both distance and time is accepted by the passengers?
- should a feeder service to other routes exist ?
-

Results

The different groups of people that were interviewed had different opinions about what services they would like to be provided with. Everyone agreed though, that the concept of a flexible transport service would suit those who wanted to reduce the distance between the bus stop and their front door. This was especially true for sick people and those with walking disabilities. Also for people with luggage. Finally, it concerns those who do not feel secure on the street during evenings and nights.

The trips that were discussed both concerned trips travellers paid for by themselves and those society pays for, for example school-trips and medical trips.

The following is a concentrate of answers from the interviews and the group discussions:

There where different kinds of suggestions on possible users: besides the elderly and the disabled (already well covered in the STS and FlexRoute services), the analysis identified other people in need of medical attention, school children, students, workers, tourists, single parents with small children and single women in evening and night travel.

Especially single parents with children in their carriages saw a new possibility with this new transport concept. Today a normal bus is not allowed to take more than 2-3 child carriages. Several of the interviewed parents have a constant fear that these 2-3 places are occupied and they will have to wait for the next bus. With DRT service they can book their space in advance and then be assured there is a space left for them.

Another suggestion is to combine some suitable goods pick-up and delivery with passenger transport, thus making the DRT vehicle a Multi Purpose Vehicle (MPV). Especially on routes between public administrations and government services such as hospitals. This would make it possible to make more efficient use of the vehicles and to enhance revenue on such services. Most different kind of trips were seen as suitable for use of the DRT concept although some have a higher potential than others. Working trips, school-trips, shopping-trips, leisure-trips, evening- and night-traffic are feasible. Especially the evening and night traffic was heavily discussed since the security in the normal public transport and even in taxis is questioned particularly for single women and young persons. People clearly see in DRT a new possibility to be transported in a safer way.

Figure 1 below shows some of the potential DRT users and their trips. The labels stands for VH=Very High, H=High, M=Moderate and L=Low relevance for DRT.

	healthcare trips	**leisure trips**	**shopping trips**	**school trips**	**work trips**
elderly	VH	H	VH	-	-
disabled	VH	VH	VH	VH	VH
otherhealthcare patients	H	-	-	-	-
school children	L	L	-	M	-
student teenagers	L	H	M	L	-
single women (evening/nights)	L	VH	M	-	-
parents with small children	VH	VH	VH	-	-
tourists	L	H	L	-	-

Figure 1. Relevance of flexible DRT services for various user categories and trip types

During the interviews it also became clear that people are willing to pay extra for the door to door service that can be provided with DRT, even one or two coupons more than the normal bus fare. The willingness to pay was also connected to the distance. The only thing that made the participants in the discussion groups confused was the question; how much longer trips (deviations) can you accept? They where aware of that the bus had to run further to be able to pick up all the people at their homes and to increase utilisation, but they did not want to sit in the bus ”too long”, it had to be a balance.
When it comes to the booking of the trip it was not regarded as a problem to book the trip by telephone. Some people mentioned that in their perception it is not more problematic to find a telephone and book the trips for the DRT vehicle than for a regular taxi. But they are not willing to wait for the bus more than one hour, preferably 15-25 minutes. It was clear that the interviewed people saw opportunities with the DRT concept, it could be used for different user categories and for different trip types during the day, Figure 2 below.

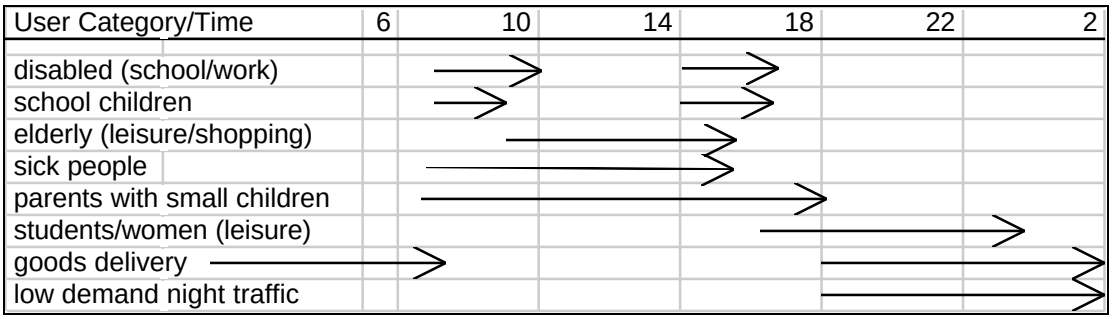


Figure 2 . Potential use of a Multi Purpose Vehicle, providing DRT service for different user categories during the day.

DRT could serve different purposes during rush-hours and low demand periods. It should be possible to change the transport tasks and the ”routes” after various needs.

DRT can run as a feeder service, flexible service route, area service or general route deviation. In order to improve the service at the same cost as current regular routes a flexible route could replace two parallel bus lines or one bus line with low utilisation. It could also provide a ”minimum transport service” in sparsely populated areas such as suburban and semi-rural districts in Hisingen or in the South West all day or only during low volume hours. A new DRT feeder service could be introduced to reduce the length of a trunk line. Of all the above opportunities it is mainly a co-ordination of all the trips paid partly or in full by the society, where DRT services will reduce the cost for transportation. This includes the heavily subsidised low demand services in sparsely populated areas and in off-hours.

But public savings can also be realised by combining goods delivery and public transport. It is however much harder to find justification for other

user categories and types of trips such as work trips (except for those disabled persons whose trips are paid for by society)..
Finally, the DRT concept can be used for totally different types of traffic, someone even suggested that it could be an interesting alternative to operate flexible boat traffic (shared taxi boats) in the archipelago during the winter when demand is low.

Annex E: List of deliverables and papers produced

SAMPO Deliverables List

Deliverable ID	Title	Work-Package ID
D8.1	Evaluation plan for the SAMPO project	WP8
D3	Analysis of user requirements for DRTS	WP3
D4	System Architecture, Functional Specifications and their Assessment Methodology for DRTS	WP4
D5	Design and integration issues regarding the use of ATT for DRTS in the SAMPO project	WP5
D6	Report of the Verification Phase of SAMPO	WP6
D7	Demonstration of DRTS in five SAMPO sites	WP7
D8.2	Results of the evaluation of the SAMPO demonstrations	WP8
D9	Recommendations concerning the market, operation, organisation and business case of DRTS	WP9

Annex F: National summaries of demonstrations and conclusions

SUMMARY AND CONCLUSIONS OF THE BELGIAN DEMONSTRATION

The SAMPO project has facilitated the introduction of DRT services on a large scale through modifications and extensions of the Ring software and other elements of the DRT system.

The Ring software enabled De Lijn to integrate DRT services as a kernel part within the dense PT network. These demand responsive services fulfil the major conditions of a public transport as a valuable alternative compared to other means of transport. In some way, DRT services come close to the service offered by taxis, but at a fraction of the cost.

Today nearly 20 areas throughout Flanders rely upon the BelBus services. As known, most of these areas concern rather rural municipalities and sparsely populated non-urbanised regions.

It goes without saying that this new concept of public transport has nothing but received positive feedback since all parties benefit from it. Travelling possibilities have been extended considerably, the municipalities are able to
relieve their citizens' basic mobility needs and De Lijn faces an increased supply and improved image without drastically expanding operational costs.
Part of the whole DRT concept is a continuous information campaign which, it seems, should be highlighted at least three times a year. Promotional actions such as special rates for the elderly, gifts and special offers from local traders or free rides offered to regular users of the BelBus, should be considered with a view to broaden the scope of DRT.

To promote the Ring software De Lijn has already undertaken several marketing actions on the international platform. Different transport companies attended the demonstrations of the software in the offices of De Lijn and at
congresses. A full-colour brochure has been printed in English, French and German and has been sent to all concerned fellow companies in Europe. Furthermore, De Lijn attended the second City Transport Exhibition of the UITP in Stuttgart.

During this exhibition, demonstrations of the Ring software were attended by numerous representatives of public transport companies e.g. from Norway, Great-Britain, Denmark, Hungary, Portugal, Germany, Canada etc. Again a considerable amount of journalists were invited at a demo of the Ring software and visited the booth of De Lijn. Relevant articles on DRT will be published in different magazines in October and November 1997.
Other marketing actions are planned to promote the Ring software such as further participation in international fairs, the release of a tutorial CD, making a video, publicity via Internet.

At this moment the Ring software is installed in 3 exploitation units of De Lijn where DRT services are implemented. But the Ring software is also implemented and tested in a Finnish pilot site. The specific evaluation will
be starting at the end of 1997 regarding the Ring software as well as the concepts of the DRT system.

Software needs to follow very closely the user needs, which as everybody knows, evolve and modify at a very fast pace. Due to feedback from users within De Lijn and its customers, and of other users of the Ring software (national and international), the modules are permanently upgrading and extending. Therefore De Lijn has a development plan for the next two years to improve the Ring software by adding new functionalities and new modules. As a result of that, new releases and new modules of the Ring software will be available on a regular base.

SUMMARY AND CONCLUSIONS OF THE FINNISH DEMONSTRATION

SAMPO demonstration period from 27 February to 31 July 1997

The Finnish SAMPO demonstration site consisted of two different locations - Keski-Uusimaa and Seinäjoki. The common travel dispatch centre for both sites was located in Jyväskylä. SAMPO demonstration phase started on the 27th of February 1997 and lasted till the 31st of July 1997.

In the Keski-Uusimaa site, SAMPO operated without any fixed route or schedule while in the Seinäjoki test-site it operated on fixed route and according to a fixed schedule. SAMPO served customers from stop to stop. However, it did pick up and drop off disabled customers at desired locations.

SAMPO received both positive and negative feedback from the customers utilising the service. Especially at the Keski-Uusimaa site, most of the feedback was positive, since the travelling possibilities considerably improved for the rural areas.

Problems with technology caused complaints in the beginning of the demonstration period, but as the system improved, the feedback became more positive.

Tight schedules had an impact on the system, and software was not totally complete when the system was opened to the public. Ideally, the system should have been in use for a trial period with a smaller group of volunteers. A few failures at the beginning of the service scared off part of the potential users and they lost interest in trying the new service again.

Other complaints were that the price of calling the TDC to make bookings was too high. Customers did not want to make orders due to this. This problem was solved after the official SAMPO testing period as the calls have been free of charge from August 1st onward.

At the Seinäjoki site, where SAMPO vehicles operated on semi-fixed routes, many of the passengers did not call TDC to make bookings prior, but just came to the stops. This was convenient for the passengers but did not give enough data to TDC.

The publicity project would have needed more time and effort. Although brochures were provided to homes, and there were articles on SAMPO in local newspapers and radio, there were still very many people who did not know what SAMPO was or how to use the services.

The training of drivers, hospital staff etc. would have needed more time. The simultaneous introduction of a smart card based payment system and the SAMPO system was rather demanding for drivers in the beginning.

The demonstration period - being only a bit more than five months - was too short of a period of time to get people to know about and use SAMPO services, and to come forth with the results of a fully working system. The SAMPO services, however, continued on both sites after the SAMPO demonstration phase.

The information campaign to Kela (National Health Insurance Institute) and to the hospitals would have needed more time. To get good results, the site area should however have been larger in order to get enough passengers travelling in the same directions.

One of the very positive things in SAMPO was the successful co-operation between the taxi and bus sectors during the project. Altogether, the co-operation between different parties was working very well.

Continuation of SAMPO

SAMPO services have continued also after the ending of the official SAMPO demonstration period. The Seinäjoki test-site has already been enlarged with one new service area where there has not been prior public transport services. Also in the Keski-Uusimaa test-site the service area will be enlarged to cover the whole municipality of Tuusula.

The Keski-Uusimaa test-site will continue as a test-site in another project, SAMPLUS, which is a continuation project for SAMPO and which will focus on the institutional, organisational and functional matters of multi-mode DRT services. The project will start at the beginning of year 1998 and it will continue till the end of July 1999.

The SAMPO transport of the Seinäjoki test-site is continuing and will continue as a national project. The current service area covers almost 40 % of the area of the town of Seinäjoki. In addition to development of the services for its citizens, Seinäjoki concentrates in developing a good transport system for the patients of the two hospitals in Seinäjoki. The area which is included in SAMPO hospital transports at present is four municipalities but in the future, it is going to be the whole district of the central hospital’s area of operation, that is 27 municipalities.

Technology has improved reducing mistakes and communication problems. This relates to the customer as better and more reliable service, and the feedback from customers has been quite positive on both sites. Some other modifications have been made to the SAMPO transport concept. For example, the price of the call to TDC has become free of charge, and the ticketing system for SAMPO trips has been simplified. People start to be more

familiar with SAMPO due to the longer period of operation and a new publicity campaign has also been started on both sites.

SUMMARY AND CONCLUSIONS OF THE ITALIAN DEMONSTRATION

In Italy 45 % of the users are shoppers travelling from Campi Centre to the new shopping centre “I Gigli”. A significant number of workers use the DRT service from Campi to the “I Gigli” (25%) while 20% of the users are workers travelling to other destinations (mainly S. A. Lecore).

Although the DRT system only has been running in the Campi service area since June 97 a very positive response was given by the Campi local Authorities and the citizens to the “PersonalBus” service provided by ATAF. Particularly, the following general conclusions can be made:

- the number of users has been increased in comparison with the previous service;
- the phone booking procedure, after a first period of adjustment, reached a good steady level both from the point of view of the user needs and operators’ reaction;
- the service will be extended to the entire territory of Campi town from 15th October 1997. PersonalBus will cover the “Rosi” and “Miccine” hamlets and the new factory of the Florence newspaper “La Nazione”;
- the industrial service has become settled in this period, showing an increase in the number of passengers.
- the achievement of the first step for the realisation of a DRT Agency serving the entire Florence metropolitan area including also private transport service providers.

Finally, the introduction of the SAMPO service in Campi resulted, on the one hand, in a close co-operation with the Campi Local Authorities and, on the other hand, the request of this kind of service by another two towns of the Florence metropolitan Area (Calenzano and Sesto Fiorentino).

SUMMARY AND CONCLUSIONS OF THE SWEDISH DEMONSTRATION

General

The Swedish SAMPO demonstrations have been successful both in terms of reducing the requirement for public funding for STS taxi travel and increasing the mobility and participation of those elderly without STS permits. The new DRT travel concept of Flexible Service Routes (FlexRoute) has been well received by the users and has a great chance of becoming a permanent travel service and being expanded over the whole city. In fact the SAMPO operation has been extended at least through 1998 when there will be a total reorganisation of public transport and STS in the western region of Sweden.

Representatives from several other cities have also visited to learn from the Gothenburg experience. The demonstration has given valuable input to the national efforts (incl. new legislation) to reduce cost for STS and is often cited as an example of how different authorities with different jurisdictions over separate transport services can co-operate to improve overall efficiency.

Economy

A simple economic evaluation model has been designed for the FlexRoute operations.
It considers the following items:

- cost for FlexRoute bus operations procured on a competitive basis from external operators
- reduced costs for STS shared ride taxi operations from modal shift to the minibuses
- income from STS tasks performed by minibuses when there is no demand on the route
- fare revenues from travellers.

During the last month of demonstration almost half of all local taxi travel previously done by STS eligible persons in Högsbo was handled by the FlexRoute buses. The reduced taxi costs covered about 20 % of the operating expenses. Fare revenue another 20 % and extra work in STS operations almost 10 %.

Though less expensive than taxi, the FlexRoute service is still considerably more expensive than regular public transport, and further improvements are necessary to increase productivity both in terms of transported passengers per vehicle hour and efficiency in the TDC. The project has given valuable insight and produced several suggestions for system enhancements. The two test sites are isolated islands in the city landscape. A full-scale implementation with connecting FlexRoutes would most likely improve the concept further.

In order to benefit maximally from the FlexRoute potential, there is a need for regulatory reform restraining the extensive use of STS taxi in Gothenburg. Such changes could include:
a restriction in the use of publicly funded taxi travel in areas and during hours where FlexRoute is available and/or
a change in fare policy for STS so that there will always be a marginal cost for the user when ordering a publicly funded taxi trip. Then there would also be a fare incentive for using the more efficient mode of transport.

With such system improvements and regulatory reform it is expected that About 75 % of the operating expenses of a future permanent FlexRoute service could be financed by cost savings in existing services and fare revenues. The remainder will probably be more than paid off by the cross sector benefits such as increased participation in society, reduced medical costs from increased mobility and the possibility for the elderly to continue to stay on in a familiar and popular district.

Operations

Service minded and friendly drivers and TDC operators are one of the key success factors for DRT. Therefore training is a key factor for smooth operations. At the Gothenburg site this was a difficult issue since the TDC policy at STS was to have a rather extensive job rotation in place. At times some 20 TDC operators circulated between regular STS duties and the special FlexRoute desk. Similarly one of the two small bus companies contracted for the FlexRoute traffic also had job rotation between FlexRoute and Tourist buses and sometimes employed not fully trained temporary staff.

When contracting with private operating companies for any kind of Service Route operation (DRT or regular route) it is necessary to clearly specify the detailed requirements for a driver profile, e g service minded, calm and friendly with the customers, but perhaps also technical skills if the DRT service include telematic functions with a PC in the vehicle.

Marketing is extremely important when implementing a new service. This can sometimes be frustrating in a demonstration context, since you want the technology to be very reliable before you go out with heavy promotion. If you promise much more than you can deliver there will be a back lash and it will be difficult to regain customer confidence. The issue of proper verification is extremely important. It appears as if the information campaigns and the different promotion activities used at the Gothenburg site have been appropriate and effective.

User acceptance

Two different surveys with users of the FlexRoute system have confirmed an extra ordinary high user acceptance and satisfaction with the DRT concept of 'Flexible Service Routes'.

The overall rating of the service concept was 9.5 resp 9.6 on a 10 scale for the two surveys. Service minded drivers and low floor accessible minibuses are the key success factors but also the service of the TDC operators and the opportunities for social contacts in the buses were highly rated. On the low end (still rated over 7) were the fact that there was a need to make a booking and the flexible schedule and its negative effects on occasional needs for a more firm arrival time. The only weak point in the FlexRoute concept seems to be the service to firm appointments (e.g. to the doctor) when some passengers in low demand periods may arrive up to half an hour too early. On the other hand the travel times and adherence to pickup times were rated in the middle, slightly above 8.

As for user acceptance of the new telematic functions it appears that the trip notification concept, to give an automatic forewarning to passengers 15 min before pick-up time) is well received,
although focus group discussions have questioned the reliability in some cases.

The automated booking on a touch tone phone (via Interactive Voice Response System) has been rather well received as a concept after modifications to make it very simple for the two standard trips (from home to a given point with next bus, and the reversed homebound version). The rather limited use (<10 % of all passengers) is assumed to be related to the fact that the planning algorithm sometimes does not assign the passenger to the best choice of bus (from the customers point of view but rather from a productivity point of view).

End-user telematics for elderly persons must be used with care, as this group is not used to telematics and there is still a great deal of conservatism towards such "novelties". This is also reflected in the rather slow pace of modal changes that has been experienced in SAMPO. To validate new concepts for this user category, the demonstration period should well exceed a year.

Annex G: References

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