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0 Executive summary

This report describes the outcomes of the state-of-the-art analysis of public transport (PT) development in Europe that has been undertaken by the VOYAGER project in Workpackage 2. The state-of-the-art report identifies the major current trends of PT in Europe and analyses the existing key problems and solutions of PT on the way to more efficient and effective PT systems and increasing PT patronage.

The content of this state-of-the-art report has mainly been provided by the state-of-the-art reports of the 6 VOYAGER Working Groups (WG), dedicated to the following PT relevant topics: Market and customer relations (WG1), Infrastructure and rolling stock (WG2), Roles and structures of PT actors (WG3), Seamless intermodal networks and services (WG4), PT and ITS use (WG5), Training and human resources development (WG6). In addition to the six WG reports, a CEE state-of-the-art review has been carried out, which provides CEE-specific information related to the priority issues of the Working Groups.

The structure of this state-of-the-art report is based on the different sustainability categories as defined by the World Bank. According to this definition, a sustainable transport policy has to respond equally to the efficiency demand of economy (economic and financial sustainability), to the social demands of individuals and society (social sustainability) and to the protection demand for the environment (environmental sustainability). All different PT related topics, which are elaborated in this state-of-the-art report, are structured according to their relevance with respect to these categories of sustainable transport.

PT and economic sustainability

Some of the main trends that currently affect regional and urban public transport (PT) are the increasing deregulation and privatisation of PT and the scarcity of public money. For the following areas, which are all expected to be relevant for achieving a more economic sustainable PT, existing trends are described.

Analysis of PT market and customer's perspective. The report gives an overview of the commonly used indicators for describing the role of public transport within the transport market. Moreover, the different instruments for the description of the transport market are described as well as the latest status of knowledge on the reasons for and against the use of PT.

Organisation of the PT sector. Major trends and problems related to the introduction of competition, contractual arrangements, emergence of new actors and the organisational integration of PT have been identified.

PT infrastructure. In this section, latest trends related to the development of PT networks and interchanges and to the design of dedicated lanes, lane or track sharing are shortly described.

Rolling stock. This section outlines the current use of rolling stock systems, the emergence of new systems for diversified PT services and new guided PT systems.

PT operation. Latest developments in the areas of fleet management, traffic signal control and bus priority and IT-based Demand Responsive Transport (DRT) services are presented.

Training and Human Resources Development. Actual trends related to the management and development of staff in PT companies are described.

PT marketing. Marketing strategies and the range of different marketing tools, which can be used by PT companies in order to improve the satisfaction of customers and therefore stop the decline of patronage, increase the number of clients or make passengers more loyal, are presented.

In the above mentioned sections of the chapter "Public transport and economic sustainability" many existing problems have been identified. The most important problems are summarised as follows:

- The analysis of the PT market and the customer's perspective of PT which is an important basis for planning efficient PT systems, is often characterised by weaknesses in terms of planning and implementing surveys and using and comparing the survey results. This means that PT can often not respond adequately to the changing activity patterns and demands of the customers.
- With the introduction of a form of competition there is a general fear, that due to cost saving pressures, social and wider community needs will lose attention. Furthermore, the introduction of competition can lead to an unfavourable PT market environment (e.g. preferential position of the former, mostly public owned PT operator in the market or dominance of few large international companies in the opened markets).
- Related to contractual arrangements a main difficulty is the combination of the binding nature of a contractual agreement with the flexibility for the operator required for developing better services. Another problem is linked with defining the right duration of contracts.
- The organisation of PT is characterised by an increasing number of actors due to the diversification of PT services. With an increasing number of different PT actors, who can sometimes have conflicting interests the development of integrated customer-oriented services is getting more difficult.
- Many authorities are reticent to transfer certain legal allocated competencies to an integrating regional authority. Moreover, the co-ordination of PT policies and other urban policies (e.g. land use planning, economic policies, etc.) is mostly not well developed. Although widely discussed, examples of true integration are scarce.
- Improvements of the PT infrastructure are often difficult to be implemented due to a lack of investment. PT stakeholders are often reticent about investing in the improvement of the design of interchanges due to high costs. The positive effects that new or redesigned interchanges can have on the efficiency of a PT network (due to time restrictions) are often not perceived. Especially the importance of small or "informal" interchanges for promoting intermodal trips are often not fully appreciated.
- Many new rolling stock systems (e.g. guided systems on tyres), which are considered to be important for diversifying the market offer and to be more competitive, are still in an experimental phase. The first projects turned out to be more expensive than expected
- Within the area of PT operation, there is often a low integration of operation management systems into overall company management systems. Another problem relates to the lack of political support, adequate funding and co-operation between authorities and bus service providers for implementing traffic signal control and bus priority systems .
- There is a tendency to dedicate less money to Human Resources Development. In terms of Management Development, many PT companies have difficulties in hiring high level managers, since they are competing with other industry sectors. Little attention that is paid to the development of middle management staff, although they are usually playing a key role in implementing changes in companies. In particular amongst small PT companies and companies from CEE, there is a lack of career and training programs.
- In the PT sector marketing is often seen as a cost factor and not as a measure to increase the income of the company. Moreover there is a general lack of integrated marketing strategies, especially in smaller PT companies. Co-operation between the marketing department and other departments of the PT company (especially the human resources and sales departments) is often very limited.

PT and financial sustainability

PT financing, which is needed for covering operational costs and investments in PT infrastructure and equipment, is an issue of high priority, especially in CEE countries. PT financing means

include transport users contributions, contributions from public sources and public companies, contributions from other beneficiaries and private sources.

Operational coverage. Transport users contributions are the most common source of financing across Europe, although in most cities they cover only a minor part of the operating costs. In general, the costs that cannot be covered by the revenues of the PT users are borne by public authorities. The different kinds of setting PT fares in Europe as well as the sources of public funding are described.

Infrastructure investments. With the increased competition of the PT market, many examples exist, where for the financing of PT infrastructure, stations or operations, private actors have been involved. The chapter briefly presents the different types of public and private funding, such as private loans and public private partnerships.

Related to PT financing the key problems that have been identified in this report are:

- Lack of reliable and sustainable operational financing models in particular for PT operators in CEE countries. Many operators are facing high revenue risks due to unreliable loss coverage by public authorities. Furthermore, important investments to modernise the ageing rolling stock, adapt existing infrastructure to modern standards and expand PT services are not taking place in these countries, due to the scarcity of public funds and viable alternative sources.
- With respect to the introduction of competition, an important problem is the unclear and unequal allocation of subsidies and other financial incentives amongst the PT operators. Very often the allocation of subsidies amongst PT operators is not based on the types of services offered by the operators, but consists of gross covering of the operator's debts at the end of the accounting year.
- Private funding options, such as PPPs, can only be used for specific stand-alone projects, which are operationally profitable. The major concern, when using PPPs for transport investments is the allocation of risks between the partners.

PT and social sustainability

Public transport can be considered as a collective mode of transport, which has to respond to a wide range of different needs and expectations. Therefore it is often considered as necessary, that Public Authorities intervene in PT, in order to ensure a minimum level of quantity and quality of services for particular areas and social groups. For the provision of high quality services to the people and in particular to the "socially excluded", the following three dimensions of public transport are of great relevance.

Availability of PT. This section gives an overview of the ways of how PT services are provided in high density and low density areas. In addition to that, the actual status of integrated PT networks as well as the development of intermodal mobility services (e.g. car sharing, car pooling, combined PT and bicycle use, demand responsive services in low density areas) is outlined.

Accessibility of PT. The accessibility of PT services is defined as the ease of the physical access to stops, stations, vehicles and of the access to traveller information. This section presents the general status of physical accessibility of vehicles, stops and stations as well as the traveller information systems currently used.

Attractiveness of PT. For improving the overall attractiveness of public transport, the maintenance of stops, stations and interchanges as well as the setting of appropriate and affordable fare structures or the promotion of user friendly ticketing systems or customer oriented behaviour of staff members are important measures. Furthermore, personal security and feeling safe is an important issue for public transport in many European cities. For all these areas the major trends are described.

Key problems for achieving a more socially sustainable public transport are:

- The in general rigid supply patterns and poor service quality of public transport systems has led to a significant loss of market share over the last decades, since it could not meet the needs and requirements of PT users by offering a certain level of comfort, safety, speed, reliability and flexibility at a relatively low marginal cost, as the car can.
- Many PT operators are sceptical towards the potential of innovative mobility services for improving the overall attractiveness of PT and see these services as being outside their field of competencies, causing extra expense without direct benefit.
- Although there are solutions to the majority of access difficulties in existing vehicles, buildings and in the pedestrian environment, these solutions are only partly implemented due to cost reasons and missing political awareness.
- Traveller information services are often provided without sufficient consideration of the actual information needs of the customer in general and special target groups. The often unclear cost-benefit ratio makes the decision on investing in high quality traveller information services very difficult.
- The attractiveness of PT is heavily affected by a general feeling of insecurity amongst PT customers, which can be caused by inhospitable conditions, such as vandalism, dirt or dark stations, fear of hijacking or terrorist attacks in the PT environment.

PT and environmental sustainability

Due to technological innovations in the automobile industry, the formerly great advantage of PT concerning air and noise emissions as well as energy consumption of motorised vehicles, compared to the cars, has become smaller. There is now a great need to maintain the advantages of PT related to emissions and energy consumption, which are key factors in further promoting the use of PT. The following areas are of relevance for improving the environmental sustainability of PT:

Air and noise pollution. This chapter outlines the new power technologies currently used and tested in the PT sector.

Resource consumption. The different energy saving potentials related to vehicles and fuel technologies and operating practices are presented. Moreover, the relevance of PT on space consumption briefly described.

Environment related marketing campaigns. A brief overview of the current status of environment related marketing initiatives for the use of PT is given.

With respect to the environmental sustainability of PT, the following problems have been identified:

- The introduction of clean vehicles in order to reduce the environmental impacts of PT, is still difficult due to the high competition between clean technologies and less pollution diesel technologies. Fleet operators are often reluctant to invest in alternatively fuelled vehicles which are often more expensive to purchase and for which maintenance and service needs are still difficult to estimate.
- As a consequence of the technological innovations in the automobile industry, the pollution levels and energy-efficiency of motorised vehicles could be improved considerably. Therefore the environment related advantages of public transport have become smaller in the last years. This means that environmental friendliness as one major argument for using PT is less convincing than in the past and environment related marketing campaigns for PT have become more difficult.

Following work steps

On the basis of the existing trends and problems as identified in this report, the VOYAGER project will start its work on PT strategy building for the PT of the future. Workpackage 3 will lead the

activities of the VOYAGER consortium towards future challenges of the public transport sector. The definition of future challenges and the development of policy and research recommendations will mainly be based on the one hand on the identified existing problems (Workpackage 2) and on the other hand on the outcomes of the analysis of external PT relevant developments (Workpackage 3).

1 Introduction

Public transport (PT) plays a crucial role in society since it can largely contribute to more sustainable mobility systems in our cities and regions. A modal shift towards PT can provide considerable societal benefits, including reduced traffic congestion, emission reductions, reduced traffic risk and energy savings. Public transport can also lead to great benefits for the citizens, mainly by improving transportation choice, cost savings and providing basic mobility needs, in particular for non-drivers. In addition to direct benefits, public transport could provide a variety of indirect effects, such as increased economic development and higher property values including near PT stations or more efficient land use patterns.

Currently, the long-term trend towards a decreasing modal share of PT in Europe seems to continue. However, the development of PT patronage depends on many factors, such as quality of services, local policies, local economic developments and lifestyles, which does not allow to generalise the trend of PT decrease. In many, mainly the larger European cities, the market share of PT could be stabilised or even increased considerably in the last years, mainly due to a proactive urban mobility policy.

In most Central and Eastern European countries (CEEC) a modal split clearly in favour of PT was reduced significantly in the early 1990s, when the changes to market economies fuelled a huge increase in car ownership. This drop of PT use has slowed to a steady decline in the last few years in line with steady economic growth and the persistent low social image of public transport

The major challenge for all public transport stakeholders is to find new ways to increase PT ridership or to stop the decrease of PT market share. The VOYAGER project will help to meet this challenge by establishing an open European network of key actors from local and regional PT, including operators, manufacturers, authorities at all levels, researchers and users in order

‘...to create a vision and make recommendations for the implementation of attractive, clean, safe, accessible, effective, efficient and financable European local and regional public transport systems for the year 2020’.

In order to develop a sound vision of future PT and deriving recommendations for future research and policy agendas it is necessary to start from a today’s perspective, analysing the current state-of-the-art of PT development in Europe. This deliverable summarises the outcomes of the state-of-the-art analysis of the VOYAGER Thematic Network that has been undertaken in 2002 and represents one of the major results of Workpackage 2 (WP2).

This state-of-the-art review identifies the current PT trends in Europe and analyses the existing key problems, obstacles and potential solutions for providing more efficient and effective PT systems and increasing PT patronage. This report will give an overview of where the PT sector currently stands on the way to achieving a more sustainable transport and will therefore establish the current scope for action for PT stakeholders. The state-of-the-art report will provide input for the strategically focussed discussion, which will take place in the following WP3.

Structure of this deliverable

The content of this state-of-the-art report has mainly been provided by the state-of-the-art reports of the 6 VOYAGER Working Groups (WG), dedicated to the following PT relevant topics:

- WG1 Public transport market and customer relations
- WG2 Public transport infrastructure and rolling stock
- WG3 Roles and structures of public transport actors
- WG4 Seamless intermodal networks and services
- WG5 Public transport and ITS use
- WG6 Training and human resources development

In order to facilitate the integration of the different WG reports, it was agreed to structure the VOYAGER deliverable on state-of-the-art according to a set of horizontal issues, which are based on sustainability categories as defined by the World Bank¹. According to this definition, a sustainable policy has to respond equally to the efficiency demand of economy, to the social demands of individuals and society and to the protection demand for the environment.

- **Economic and financial sustainability.** PT systems should be efficient and effective, providing cost and production efficiency, they have to aim at an efficient balance between PT demand and supply. As for financial sustainability, funding and pricing of PT services should be financially sustainable. This includes also subsidisation only for social and economic reasons.
- **Social sustainability.** PT systems should be designed to provide the citizens with better travel opportunities and better access to their day-to-day activities, such as employment, education, and health services without being dependent on the car. Accessibility is particularly important for people with reduced mobility or living in remote areas in order to avoid social exclusion. Furthermore, PT systems can have considerable impacts on safety and security of passengers and staff (e.g. reduced accidents, journey stress reduction through better information, etc.).
- **Environmental sustainability.** The development of PT systems can have significant effects on environmental and ecological sustainability. Making better use of readily available and cost-effective technology is important to reduce energy consumption and air / noise pollution, but not in itself sufficient. Strategic action in the form of network design land-use planning as well as stricter traffic management can have great, but indirect impacts on the environment.

All different PT related topics, which are elaborated in this state-of-the-art report, are structured according to their relevance with respect to these categories of sustainable transport.

In response to the specific framework conditions of PT in Central and Eastern Europe (CEE), the VOYAGER state-of-the-art analysis has laid a particular focus on the current status of development of PT in CEEC. In addition to the six WG reports, a CEE state-of-the-art review has been carried out, which provides CEE-specific information related to the priority issues of the Working Groups. The CEE-specific state-of-the-art report is the result of a literature survey, personal discussions with experts in the field, results of the first two WG meetings and the synthesis of contributions from 9 CEE countries, 7 of which were created directly by renowned experts from the individual countries.

¹ World Bank: "Sustainable Transport: priorities for a policy reform", Washington, 1996

Work steps of the state-of-the-art analysis

The six WG specific state-of-the-art reports, which delivered the main contents for this state-of-the-art report, have been developed in parallel by the WG leaders, supported by the expert members of their Working Groups between February and August 2002. The Working Groups were composed of a limited number of external experts (usually between six and eight persons), including representatives of all PT actors from all over Europe.

The objective of the first WG Meetings, which took place in Brussels on 22-23 January 2002, was to agree on the WG specific “hot issues”, issues that currently are of great importance for PT stakeholders, and to discuss ongoing developments and trends. The scopes of the WGs have been fine-tuned in order to ensure that the relevant range of topics is covered without having too big overlaps between the WGs.

Based on the identified “hot issues”, the different WG leaders started their literature analysis in February 02. This analysis included the collection and review of information on relevant RTD projects and programmes at European, national and local level, policy documents and practical experiences, which reflect the current status of development and trends.

At the second WG Meetings, which took place in Lisbon on 20-21 June 2002, the WG experts discussed the identified key problems, obstacles and potential solutions in more detail. Objective of these meetings was to establish the current scope for action by the PT stakeholders themselves and to identify barriers, where currently a lack of policy, knowledge or technology prevents the PT sector from action.

After the second meeting, the WG specific state-of-the-art reports have been finalised and integrated into a draft version of this deliverable. The key findings of the state-of-the-art analysis have been validated with another panel of external experts during a plenary session that was organised in Genoa on 28/29 November 2002. Feedback received from the experts attending this plenary provided the final input element for the VOYAGER State-of-the-art report.

2 State-of-the-art analysis

2.1 Public Transport and economic sustainability

2.1.1 INTRODUCTION

Some of the main trends currently affecting regional and urban public transport are the scarcity of public money and the increasing deregulation and privatisation. In a competitive environment it is essential for the PT sector to ensure economic efficiency and effectiveness of the PT system. A major goal of companies of the PT sector is therefore to achieve a better capacity utilisation of their PT network.

For achieving this goal, the following topics are of great relevance:

- **Analysis of PT market and customer's perspective.** It is important to position PT within the overall transport market, and to analyse the role it could play and the user needs it should respond to. Surveys and studies about the PT market and the customer's behaviour and preferences with regard to PT are the basis for planning effective and customer-oriented PT services.
- **Organisation of the PT sector.** In order to support a higher efficiency of the PT sector, it is necessary to review the structure of the sector. Improved co-operation between actors could help to achieve better outcomes and stakeholders should be put into the organisational place where they can contribute best.
- **Use of infrastructure and rolling stock.** The more efficient use of infrastructure and rolling stock include large potentials for a better capacity utilisation of the PT network.
- **Management of PT operations.** A better planning of the vehicle fleet operations, traffic signal control and bus priorities are important elements for a more efficient PT network.
- **Training and human resources management development.** The management and development of staff in PT companies can play a crucial role in improving and smoothing the services.
- **PT marketing.** After streamlining the existing PT network and organisation it is important to better "sell" the PT service in order to increase the PT market share. PT marketing is increasingly recognised as efficient and effective tool for the future development of PT. Recent major changes in the market environment require a customer-oriented approach that gives marketing a key function in the management of PT systems.

2.1.2 PT MARKET ANALYSIS

The collection and analysis of information about the transport market and the PT customers is the basis instrument for PT key actors to learn about the position of PT in the market and subsequently any need for action. PT market analysis also helps to plan, implement and evaluate any measures taken.

PT within the transport market

Transport market analysis strongly differs between and within the European countries, regions and towns. However, the most common indicator used, is the modal split. The modal split of PT in European Cities differs between less than 5 % in rural areas and small towns and up to more than

30 % in some big metropolitan cities. The probably highest PT shares in Western Europe can be found in Zurich (37 %) and Vienna (34 %).

A more detailed look reveals some interdependencies between modal split and urban structure. PT shares of more than 50 % are not unusual for trips to the city centres of towns with more than 500.000 inhabitants. There is a close relation between the modal share of PT and the size of a town, in general the modal share of PT increases with the size of a town. Big and densely populated towns have a better chance to create high PT shares, however an even bigger influencing factor is how PT is treated in a specific town or region.

A common characteristic of the transport market in the European Community is that changes occur relatively slow. Annual rates of change with the modal shares of more than 1 % without specific influence factors are rare. The following table provides a global picture of the position of PT within the transport market in selected cities of the European Union². Following more details regarding the different PT market analysis tools are given.

City / region	Walking	Cycling	Two-wheelers	Car	PT	Total
Zurich (CH)	28	7	1	27	37	100
Vienna (AT)	27	3	1	35	34	100
Barcelona (ES)	33	1	4	30	31	99
Munich (DE)	23	14	0	38	25	100
Rome (IT)	21	0	12	46	21	100
Leipzig (DE)	26	9	0	49	16	100
Nuremberg (DE)	23	10	1	46	20	100
Nantes (FR)	23	3	2	58	15	101
Ludvika (SW)	25	14	0	56	5	100
Walloon region (BE)	17	2	1	72	3	95
Oulu (FI)	14	26	0	57	2	99

Figure 1 Modal split of selected cities in Europe (Source: Citizens' Network Benchmarking Initiative and Socialdata 2002)

Compared with the European Community, CEE countries show a number of specific characteristics, which are a legacy of historical developments. Major characteristics are the comparatively low degree of motorisation, which has increased fast in the last decade (in 1997 growth of motorization in CEE cities was still on average 10 % per year) and the high importance of PT, which has however seen a fast decrease in the last decade. In a number of countries a very rapid fall in the early to mid-nineties has somewhat stabilised generally to more gradual but still relatively fast decline of between 1 and 5 % per year. The resulting modal share of PT is often well over 30 % for smaller cities with 50.000 – 200.000 inhabitants and sometimes over 50 % for larger cities with more than 500.000 inhabitants.

Besides the modal split, surveys analysing the transport market also should provide information on the following important indicators³:

² Citizens' Network Benchmarking Initiative, Full Project, <http://eltis.org/benchmarking/> 2002

³ Brög W., Erl E., 1996, Can daily mobility be reduced or transferred to other modes, Paper presented at the European ECMT Round table 102, Paris (France)

- Activities
- Travel time
- Number of trips
- Covered distances

The overall trend in Europe regarding these travel patterns is that the number of activities, the travel time and the number of trips have remained nearly constant for the last thirty years. The major development that took place was the doubling of the covered distances. This increase in distance is mainly a result of the increased share of trips made by car, which took place in combination with a decrease of walking trips. The background for this change are the major changes of spatial patterns like urban sprawl or shopping centres development on the outskirts of the cities, which increased the distances between the place of residence, the place of work and the places of other activities. It is important to note that the activity patterns of people are getting more complex in general.

Instruments for the description of the transport market

The most important tools for collecting and presenting data about the transport market are:

Statistics. An extensive wealth of transport statistics exists, in which PT plays a role. They are the main instrument for the general description of the transport market (data-presentation), ranging from statistics that provide information on a lot of topics including transport to statistics that concentrate solely on transport related information or even only on PT related information. Their main purpose is to provide information about the transport market in a clear and comprehensive form. Other important purposes are the identification of changes and developments and the presentation of comparable information for different countries, regions or towns (“Benchmarking”).

Surveys. Surveys are used to identify the role of PT in the transport market and they are an important database for statistics. National travel surveys commissioned and financed by the government are conducted in a number of countries (e.g. Germany, Austria, Sweden, Netherlands, Great Britain, etc.). They are an important information tool for political decision-makers, state authorities and transport researchers especially if they include comparable information for entire regions or countries. Regional studies can also be used to make comparisons between different countries and cities (benchmarking).

However, PT companies rely more on their own surveys tuned to the claims and objectives of the commissioning company, taking place every two or three years or even annually with smaller databases. A lot of PT companies use local or regional mobility/travel surveys to get information about different aspects of the travel behaviour of their customers or of all inhabitants. The ongoing citywide KONTIV[®] survey of the Wiener Linien in Vienna is a good example for such a survey.

In CEE countries data collection remains at a relatively low level especially with regard to customer preferences and perception. It is usually limited to capacity planning support and looks into occupation measurement and basic surveys trying to identify basic passenger profiles, origin-destination relations and sometimes trip motivation without opinion data. So far data collection is mostly carried out in larger cities only, however a trend towards higher awareness of data collection needs can be noticed.

Passenger surveys. Passenger surveys are used for different purposes. The simplest form of survey is the counting of passengers in order to measure the use of a certain line or the total system. They are also motivated by the need to realise a fair revenue distribution between different operators within authorities and the necessity to produce a solid database for such a division⁴.

⁴ see chapter 2.1.3 Organisation of the PT sector

Furthermore, practically all PT companies have created their own kind of company statistics, which contain information about the number of passengers and tickets sold. These statistics can be based on passenger surveys, passenger counting and/or the evaluation of ticket sales. Only some PT companies use a direct counting of their customers since a systematic counting of PT customers is only practical with check in and check out barriers, but provides no information about the ticket used.

Relatively new instruments are smart cards⁵, although the main objective of using smart cards is not the collection of data about PT usage. Smart cards can be very helpful to identify travel behaviour of PT users and also deficits in accessibility. If the card holds individual information, as it is the case in some case studies even way-maps of user groups can be produced⁶. Even if no individual information is integrated, electronic ticketing can provide a lot of information regarding travelled routes and times. In the Northern Sweden region an electronic ticketing system has been introduced, which makes it possible to follow the number of trips in each part of the affected area. This implementation was motivated by the wish to come to a fairer money flow between the participating PT companies.

Reasons for and against the use of PT

The identification of the exact reasons for and against the use of public transport enables PT practitioners to measure the quality of service in PT and to point out deficits in all fields of service quality (e.g. information, cleanliness, comfort, service frequency, reliability). The main instrument to identify reasons for and against the use of PT are user satisfaction surveys⁸. Since these surveys are mostly done in scientific mobility and PT research, most PT practitioners do not have a systematic knowledge about reasons for and against the use of PT.

The perception of reasons for and against the use of PT differs strongly between European countries and cities. It is therefore not possible to make a general ranking of reasons. In the following overview, the most common reasons for and against the use of PT are listed.

Reasons for the use of PT

No alternatives available (Captive users). Captive users are PT users, which have no alternative (no car, no driving licence, physically handicapped,) for using PT, while non-captive users could also use other means of transport and decide to use PT due to other reasons. The share of captive users differs strongly within Europe. Captive users are a group, which cannot change their travel-behaviour immediately and therefore PT companies often do not pay special attention to this group. Research shows that there is a trend towards a decrease of the share of captive users mainly due to increasing motorisation.

High quality of the existing PT offer / User-advantages of PT. Major aspects of a high quality PT offer are the density of the network, reflected by the number of stops or the service frequency, and a good intermodality and integration of the system⁹. The importance of this reason is reflected in the decreasing modal share of PT from big towns towards rural areas, as it is easier to create a dense network with different means of PT in densely populated areas. Further quality-related aspects of the PT offer are the accessibility, comfort, punctuality, reliability and costs of PT¹⁰.

⁵ Busby David., Contactless card technologies and open system, 2002

⁶ question of data protection: see chapter 2.1.2 problem section

⁷ Brög W., Erl E., Can daily mobility be reduced or transferred to other modes, Paper presented at the European ECMT Round table 102, Paris, 1996

⁸ see chapter 2.3.4 Handling of the customer's perspective

⁹ see chapter 2.3.2 Availability of PT

¹⁰ see chapters 2.3.3 and 2.3.4 Accessibility and attractiveness of PT

Within Europe the PT offers of Swiss towns have a very good image. Zurich and other Swiss towns are often stated as positive examples for a high quality PT offer.

An important reason for the use of PT could be provided by advantages over car using. For PT users it is not necessary to find an available parking space in the destination area and to pay high parking fees.

PT service frequency and area coverage are often still very impressive in accession countries, reflecting the greater market for PT and the reality that PT is a more essential public service. Measured by other quality indicators, however, (such as vehicle cleanliness, reliability, stop and terminal quality, information provision, integration of ticketing and services, staff attitude, security measures, economic efficiency), the service level generally falls behind that provided on average in the EU.

Subjective reasons / Positive evaluation of PT. More and more people see the use of PT as a possibility to meet other people and for a better social life. Also, especially in busy urban areas the use of PT is less stressful than driving a car. Another subjective reason for using PT is its ecological image compared to the car¹¹.

Reasons against the use of PT

Material constraints. For many people it is not possible to use PT for every trip due to material constraints, such as: transport of luggage, car used due to occupational reasons or physical handicaps that make PT use hard or even impossible. As it is not easy to overcome these material constraints, most PT operators concentrate their efforts on making PT more accessible, especially for the physically handicapped or elderly customers¹².

Regarding other mentioned constraints the efforts of the companies are less extensive and systematic. A positive approach for luggage handling can be found in Madrid, where the public transport provider CRTM offers its users to check in their big luggage at the central office and then use the Metro for their trip to the airport.

No (reasonable) public transport alternative existing, which can mean:

- No alternative public transport connection available
- It takes too long to use an existing PT service to get to the destination
- At the time of the journey no public transport services are available

A lot of PT companies consider the factors of availability of PT¹³ as the most important reasons against the use of PT and concentrate their efforts on measures to increase the density of the network (number of lines, number of stops, tact frequency).

Lack of information about the existing PT offer. In general the share of people that is informed about the existing PT connections is less than 50 % of those who actually have an adequate PT connection. Only cities with offensive information strategies are able to increase this degree of knowledge. In this context it is not sufficient for a PT company only to provide information and to expect the customers to collect this information themselves. Rather the company has to become active and to bring the needed information to its customers¹⁴.

Subjective reasons / Negative evaluation of PT. An important reason against the use of PT mentioned by non-users is its relatively bad image regarding “individuality” compared to the car. The car is seen as a means of freedom and individuality, whereas PT is seen as a forced means of

¹¹ see chapter 2.4 PT and environmental sustainability

¹² see chapter 2.3.3 Accessibility of PT

¹³ see chapter 2.3.2 Availability of PT

¹⁴ see chapter 2.3.3 Traveller information services

transport for the poor and disadvantaged. In CEEC the 'car is king' attitude and the "social service for poorer people" image of PT seem even more pronounced than in Western Europe.

Existing problems and solutions

Comparability of statistics

Despite some ongoing efforts it is still difficult to compare PT relevant data from different statistics. Depending on the method and survey design used differences can be noticed regarding:

- Modes included
- Reference background of collected data (unit, date of sample, persons/age, etc.)

One important attempt to streamline statistics on an international level is the founding and further expansion of EUROSTAT that provides some basic figures for all EC countries.

A key conflict exists regarding the continuity of statistics. In order to ensure that PT statistics reflect ongoing political and institutional changes in the sector, the pool of data collected might need to be updated. On the other hand, only a continuous pool of data ensures the recording of developments over a certain period.

Comparability of performance data

It can be difficult to compare the performance of different operators as internal data collection is mostly organised according to internal policy and may therefore not provide all data necessary for comparison. Especially in the light of the liberalisation of the PT market in Europe authorities will need common measurement tools for the comparison of the offers of different PT operators. Some efforts are already being made to create such tools.

An interesting European approach is the Citizens Network Benchmarking Initiative of the European Commission. The project consists of two major parts. The Pilot project took place until 1998 and the major project started in 2001 and will continue at least until 2004. One of its aims is to enable authorities, operators and citizens to compare local or regional transport systems within Europe. Benchmarking also has a high value regarding marketing as it enables PT authorities and operators to ascertain whether solutions are transferable to other locations.

Missing knowledge about the handling of survey results

The content of surveys is often discussed, however there seems to be a problem in utilisation of survey results. Departments responsible for designing a survey seem not always to be aware of the wider potential benefit of their survey, results are not necessarily communicated to all actors concerned, thus operating departments get delayed access to data and can therefore not immediately react. Positive examples for a fast communication of survey results can be found at RATP.

Underestimation of subjective reasons for the use of PT

A lot of PT companies concentrate on objective reasons for the use of PT and therefore favour hard policies to react to possible deficits, whereas the importance of the subjective reasons for and against the use of PT are often neglected. Therefore it is necessary to widen this perspective and to show the interrelations and synergies between subjective and objective reasons for the use of PT.

Lack of attention for PT user image

Since captive users cannot change their travel behaviour immediately, PT companies do not always pay sufficient attention to increasing the quality of the PT offer for this group, but may rely on the dependence of captive users. However, with the increasing car ownership rate, the number of truly captive users has been continuously decreasing in EU Countries during the last decades and similar developments can now be observed in CEE countries. Despite the fact that PT users show an exemplary social behaviour, with their use of a mode of transport that is both environmentally-friendly and suited for use in an urban environment, this fact is in no way reflected in the image of PT.

Slow speed of reflection of measures in modal split

A common characteristic of the modal split in the European Community is that changes occur relatively slow. Any measure taken to shift the modal split towards public transport will take a long time before it might be reflected in the overall modal split.

Changing activity patterns

Current analysis of people's mobility behaviour unveils that the traditional travel patterns, such as home-job-home or home-shopping-home, which formed the background of traditional PT service, are becoming less and less dominant. Along with a general change of lifestyle people try to combine activities, thus travel patterns are becoming more and more complex. In order to enable PT to respond to this development, existing services should be evaluated and alternatives designed.

Systematic counting of users

Only some PT companies use a direct counting of their users to learn about the distribution of passengers within their network. From a today's perspective a systematic counting of PT customers is only practical with check in and check out barriers, which is expensive and practised only in metros systems, such as in London or Stockholm. A more customer-friendly solution might be invisible automatic counting barriers as practised in a lot of busses in Sweden, even though the collected information is less reliable.

Conflict between data protection and trip recording

Electronic ticketing offers new possibilities for passenger counting. The data collected would support fair revenue distribution schemes among operators and would also allow for better evaluation of passenger distribution within any PT network. A data protection problem would however arise if the electronic ticketing holds and stores individual information and would allow to monitor an individual journey in detail.

2.1.3 ORGANISATION OF THE PT SECTOR

Trends like diminishing public funds for operations, reduced patronage and increasing car use are forcing PT stakeholders to strive for a more economic efficient and effective PT. A revision of the objectives, and organisational forms of PT is required.

The issue of new organisational forms and competition in PT has certainly been one of the most debated issues over the past 20 years. It has been affirmed that better organisation of PT provision can be obtained by effective competition and well-designed regulation. This may allow for substantial improvement, with relatively little investment. Many research projects and studies have been dedicated to the organisational and regulatory framework and competition in PT. At the EU

level the need for new organisational forms is described in documents of the European Commission, such as the Citizens' Network Green Paper (Com (95) 601) and the subsequent Communication (COM (98) 431), the proposed Regulation concerning "public service requirements and the award of public service contracts in passenger transport" (2000) and the White Paper 'European transport policy for 2010: time to decide' (2001).

Introduction of competition

Important and interesting organisational changes are already ongoing within the Metropolitan PT networks. At the level of the EU the emergence of a single European market for PT can be noticed and according to a UITP survey¹⁵ eleven out of the 15 EU member states have now introduced an element of competition into the PT market.

A study realised for the UK Department for International Development (DfID) in collaboration with the World Bank¹⁶ provides a very well structured classification of potential forms of competition in PT. This study looked at a range of competitive/regulatory regimes in the developing and developed world in order to help develop guidance as to the most effective way competition can be deployed to improve the organisation of PT.

The study basically distinguishes between direct and indirect competition. It highlights that the latter can be seen in competitive procurement of support activities, competition within a company between business units and managers, competition for profitability and competition for acclaim either by repute or more systematically through benchmarking. It notices that whilst indirect competition can achieve some improvements in performance, and help prepare a PT operation for direct competition, experience shows that it is much less powerful in driving performance improvements than direct competition.

In relation to direct competition it mentions two main types: competition for the market and competition in the market¹⁷. In the former a contract or permit to provide services or facilities is granted for a defined period following an open competition. In Europe this form is already in use at large scale in Sweden, Denmark and France and in growing use in Germany and the Netherlands. In the second operators offer competitive services to users subject to a number of rules governing trading and operating practices. This is what is happening in the UK.

The results of the study are structured into the following 9 categories of possible competition:

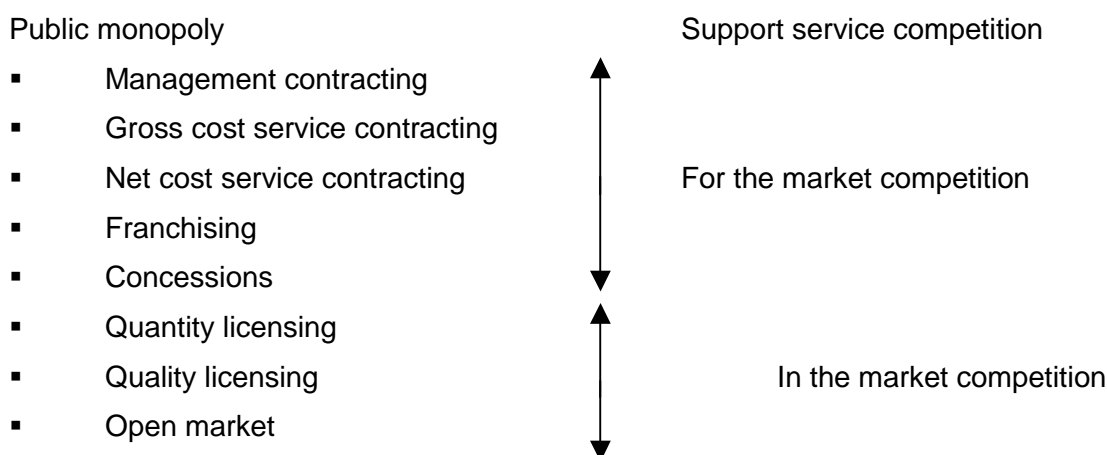


Figure 2 Competition Types (Source Halcrow study, 2000)

¹⁵ Preston, John, "Regulation on Public Service Requirements", Public Transport International – 2/2001

¹⁶ Review of Urban Public Transport Competition, Draft Final Report, May 2000, Halcrow Fox.

¹⁷ In the MARETOPE project these basic types of competitions correspond to competition on the road (in the market) and off the road (for the market).

The figure has its breakpoint between competition for the market and competition in the market between concessions and quantity licensing, except where franchises or concessions overlap competitively.

Finally, the study also highlights that many variants on these nine themes exist, each with its advantages and drawbacks, and that more than one arrangement can apply in the same area, especially where there are several PT modes.

The range of different existing competitive/regulatory regimes in PT in Europe has been classified within the research projects ISOTOPE and MARETOPE. The basis of the classification between regulatory frameworks with a form of competition is the initiative for the creation of PT services. In an authority initiative regime the (transport) authority has a legal monopoly of initiative such as, for instance, in France outside Paris.

In market initiated regimes the supply of transport services is based upon the principle of autonomous market entry, resulting from a market process with more or less regulatory checks at the entrance. This happens currently for instance in the UK, Germany and the Netherlands with different degrees of freedom. In this organisational form commercially viable services are meant to appear out of autonomous market processes (see figure 1.1.2).

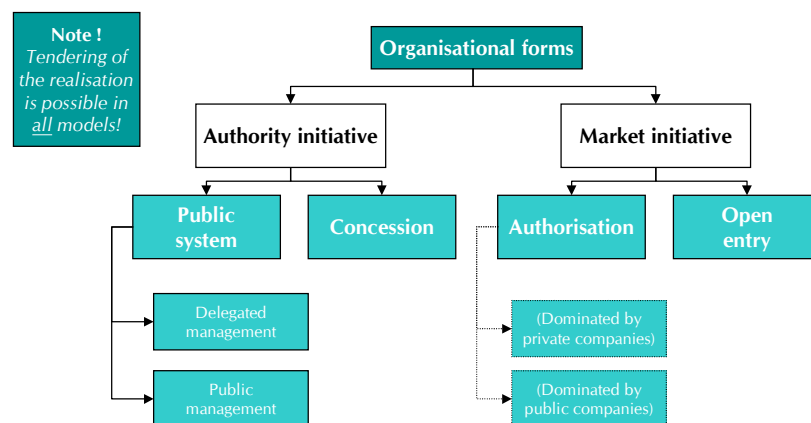


Figure 3 Organisational forms in PT (Source: MARETOPE, Reference framework and harmonisation of concepts (D1), page 7)

Recent organisational and legal developments in Europe

The recent organisational and legal developments in Europe are summarised in an UITP working group paper¹⁸, which describes the current situation in Scandinavia, France, Great Britain and Germany. These 4 countries represent with a good degree of approximation, the 4 typical scenarios of PT organisation and competition in Europe.

Great Britain adopted one of the most extreme forms of competition, with a model of open entry (outside London and Northern Ireland). Scandinavia and France are considered in the middle categories with a system based on competitive tendering. The main difference lies in the fact that in France tendering is mainly carried out for a complete network, while the Nordic Countries use a route-by-route procedure. Germany represents in a certain sense the countries that are

¹⁸ Werner, Jan, "The current state of organisation and finance of public transport in Europe", 20 April 2001.

newcomers to competition and which were formerly characterised by a closed market with monopolistic operators.

Also in CEE countries a legal transformation of PT companies has taken place. A clear trend is the transformation of dominant PT companies in cities into enterprises that are subject to commercial law. In Poland for example the number of budgetary enterprises in municipal PT decreased from 61 % in 1995 to 38 % in 2000 and other countries move around this extreme, with more transformation in smaller towns. Regional services have mostly been privatised and some form of competition has been introduced in many countries. Some notable exceptions can still be found in Slovakia and Hungary, although Slovakia is in the process of privatisation.

The trend for admittance of smaller private carriers into urban networks is growing steadily. In most large CEE cities, though, the dominant PT company(s) are owned in a large percentage by the municipality, and the market share of tendered or informal private carriers varies between 0 and a maximum of 30 %.

However progress in privatisation and competition in urban networks does vary widely between countries in CEE. Significant changes are being achieved in Slovenia, Bulgaria, Lithuania and Estonia and to a lesser extent Poland, whereas in other countries developments are more cautious. Widespread privatisation and competition in the urban environment has generally occurred only in those countries where it is being more aggressively imposed by legislation and implementation timetables.

Roles and types of PT authorities, operators and new actors

PT authorities

With the increasing level of competition, almost every national, regional and local PT authority is in a process of restructuring, clarifying and formalising the different competence levels and implicit procedures. A decreasing number of authorities are directly involved in the operational services, although in many cases they are still the owner of the local PT operator(s). The actors involved in the product specification and operation are depending on the concrete organisational PT form in force. Their relationships and powers vary from country to country and even from city to city and per mode. For instance in a system with central planning and publicly owned PT operators, the product specification and operation is the responsibility of the authority, while in a deregulated market everything is left to the operator and the authority is just setting safety standards.

In many cases the PT operator is brought under private law and the tactical part is split from the operational part. This is for instance done in the case of the former London bus operator. The tactical part was transformed into a tactical authority and the operational part was on a route-by-route basis tendered to the market. The tactical part was on a later stage joined within the overall transport authority of London "Transport for London". A trend of the last two decades is the separation, clarification and formalisation of the strategic, tactical, and operation decision level. For instance for fares, it is quite common that political authorities retain decision power on maximum average fare increases, sometimes even on fare levels and that the fare structure is determined by a co-ordinating PT body. The transport operators within the limits set by the other actors determine the actual fare level.

A very important element of tactical planning is the network design, which constitutes a major success factor of the overall PT service. In the European reality, this is very often only allocated to the authority, with no or hardly any decision power for the operator. However, in Germany the authorities allow some operators initiatives of creating flexible services in the commercial viable part of the PT network. Operators can replace big buses by smaller buses or they are allowed to add new PT services. Operators are free to develop to a certain extent their own flexible services. The tender details of the authorities specify only where and when the PT service should be

provided. Based on the number of passengers, the operator can decide on the size of the bus. The operator is positioned best within the PT system to propose efficient and effective adjustments. Connex has some flexible service contracts with some medium-sized cities in the middle of France. In these cases Connex gained the exclusive contracts to provide this type of services. The process of the development of these new services is as stated above in general characterised by a continuous dialogue between the operator and the authority.

With this organisational restructuring, in many cases the identity and structure of PT authorities are also being altered. The creation of new entities, restructuring of existing ones and new institutional relationships between agencies responsible for PT and general road traffic, land use planning and other sectors emerge. Furthermore, the question of the most appropriate territorial levels to organise PT is raised. There is a trend towards a centralisation of PT competencies of the metropolitan area and its communes, or conglomerate of larger neighbouring cities towards an 'umbrella' authority. The physical enlargement of the urban mobility scope and the split of PT tasks and responsibilities, owing to the liberalisation of the PT market, are trends that are influencing the collaboration and co-operation forms between authorities. For instance in the case of Barcelona, a new integrating tactical Transport Authority ATM has been created. This authority is responsible for the planning, integration (information, ticketing and planning of PT services) of the metropolitan PT network. Besides these reallocation of competencies there is a closer co-operation with related sectors; as for instance land-use and road authorities.

The organisational restructuring process of the PT sector require new competencies for PT authorities. Tendering, services specification, contract design require specific skills and excellent co-ordination competencies are becoming essential in order to develop an integrated and efficient and effective service¹⁹. In addition, roles in taking the initiative for the provision of a service, in planning, financing, etc. have to be reconsidered.

PT operators

Also PT operators are trying to adapt to this reform and restructuring process. Their relationship with the authority is undergoing in most cases a formalisation. The relationship with manufacturers becomes more intensive, due to tools like leasing and the hand-over of maintenance, but also more formalised, owing to the widespread introduction of tendering for infrastructure and rolling stock. But also the relationship with the customer is getting more intensive, caused by a re-orientation of the PT services towards the customers. Finally, the operators themselves are specialising and diversifying their core businesses, by providing a wide spectrum of transport services and outsourcing of 'additional' services, like for instance cleaning. Special attention has to be paid to the outsourcing of PT-related services, like ticketing and customer database handling.

Co-operation, acquisitions and mergers are getting more common. PT operators of the same urban areas are increasingly interested in integrating PT services and schedules as well as shared use of facilities. A further step is the integration of strategic additional services, like ticketing or sharing of customer data (the PT operator associations, called "Verkehrsverbünde", are examples of this kind of co-operation. Finally a merger of the different operators is possible. This can be a complete merger of the operators or an exchange of PT services and a complete reform of the organisational structure of the PT network, as has taken place in the metropolitan area of Rome. Some PT operators are enlarging their scopes through service diversification or enlargement of their markets. For instance by early 2000 at least 9 PT companies acted in more than one EU member state. These companies include mainly British and French groups, however some Scandinavian and Spanish operators are exploring the market.

¹⁹ see chapter 2.1.7 Organisational and personnel development

New actors

Through the tendering and outsourcing activities of the authorities and PT operators new services have been created, giving room for the rise of new actors. The 'additional' services, like ticketing, information, management of interchange stations or advertisement, are mostly being operated by a single entity. However, in many cases these services are tendered or given in concession to new private actors, such as rolling and infrastructure stock companies, call centres for information and ordering of PT and ticketing companies.

For instance, in The Netherlands the provinces are outsourcing large PT call centres. Connex is operating a PT call centre in the south of the Netherlands, 20 hours a day with 30-50 people. The call centre provides services, like taxi demand services for rural areas. In Brussels, the PT competencies are split among various actors. There is only one bus operator that operates all services. However, the equipment of the stops is in the hands of the communes, which tendered the stops to an advertising company. This company is selling the advertisement space and in the meanwhile takes care of the maintenance of the shelters.

Another new development is the leasing of rolling stock or lease-and-sell-back from a rolling stock company (RosCo), which first appeared in the UK. These rolling stock companies are, caused by the short franchise periods, essential for the train operators in the UK. Certain tax advantages are an important reason for the leasing of equipment in the bus sector. The RosCo's allow for more flexibility within the system. They facilitate the use of relatively short-term contracts and the creation of a second-hand equipment market. However the latter often means leasing to the following operator, who is franchising the specific service. For the moment there does not exist a large geographical (i.e. rolling stock used in other city) second-hand market of rolling stock. There exist several types of RosCo's and diversification in the market. The RosCo's in the UK are internationalising and expanding to the European mainland. Also in the rest of Europe RosCo's are now created. Public companies like the Austrian railways are creating their own RosCo's. There are RosCo's that are financial institutions, only arranging the financial structures, like for instance bank leasing. On the other hand there are RosCo's that really physically own the rolling stock. The last group is in a really specific business, caused by for instance the special safety regulation and technical standards of the equipment.

Suppliers and financiers of transport infrastructure and equipment are becoming more and more involved in PT operations. Their roles may range from simple infrastructure and equipment suppliers to a very sophisticated combination of supply and financing functions with PT operations. The concept of product-life-cycle acquires importance.

Citizens may directly or indirectly have a role in the determination of the PT service (e.g. informal requests, opinions through quality surveys, formal consultation, and representation). Customer and citizen representative / lobby organisations start to have an important role in exercising pressure against or in favour of PT. Related to citizens and customers and their representing lobbying organisations with the PT system, interesting phenomena of spontaneous and formal association, consultation and representation exist.

Contractual arrangements between different PT actors

Relatively new themes for many PT actors are contracts, questions on degree of initiative and risk taking, commercial freedom over existing services, incentives and penalties. The trend of separation and formalisation of the relations between the different PT actors and the decision to use some form of competition has lead to contractual arrangements between the actors, in which risks are divided and various types of additional incentive mechanisms can be added, for instance related to quality²⁰.

²⁰ see chapter 2.3.4 Service quality standards in contracts

A wide spectrum of types of contracts is being used in the majority of European countries, between public authorities and public transport operating companies. The already mentioned EC draft Regulation on public service requirements makes contracts mandatory when an exclusive right is awarded to an operator or when the payment of a financial compensation to offset the cost of complying with public service requirements is envisaged.

Examples of contractual agreements between authorities and PT operators are:

- Service contracting. Certain operating or maintenance activities are transferred to the private sector ("contracting-out"), preferable after competitive tendering.
- Management contracting. In management contracts a wider scope of operating and maintenance is transferred to the private sector for a certain period (usually 3-5 years), instead of single services. Operators have autonomy in terms of financial management, but they have to respect the financial commitments for operations and investments set in the management contract.
- Operator scheme. The private enterprise constructs a facility, operates and maintains it, for a specified period and then transfers it to a public authority. It refinances its investments with user charges, thereby reducing risks for the public sector. For instance in Manchester in 1989, a consortium that won the DBOM (Design, Build, Operate and Maintain) contract constructed the light rail system. After the completion of the construction in 1992, the consortium operated and maintained the light rail services and infrastructure till 1997. In that year the facilities and services were handed over to the local transport authority, which organised a new tender for its PT services and maintenance.

Contracts can also be found to govern the relations between a public authority and an operator acting as monopolist. This happens, for instance, in Brussels, where the use of a management contract has enabled losses by the operator to be reduced and brought an increase in services. Similarly, in Italy service contracts concluded between public authorities and public operators have also led to a reduction of operating costs, and hence public subsidies, while at the same time increasing PT use and increasing services and improving their quality. In Norway, quality contracts are an instrument to avoid tendering, which constitutes a constant threat.. As a consequence of the emerging threat of competition, the county authorities established a stronger position in negotiations with operators. This led to a new form of contract known as 'efficiency agreements'. A number of countries have retained the cost-focused 'efficiency agreement' type of net contracts, usually with the underlying threat of tendering if the companies fail to meet the negotiated cost efficiency targets.

Contracts between authorities and operators can also be used for the determination of social and environmental standards when developing PT services²¹. Most EU member states promote environmenta

context contractual agreements may be concluded only among operators, as it happens, for instance in Lisbon, or between a transport authority and single operators, such as in major Spanish cities or between the German transport authorities and the operators.

²¹ see chapter 2.4.5 Defining environment related quality standards in contracts

Other contractual relationships for specifying the involvement of private actors and the use of private financing of PT are used, for example:

- between operators and rolling stock manufacturers. Originally these relationships resulted in simple purchase contracts. Nowadays these contracts often include maintenance and guarantees valid throughout the whole lifecycle of the rolling stock.
- between operators and banks in the field of smart cards for ticketing and fare collection in PT – suggested type of agreement²²

Contractual arrangements and risk sharing

Much research has been dedicated to the contractual relationships between authorities and operators. There is a clear trend of transfer of risks from the authorities to the operators. The authorities are bearing in most cases all or a larger part of the financial risk, while the operation risk is allocated to the operator. Incentives should transfer some of the financial risks to the operators. There are cases where also the financial risk is for the operator. For instance in Görlitz the authorities agreed a 10-year contract with the private PT operator Connex with a fixed subsidy. In the UK in general also all risk is put with the operator.

The ISOTOPE and MARETOPE research²³ distinguishes these contracts according to the way the risk is shared between these two actors. Based on this criterion, the following figure distinguishes between management, gross-cost and net-cost contracts. Yet many intermediate forms of contracts are thinkable as can be seen in the shaded boxes.

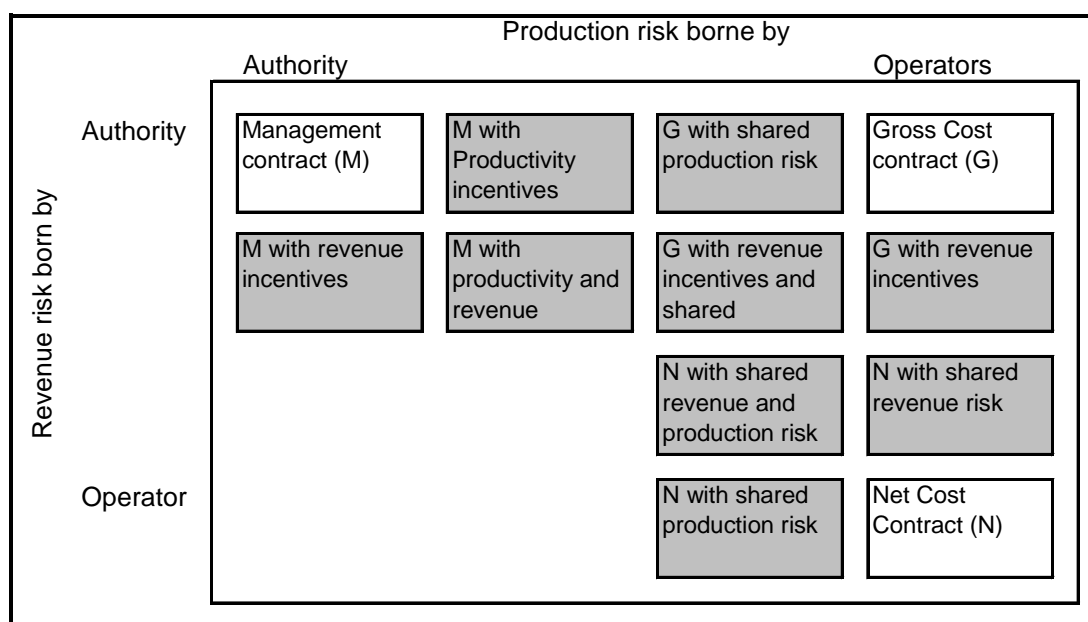


Figure 4 Risk division Source: MARETOPE Deliverable 1, page 35

The application of the different contracts depends on the desired risk sharing and the existing organisational division of competencies. A management contract will most likely be used in an organisational framework where the authority decides on the fares and the infrastructure and services to be used. The operator can only be held responsible for the operational management. A

²² Stroo, Peter, "Public Transport and Banking", UITP Conference Bologna 2002.

²³ Maretope (D1, page 34)

Net cost contract can be applied when the operator has competencies regarding the setting of the fare level and the operational production risks. Based on certain desired social services levels of the authority the net cost subsidisation can be determined. Between these two extremes of risk division a wide range of possibilities are applicable.

Existing problems and solutions

Related to the organisational aspects of the public transport network many problems and some solutions are identified. These problems and solutions can be related to the following described organisational issues:

- introduction of a form of competition;
- contractual arrangements;
- diversification of public transport services and specialisation of the different PT actors; and
- organisational integration of Public transport.

Fear of decreasing attention to social and other wider community needs when introducing form of competition

Authority control over services and fares, considered as strong points of public monopolies, will be put at a larger distance. The fear exists that there will be a decreasing focus at the social and wider community needs. There is a risk that social needs are losing weight under cost saving pressure. Several solutions can be found to overcome this problem. The right solution is depending on the specific case study characteristics. In most cases this fear is overcome through the establishment of clear and formalised agreements between the respective authorities and operators.

Preferential position of the former, mostly publicly owned PT operator

After the introduction of competition the incumbent operators, mostly public owned, often continue to have a preferential position in the market and try to block competitive tenders. In order to control such problems competition authorities could be set up. An example has been found in the Netherlands. The NMA (Nederlandse Mededingings Autoriteit/ Dutch Competition Authority) is an authority that is responsible for fair competition within the Dutch market. From the first of January 2003 this competition authority has a special chamber of transport. This chamber will in particular be in charge of fair competition in the area of urban public transport.

Missing access to market information

When introducing a form of competition there is the need of accessible market information. Related to the problem described above the necessary market information is only available for the present often former publicly owned PT operators. The present PT operator has often all and solely the direct information of his PT services, which is a serious problem for all potential competitors. A possible solution could be to separate prior to the introduction of the competition the planning from operational activities and to transfer the responsibility for planning to the PT authority. In London for instance the operational part of the former publicly owned PT operator was separated and tendered in pieces, the strategic and tactical part was joined with the new transport authority Transport for London (TfL). At a later stage legislation should guarantee the availability of information.

Fear of worsening labour conditions

There is a fear that along with the need to increase flexibility and efficiency of the PT operator in a competitive environment negative impacts might be noticed regarding the working conditions. Unions often oppose against the introduction of competition fearing a worsening of labour conditions. To overcome this obstacle, it is important to intensify the information exchange with different actors (e.g. employees, politicians, citizens, interest groups, etc.) and to involve the unions in the processes of preparation, implementation and realisation of competition.

In London an agreement with the unions and the PT operators could be reached. Although costly, the PT operator gave compensation to its employees in order to be able to implement the necessary measures, which included worsening of working condition. This compensation consisted of a lump sum and the remaining of certain travel rights for the employees. In return the PT operators could carry out the necessary reforms in wages, work conditions and pension rights.

Lack of flexible forms of market access for different modes

There is a strong need to consider transport modes characteristics when introducing competition. Not all types of competition might be suitable for all PT modes, differences when initiating or realising the transition and costs to be expected have to be taken in account. With buses almost any type of competition is possible and therefore widely differing regimes exist in Europe. However, they are not all effective in promoting efficiency and meeting the needs of passengers²⁴. It is therefore important to consider local characteristics.

An example of more flexibility in the tendering of PT buses can be found in London. During the tendering of the bus routes in the London area, the bidding parties could bid for just one route, but they were also given the opportunity to create and propose composite packages of bus routes. This guaranteed the joining of small and large PT operators, but also established a kind of natural equilibrium of an efficient and effective division of the available bus routes. Also in the introduction of competition of the bus routes in Stockholm some flexibility was established. The network was divided in four parts, in order to guarantee competition. Besides this, a learning process was created through a one-by-one tendering of the different network pieces.

Unfavourable PT market environment

Introducing competition might bear risk if there are not enough potential PT operators/bidders for operating the PT network. This can have many reasons, for instance the size of the tender, a PT network that is too small or too large to attract various operators. Intended competition can be introduced, however the expected benefits of introducing competition will be lower. Authorities might even be forced to accept lower offers than expected.

Danger of unbalanced market forces

After opening of the market a problem of achieving a balance of market forces. At the moment there is a trend of a few large international companies that are dominating the opened markets in the different European member states. There is a danger that the international operating PT companies will consolidate the European PT transport market as an oligopoly. In this case, effective competition will be jeopardised and disturb a balance of market forces between manufacturers, operators and authorities.

Transition period when introducing competition

Several problems identified are linked with the transition period of one organisational framework to the other. In most cases institutional and organisational barriers are related with the restructuring of responsibilities and the organisation of competition. There is often an overlap of competencies and

²⁴ E.g. Halcrow study

the structure of legal allocated competencies is the basis for hindering situations, while introducing competition. In case of an “for-the-first-time” introduction of competition, there is often a lack of time and knowledge related resources within the organising authorities. An identified solution is to find examples of cases in other cities, where the desired form of competition is already implemented.

Degree of contract flexibility

A main difficulty when designing contractual agreements between authorities and operators is how to combine the binding nature of a contractual agreement with the flexibility required to effectively and efficiently managing the overall mobility. Even within a binding contract, it is important to safeguard a certain degree of entrepreneurship for the operator, which allows adopting the appropriate measures for developing better, more customer-oriented services. This can be guaranteed by a penalty and premium system.

Within Europe large differences exist in relation to what is legally allowed. For instance in France negotiations during the contracting phase are allowed. In Saint-Etienne (France) the bidders were asked to evaluate the tender specifications of a tendered new tramline and if appropriate to propose another route. This would not have been possible in a ‘ready-to-sign’ contract, which is common practice in Scandinavia. In Stockholm the operator is expected to put just his price under the specified contract of the authorities.

Duration of contractual arrangements

A further and closely related problem may arise when deciding on the contract duration. While longer contractual periods allow for stability on the operator side, a short duration ensures flexibility for the authority.

A DfID/World Bank study²⁵ longer term periods (10 – 30 years) are recommended for rail vehicle, compared with bus contracts (3 – 7 years) and franchises (5 – 10 years). It is also added that special provisions in the agreements will be needed to deal with the maintenance, betterment and subsequent transfer of these at the end of the concession period.

Lack of integration through increasing number of actors

Together with the diversification of public transport services, a further specialisation of the different public transport actors (often imposed through a legal separation of competencies or introduction of competition) can be noted. With an increasing number of different PT actors, who can sometimes have different or conflicting interests, the aim of providing seamless and integrated services for the customer is getting more difficult. For instance in Belgium, a publicity company that is taking care of the bus stops is more interested in selling advertisement space than providing a safe and comfortable waiting place for the bus passengers. The bus operator had no legal power to change the actions of the publicity company. This practice already caused problems, including disturbed PT experiences for customers.

Reluctance by authorities to transfer competencies to an integrating overall authority (which could encounter the widening scope of the citizen’s mobility needs)

Often, a horizontal co-operation has to be established between a relatively large and powerful authority of a central urban area and the surrounding municipalities. In most cases these sub-urban localities are attracting a lot of dwellers and daily commuters, which might provide relatively large amount of financial resources, thus these authorities are not eager to give up these resources.

²⁵ Review of Urban Public Transport Competition, Draft Final Report, May 2000, Halcrow Fox.

Municipalities are not always willing to transfer certain legal allocated competencies to the region (vertical integration). They fear that their specific needs will be neglected or get less attention. Especially they fear a loss of the social, but economical non-viable PT services within their area, due to the enlarged scope of the new Transport Authority. A possible solution can be found in the Ile de France region.

The STIF, a sole transport authority, has a contract with the RATP, SNCF and private operators. However two years ago it became necessary to introduce second level of authorities in order to remain the locally necessary flexibility. These second level authorities (often part the local communes) are under the jurisdiction of the STIF, but to a certain extent free to organise the local transport in their respective area. These second level authorities have management contracts with private operators and are responsible for revenue distribution among these local services. The specific services are financed with local taxes.

*A good example of a horizontal and vertical co-operation between different authorities can be found in the **German PT authorities associations**. For instance, the **PT authority in the region of Dresden (ZVOE)** covers 5 districts and 2 cities (including Dresden). This authority has full power for rail tendering and ordering, bus services, commuters and regional transport. There are three levels of co-ordination and assuring integration:*

- *General transport plan with basic service and quality levels;*
- *Co-operation contract with the association of operators, where new operators can join in. This is a more detailed plan with quality criteria, fare system and revenue allocation. In case of winning the tender the operator has, if not already, to join the agreements;*
- *Operators' contract (service contracts) These contracts are not too much specified, the operators have some kind of initiative and can propose.*

Lack of integration of PT policies and other urban (transport) policies

Special attention should be given to the integration of PT planning, the overall urban transport and other urban policies (e.g. related to land use, urban environment, etc.) Although widely discussed, examples of true integration are scarce. In many cases the outdated dogma of competition between private and public transport, including a separation between urban development and public transport is still present. An example to overcome this lack of integration can be found in the metropolitan area of London.

The PT Authority Greater London Authority (GLA) and the PT Executive Transport for London (TfL) are not only responsible for public transport, but also for private and all other transport related issues. The GLA also is responsible for the urban planning and development. This is guaranteeing an optimal integration between urban PT and all other modes of transport. However, the authority has no competencies for the regional rail, which is heavily used by commuters. In the Netherlands at the interregional level a centralising planning authority is founded that should integrate all planning issues regarding, land-use, private and public transport of the Randstad.

2.1.4 INFRASTRUCTURE

PT networks and interchanges

PT networks

A key objective of network design is to reach the optimal balance between the desired door-to-door trips of individual users and characteristics, like speed, capacity and costs of the modes available. This means that different transport modes are used for different transport densities in order to be economically viable. In densely populated urban areas of larger cities, PT networks are mainly operated by metro, light-rail or sometimes by bus systems, which offer services with high frequency and capacity.

In terms of passenger capacity by mode, a light rail vehicle with 2 units can carry at best about 4 to 5 times more passengers per hour than a standard bus. Metro vehicle capacities are similar to light rail, however system capacities for metros are higher than for any other urban public transport system, due to the use of more cars per train and to higher frequency. Regarding the average speed of the different modes in densely populated areas, again the light rail systems perform better than buses. The speed performances of light rail and buses are potentially similar, with comparable distances between stops. Their commercial speed is mainly linked to the traffic conditions on their route. In mixed traffic, the speed can decrease down to 10/12 km/h and can reach 20/25 km/h on their own right-of-way.

In less populated peripheral areas with a lower transport demand, PT networks generally consist of bus systems, which show the highest area coverage. The load limit for a load for a conventional bus service in the UK to be economically viable is estimated to be about 10-12 passengers (averaged over the whole day in both directions)²⁶. In lower traffic densities, smaller vehicles, such as minibus or shared taxi, are often considered to be more suitable²⁷.

The PT networks in cities up to 100.000 inhabitants are mainly limited to radial routes linking the peripheral with the central areas. In larger cities, however, also inter-suburban lines have been established, which link inner suburbs. Network operators of large cities are facing more and more diversified areas to be served by their routes. One major trend of improving the PT network efficiency and visibility is to form their transport services into a hierarchy. It consists in choosing the most performing system as the core of the PT network, which would normally be a light rail, metro or tram network.

For a pure bus network this means that a few bus lines are favoured and will be upgraded to higher service frequency and higher operation speed. These routes are implemented with a lower number of stops but these stops are chosen at strategic nodes for transfer to other bus routes or mass transit systems. They are particularly suitable to serve medium corridor, peri-urban residential areas or industrial activities. The bus service benefits from infrastructure enhancement, from specific identity standards for higher visibility and better service quality.

The “Trunk Network” of Stockholm²⁸ consists of five selected main bus routes with priority given to buses by means of reserved lanes wherever possible, by-pass to ease the crossing of intersections and dynamic priority. The distances between stops have been increased, bus stops have been enhanced and well-equipped articulated buses are operated. Since the opening of the first bus route of the “Trunk network”, the number of customers has increased by 40 % and the speed by 35 %.

Comparable features have been chosen for the “Rapid Bus” Project of Los Angeles²⁹. The patronage on the first corridor reached a 27% increase over the base level and the ridership in the second corridor increased by 33%. The total travel time on each Bus Rapid route has dropped by 25% compared to the local service, meeting the project goal. 30 to 40% of that drop is credited to the system's signal priority technology. With a so significant decrease, the travel time compares favourably with automobile travel time in the “Rapid Bus” corridor.

²⁶ White, Peter: “Public Transport : its planning, management and operation” (Fourth edition), London 2002

²⁷ see chapter 2.1.5 New systems for diversified PT services

²⁸ Stockholm “Trunk Network”. In TEC (Transport/Environnement/Circulation), n°164, 2001

²⁹ Rapid Bus Project (Los Angeles County Metropolitan Transportation Authority and Los Angeles DOT)

Passenger interchanges

In PT networks passenger flows are concentrated onto specific lines of movement. Bearing in mind economic efficiency requirements to PT systems, the network of individual lines cannot serve all combinations of passenger origin and destination. This means, that for many passengers interchanging between services and modes is a necessity to reach their destinations. Only little is known about the volume of interchange taking place in many cities. Surveys from cities, like Munich and London show that almost half of all passenger journeys involve at least one change of mode or service. Other surveys (in Manchester and Newcastle) show proportions lower than 10% of interchanging passengers³⁰.

For many passengers, the negative aspects of interchanges (long waiting and walking times, unpleasant conditions, lack of information, etc.) may be a decisive factor for not using public transport. Therefore, the development of accessible, safe and comfortable interchanges can play an important role in increasing the use of public transport and therefore improve the economic efficiency of PT. For creating attractive interchanges it is not sufficient to consider only the design of the interchange itself³¹, but also the feeding modes, the integration in the existing PT network and the characteristics of the surrounding areas.

Many existing interchanges have not been created as a purpose-built interchange, but have been developed from existing bus or railway stations. The development and location of these interchanges were often determined by the interests of network operators to optimise the linkage between their services. The function of interchanges to serve the passengers coming from the immediate surroundings has often been under-valued. In addition, interchange locations often had to be moved away from central urban areas, due to competing land use interests. The development pressure in central areas, caused by higher site values for retail and housing facilities, makes it often very difficult to find optimal and central locations for interchanges. This has led to situations, where interchanges have been located in peripheral, often less suitable areas.

Management of interchange

For the majority of interchanges, a long-term strategy for interchange and service management is not existing. Planning, new investments and maintenance of interchanges are often carried out by several authorities and stakeholders and are not co-ordinated. Some examples can be identified however, where a co-operation between different actors for construction, modernisation or joint management of individual interchange zones has been established.

³⁰ Terzis, G./ Last, A./ Sullivan, K.: "GUIDE: Identifying good and bad practice in passenger transport interchange"

³¹ see chapter 2.3.3 and 2.3.4 Accessibility and physical design of vehicles, stops, interchanges

*In the UK, some examples exist, where multi-agency partnerships have been set up to develop new or improve existing interchanges³². Examples are the **South and West London Transport Conference** (SWELTRAC), the **South East London Strategy** (SELTRANS), and the **West London Transport Strategy** (WLTS). SWELTRAC is a multi-agency partnership between 12 local authorities, the London Transport Users Committee, Transport for London, bus operators and railway companies. This partnership has succeeded in improving interchange zones at Feltham, Kingston, Wimbledon and Raynes Park.*

*In addition, for the London region a "Code of Practice" for interchange quality has been developed and a task force, called **LINK (London Interchange Network team)** has been set up, which supports and co-ordinates the work of the different local interchange partnerships on a network-wide level.*

*An example of co-ordinated planning and investment can be found in **Copenhagen**, where a joint partnership between PT agencies has been established with the objective to provide PT passengers with the best possible interchanges³³. Three partners (Copenhagen Transport, the Danish National Railway Agency and the local municipality) developed a Master Plan for interchange facilities, which included conceptual solutions for more than 30 interchange projects as well as the definition of common financing arrangements.*

*In the city of **Paris** up to now around **50 interchange site committees have been set up**, who are mainly in charge of defining the site's organisation and rules of operation³⁴. Another interesting example for the management of an interchange point is the **Avenida de America interchange in Madrid**. The construction as well as the management of the interchange has been fully awarded to a private company by means of a long-term administrative concession. Already after the first year of the concession, the demand for the interchange has increased by 30%.*

Design of dedicated lanes, lane or track sharing

Congestion is a major obstacle to the efficiency of on ground PT networks. In 1999, Brussels evaluated operating losses in PT at 18 % of total service production cost. For improving the capacity of PT networks, the development of efficient and attractive surface PT routes are gaining importance.

PT projects with dedicated lanes are flourishing, using various solutions, from partially to fully dedicated routes. The key objective of dedicated lanes is to achieve a better share of the public space for public transport systems, which induces a disadvantage for private cars. Examples in many cities in Europe and other parts of the world show the high interest of dedicated lanes for PT. Particularly, they show the direct link between the ratio PT speed/cars speed and PT attractiveness³⁵. An important condition for the success of dedicated lanes is a high visibility. Experiments in the UK and France are conducted in order to harmonise the dedicated lanes marking.

Busways and guided buses, such as the O-bahn in Essen (GE) and Adelaide (AUS) and the "Superbus" in Leeds (UK), provide an effective means for buses to bypass traffic queues without any of the problems of misuse or violation of conventional bus lanes. The standard buses are fitted with small guidewheels to allow them to be steered automatically along the concrete busways. The

³² Transport for London, 2001, "Intermodal transport interchange for London – Best Practice Guidelines",

³³ Lindboe, E., "Contribution to UITP Conference in Vienna on Intermodal Interchange Points, 1998, "Managing and Financing Traffic Terminals in Copenhagen"

³⁴ Laferre, Public Transport International, "The organisation of multi-modal management in urban interchange points"

³⁵ A congestion-free bus network. UITP position paper. in Public Transport International, December 2001

guided bus operates as a normal service when leaving the busway. Patronage on the Leeds guided services has increased by over 40% since the opening of the first guideway in 1995.

In some cases, lane sharing or flexible use of a dedicated lane may be very interesting. The Portuguese project "Intermittent Bus Lanes" (IBL) is especially intended for bus corridors with low to intermediate frequency of services, but located in city areas where general traffic congestion is a recurring problem. The efficiency of signals along the road to restrict the lane usage to buses has not yet been assessed.

Track sharing has been first introduced in Karlsruhe³⁶ and Saarbrücken (Germany) to adapt light rail vehicles operation on heavy rail lines³⁷. Their operation demonstrated the feasibility to gain from opportunities to use existing railways and offer more competitive investment costs. After these tram-trains' success, other tram-train projects are progressing, mainly in France, where Mulhouse, Ile-de-France, Nantes are the most advanced³⁸.

Existing problems and solutions

Punctually reduced service quality through hierarchic network structures

Hierarchic network structures, even if they are spreading out slowly, are demonstrating their relevance for significantly reduced travel times and increased patronage. One major drawback is that, due to the lower number of stops customers are more often obliged to make a connection with another route which service their final destination. So there is a need for enhancing co-ordination of PT services at connections.

Conflicts between PT prioritisation and other modes

The development of infrastructure especially dedicated to PT (separated or dedicated lanes, etc.) needs to take into account a lot of local technical constraints, such as:

- road safety vis-à-vis all road users,
- bicycle lanes and pedestrian rights-of-way,
- local resident needs,
- maintenance,
- connections with the road network,
- accessibility for people with reduced mobility, etc.

Owing to such a complexity, project managers are facing difficult compromises and co-operation needs quite a long time before agreement on a project.

Lack of awareness of potential impact of interchanges on urban development

The important role of interchanges to strengthening the integration of different transport modes and making passengers' trips smoother tends to be underestimated. Focus is laid on important centrally located interchange facilities, where numbers of transfers between modes are realised. Here the possibilities for improvement are most likely, since PT operators see clear benefits and commercial investors can be attracted. In contrast, improvements of small and medium-sized interchanges in peripheral areas mostly have a very low priority. The fact that each bus stop can

³⁶ Karlsruhe, Germany intermodality Tramway/Train. In "Good Practice Guide" European Commission

³⁷ see chapter 2.1.5 New guided PT systems

³⁸ Chaine, Hervé/ Forte, Pascal, , "Tram-Train in France – just another fad?", Public Transport International 6/2000

be considered as an interchange location and that many interchange activities are undertaken outside the large facilities is often neglected. PT operators often do not fully appreciate the importance of these small or medium-sized interchanges for promoting intermodal trips and their role as a “point of sale” for attracting new customers.

Inadequate location and accessibility of interchanges

In order to make PT systems efficient and serve best the passengers needs, networks and interchanges have to correspond with key mobility patterns. For the development of new interchanges this request could be met by an integrated land use and transport planning approach, which co-ordinates major land-use developments with the expansion of the PT system. Effort to implement such planning strategy is being made in Germany, however, sometimes the integration is limited to individual transport infrastructure only.

The location-problem is even more evident for existing interchanges, which cannot simply be transferred. If current urban mobility patterns have shifted away from those that are facilitated by the PT network, urban planning would be needed to balance and to ensure that traditional focal points of activity (housing, working, shopping, etc;) are not abandoned towards suburbs, but revitalised instead.

Missing strategy for planning, designing and managing interchange locations

Intermodal interchanges normally involve different operators, thus planning needs to take into account a variety of business interests and approaches. A lack of co-ordination can result in the problem that the passenger perceives a bad harmonisation of services or changes in the level of services. Some examples, where a co-operation between different actors for the joint management of individual interchange zones has been established, can be identified. In London, Paris or Copenhagen examples exist, where various actors co-operate in form of multi-agency partnerships for achieving new and improved interchanges.

Lack of investment in infrastructure

In many cases, only limited financial resources are made available for the improvement of interchange facilities. Although there is a high political demand for increasing the quality of PT services, the general scarcity of public funds limits the level of investment in PT infrastructure. Clear investment priorities have to be defined, which normally favour those locations and services, where high numbers of passengers provide a high degree of visibility. This means, that especially for small or “informal” interchange points, the problem of missing funds is obvious. Funding of interchange upgrades is a particular problem in CEE countries for all the reasons above and a more general lack of public financing availability.

Inefficient use of railroad tracks

Often the use of existing railroad tracks could be an interesting option for different PT operators, but for either technical reason, such as different speed levels, security requirements, track gauge, space needs of vehicles, or legal one like ownership of infrastructure this is sometimes impossible. In the UK, Germany (Karlsruhe, Saarbrücken) and Switzerland, re-using railway tracks for light rail has been successfully implemented.

2.1.5 ROLLING STOCK

PT networks in Europe are operated with a large variety of PT systems. Bus systems are the most widespread means of PT in Europe, as in the rest of the world. These systems with road vehicles do not need specific infrastructures, apart from bus stops, and their implementation is the most

simple, flexible and the least expensive. In many European PT companies it seems that there still exists a tendency to utilise large capacity buses (especially in larger city owned PT companies) when medium and small buses may be more efficient and offer a better quality of service.

However, nowadays more diversified types of vehicles or new systems appear on the market, in order to increase economic efficiency and better answer to passengers' travel demand, in terms of served urban and peri-urban areas as well as time schedule amplitude. Mini and midi buses, 7 to 9 meters long, have been designed, with occupancies intermediate between the taxi cab and the standard 12 meters bus.

The trolley bus has been abandoned in some European countries, due partly to the lack of flexibility of the route and partly to the investment cost. 15m long buses, articulated and double-deck buses were introduced to supply a higher capacity on major routes. Bi-articulated busses (24.5m long) can be found in only a very little number.

With the exception of buses, light rail is the most commonly operated public transport mode in urban areas. Light rail is experiencing intensive development and expansion worldwide. Many European cities now operate light rail or modern tram systems developed over a period of many years from traditional tram operation. In Europe, new light rail lines are mainly being built in France, Spain, Italy and the UK. This activity is a testimonial to the fact that transportation planners, decision makers, and operators see light rail as a viable, cost-effective, and essential component of their urban transportation systems.

In the following table, the main differences between the different PT systems with regard to their operating conditions in Europe is summarised:

PT system	Capacity Pass/h/way (4 pass/m2)	Commercial speed Km/h	Investment cost in million Euros / Km and 2 ways	Operating cost (Trainset x km)	Use and limits
Bus	100 - 2500	10 - 22	0.2 - 9	2,5 à 3 €	suitable for short way between stops and for little capacity Low commercial speed The most flexible systems for operators The less expensive More efficient on dedicated lanes Possible evolution to a tramway
Guided systems on tyres	1500 - 3500	18 - 22	8 - 20	-	New systems in development (mostly in France) hard competition with tramway
Tramway / light rail	2000 - 8000	18 - 25	16 - 23 (without tunnel)	4 à 5 €	Low speed in downtown Compatible with suburban train systems (tram-train) Limited frequency, as buses Limited on ramps Not suitable in short curves
Metro	5000 - 30 000	25 - 35	53 - 100	7 à 12 €	Closed-circuit(higher speed, regularity and frequency) Suitable for high capacity and long way between stops (over 500 m) Shorter intervals with driverless system
Express suburban train, as RER in Paris	10 000 - 70 000	30 - 60	> 80		Suitable for large urban area, mass transit and very long way between stops
Automatic cable systems	400 - 6000	15 - 25	8 - 18		Traction system out of the bodies Suitable for short distance or specific constraints (steep ramp,...)

Figure 5 PT systems with regard to their operating conditions in Europe, Certu, 2002

In Europe, various strategies are used for maintenance of all these systems. Maintenance may be ensured by the operating company itself, or completely, partially or fully outsourced. On the one hand, in case of complex technologies and due to licences, maintenance must be outsourced to specialised companies. On the other hand, outsourcing may be decided because of financial guarantees. The Tramlink, light rail line in Croydon – UK, is an example where Bombardier ensures the maintenance so that the system's availability is kept over 99.9%.

New systems for diversified PT services

PT operators are looking for new services to complement their standard mainstream networks to serve low-density areas and/or populations with specific needs. They consist of demand responsive services, mainly feeder services, running with new small vehicles equipped with new telematics management systems³⁹.

During the last decade, minibuses have been updated. Their comfort has been enhanced thanks to better suspension systems and passenger compartment equipment. Now they are built with a low-floor design and often with new power engines and fuels. More recent developments focus on concepts which all integrate environment-friendly and low-capacity vehicles:

- Small electric cars staffed with a driver, offer a transport service for distances too long for walking. The first example has been introduced in Le Palais, Belle Ile – France. There, 5 small electric vehicles TOUC were used during summer 1998 to pick up passengers at the loading stage and to move them to the parking location near the city centre and connected to the transportation network service (bus, car rental.). The demonstration and evaluation were part of the European project UTOPIA⁴⁰. Around 540 to 670 passengers per day were transported. The first balance sheet, developed in October 1998 showed a total of 42 000 passengers. In summer 1999, this experiment was continued with a Park and Ride system, which was used by 55 000 passengers. In summer 2000, the system has been fully integrated into the island travel master plan.
- Iciéla service (Connex group) operates in Amiens with electric urban cars for 7 seated passengers, to serve as a link between a large pedestrian area, car parks and bus routes. Public/private partnership is sought for settling and eventually financing or subsidising the service.
- Another concept, still at R&D stage, is investigating ITS technologies in order to create a small car system with automatic guidance and fleet management which could be available at major city locations, such as train stations and commercial, industrial and public services areas (CyberCar project⁴¹).
- The Automated People Mover, providing operation flexibility with small carriages. The on-demand system will consist of driverless automatic taxis travelling on their own guideway network – ULTra Urban Light Transport (developed by Advanced transport systems Ltd). The first test track is being implemented in Cardiff (UK).

³⁹ see chapter 2.1.6 IT-based demand responsive services

⁴⁰ UTOPIA, Final report and policy recommendations, 2001. European FP4 Transport programme

⁴¹ Cybercar - Cybernetic Technologies for the Car in the City. European FP5 'Information Society Technologies' programme and 'Energy, environment and sustainable development' programme

New guided PT systems

After the success of new tramway lines implementation, manufacturers are working on new systems, mainly to diversify the market offer and be more competitive. Since a few years, developments concern guided systems on tyres, tramways and tram-trains. The trend is to lower the cost of investment together with the cost of operation and maintenance, which is particularly important for CEEC with their huge investment demand in PT systems.

Apart from the guided buses mentioned earlier, new guided systems on tyres, intermediate between the bus and the tramway, aim at reducing the investment cost, mainly on infrastructure. Guidance is obtained either with a steel wheel running on one track, with localisation by image processing of a predefined trajectory painted on the road pavement or with magnetic studs buried beneath the pavement. First implementations started in France (e.g. "Civis" in Rouen and Clermont-Ferrand (trial stage), "TVR" in Nancy and Caen and "Translohr" in Clermont-Ferrand). Two other projects are under way in The Netherlands with "Phileas" in Eindhoven and in Italy with "Stream" project in Trieste.

The new design of tramways aims at reducing their cost, owing to industrial processes and to a modular concept, which can address a large range of markets. Infrastructure investment remains expensive. In La Rochelle, the joint project of ALSTOM and the Community of La Rochelle seeks to reduce by nearly half the tramway average cost per km, mostly through technological innovations in infrastructure. The cost reduction would allow medium-sized conurbations (100,000 - 150,000 inhabitants) to implement such attractive light rail systems.

Tram-trains are a promising way of optimising land use with track sharing. They address high capacity travel demands. The example of Karlsruhe showed the high economical interest to catch opportunities with existing rail tracks. Highly significant results were rapidly obtained, motivating a next development programme for a service length of 135 km in 1992 with a potential expansion to 200/250 km in the next ten years, using the DB infrastructure.

Fully automated systems (without driver), have been developed for mass transit to provide a high frequency (in some cases less than one minute). They are progressively spreading out with the examples of Val narrow gauge system (e.g. in Lille, Toulouse, Rennes, Chicago, Taipeh, Turin, etc.) and those of standard gauge (e.g. Lyon Maggaly metro line D, Paris Meteor metro line 14 and London Docklands line).

Existing problems and solutions

High investment costs for development and production of rolling stock systems

Due to the relatively small size of the PT market in terms of industrial vehicle production, the costs for development and production of rolling stock systems are rather high. Efforts are being made to reduce these costs with standardisation and modular vehicle concepts, which can address a variety of needs with lower costs.

Infrastructure investment remains expensive, the problem is sometimes even forced by the land and real estate price level in a city, which can make the most attractive locations far too expensive for PT related developments. Strategic integrated planning could support PT by taking into account likely future land demand of the PT systems.

New rolling stock systems still in experimental phase

The market for new guided systems on tyres is reduced, in competition with new tramways. The first projects are more expensive than expected but they can demonstrate added value from easier integration in downtown areas, better ability to go up slopes and lower noise levels. But these

technological innovations need assessment in terms of cost and reliability. The experimental trial “Leo 2000” in Clermont-Ferrand and implementation in Rouen will provide a comprehensive evaluation under real operating conditions.

Previous attempts to develop innovative small systems (ARAMIS in France, Personal Rapid Transit in USA) have failed in the 80's. The new developments underway may not get a market large enough to pay off the investment. Opportunities should be sought in the future by integration of the taxi industry into the PT operation and by the use of new information systems for demand-responsive services.

The bus cost does not decrease, due to integration of various requirements for passengers' comfort such as accessibility features, clean engines, information and control system equipments, air-conditioning, etc.

Unclear functional safety of tram-train systems

Tram-trains have to integrate the specification of two approaches – that of light rail operation and that of railway systems. In this context, functional safety of their control systems is a problem needing improvements in order to make the systems ready for wider use.

Lack of value for money culture for PT investments (especially in CEE countries)

By systematically applying value for money principles, many PT operators might still make significant savings. It seems that progress is slowly being made though it is still not mainstream thinking to consider value for money right from the outset of PT network planning. Sometimes there is still a tendency to come with the most attractive engineering and urban solution and then justify it or make small modifications, rather than consider a range of cost options across the range of affordability right from the beginning.

An important need it seems is to have well defined socio-economic evaluation mechanisms which include opportunity cost analysis, passenger demand, preference studies and impact on traffic that can decide as objectively as possible which is the superior option in the given financial situation. This process is still formally missing in a number of CEE countries, although there is a trend towards rigorous formal financial evaluations of at least large projects and generally a number of options are considered.

PT OPERATION

Fleet management

The purpose of fleet resource management is to improve the overall efficiency of the vehicle fleet operations and therefore to improve the quality of public transport services. This can be achieved through better management planning, survey and an increased flexibility of service operation, which improves punctuality and ensures a better adaptation of services to the actual demand.

There are several types of Automatic Vehicle Management (AVM) systems existing, which can be used for the optimisation of timetables, maintenance of intervals, emergency management and the provision of real time user information. Some use ground-based positioning systems, others use the Global Positioning System (GPS) for vehicle location. Especially in dense cities with high buildings and in some mountainous areas GPS does not always work properly. It must therefore be combined with other systems such as dead reckoning systems that compare measured co-ordinates with an electronic map. Differential GPS offers improved accuracy (potentially down to 10 metres). These systems are well tested these days and provide reliable data operation management.

In terms of organisational aspects the AVM systems can streamline internal management processes, thus improving resource management. This does not only include physical assets but also staff management. Ultimately, organisational changes in structures will reduce management costs. Systems allow remote management of services that reduces the need for on-site supervision and eliminates manual data analysis.

*There are many fleet management systems used in Europe. The **Berlin public transport operator (Berliner Verkehrsbetriebe-BVG)** started in the late eighties with the planning and installation of a network of different ITS applications. The networks of ITS applications, called BERTA, covers all functions ranging from drawing timetables, monitoring actual operations, providing real-time information to passengers, to supervising safety and security in the stations. The different modules are all interconnected. BERTA is a basic tool for maintenance of all ITS data. It integrates all modes (bus, tram and metro). BERTA is currently in full operation and includes planning daily timetables, optimising vehicle and staff allocation, optimising vehicle movements in the depots, planning daily staff duties and assembling data needed for the payment of staff. The tools used for the surveillance and control of the actual operations depend on the transport mode. One tool (RBL) takes care of the control, management and optimisation of the bus and tram operation and another one (LISI) is an integrated safety control and management system particularly adapted to the metro operation. Based on these operation and control systems, a number of systems provide information to the users. All these systems work together on-line and are fully integrated. A dynamic bus scheduling and remote maintenance monitoring system was demonstrated in **Valencia (Spain) under the AUSIAS project**.*

Traffic signal control and bus priority

An important element to solve congestion problems of PT vehicles is the development of bus priority systems at traffic light intersections. The bus priority system is based on a technology which allows that busses can pass the intersection more quickly (traffic signals are held green for buses or made green earlier than scheduled). This can lead to a considerable shortening of bus delays. When the bus priority system is managed centrally, the efficiency and therefore the quality of the PT system can be enhanced.

Advanced, integrated systems for bus priority at traffic signals have been implemented in many cities around Europe. Most cities are extending their bus priority systems incrementally, using local priority actions, albeit sometimes controlled by Urban Traffic Control systems (UTC). A wide range of system architectures is being used for bus priority schemes. In general, systems are evolving in complexity and functionality, from transponder/tag based systems providing 'local' priority for all buses, to more integrated AVM/UTC systems. The latter systems offer real-time fleet management, passenger information at bus stops and 'differential' priority for buses at traffic signals, seeking to improve bus regularity and reliability, as well as increasing operating speeds. For traffic signal control, some cities are already committed to a particular type of UTC system, and bus priority then has to be integrated into it in the most efficient manner.

There is little evidence of network wide strategic approaches being taken, as proposed in EU project PRISCILLA⁴². Within this project the cities of Genoa and Toulouse have developed area-wide bus priority systems, covering a great number of buses (200/300) and a great number of junctions (80/100). In Southampton an area-wide bus priority simulation model has been developed. The PRISCILLA project has shown that bus priority at traffic signals can provide good operational and economic benefits when conditions are favourable. Bus delay and regularity

⁴² Priscilla project – Bus priority strategies and impact scenarios developed on a large urban area - Deliverable D4 European FP5 Information Society Technologies programme, 2002 <http://www.trg.soton.ac.uk/priscilla/>.

improvements can often pay for implementation costs within one or two years, with strategies able to cause minimal impact on general traffic.

IT-based demand responsive Transport (DRT) services

In many EU countries, the development of IT-based demand responsive transport services has been strongly promoted in recent years. The use of Information Technologies can be seen as particularly important for booking services, automated scheduling or for ensuring links to other services. A variety of output devices is started to be used in the vehicles, including mobile phones, on-screen maps, faxes, printers and radio communication. Information can also be dispatched through digitised radio. Global positioning systems enable booking operators to monitor the vehicles' location. Computer systems in control rooms store reservation information. The development of software enables to link routing and reservation information. This enhances the efficient management of vehicles. All technologies are well proven, although specific software development can prove difficult in the early days of system operation. Generally, this is a short-term issue.

At present, DRT services⁴³, which are self-financing, are not yet known. Since most of the existing DRT services are financially supported by public authorities, private operators are not really motivated to develop DRT services on their own, which could lead to a business case model in the future. In order to achieve more attractive services and a better staff and vehicle capacity utilisation, new ways to better integrate local mobility services at the local level and provide links to longer-distance or inter-urban services have to be found.

Institutional, operational or legal framework conditions, however, make the more effective combination of local mobility services often very difficult. Partnerships between neighbouring administrative districts and local operators can lead to more efficient multipurpose transport services. Close co-operation can also lead to common marketing strategies, which are important for promoting the mobility services in the region that are often not well known. However, this type of partnership is only poorly developed in Europe.

Existing problems and solutions

Low integration of operation management systems into company management system.

Operations management systems can be integrated in a fully automated company management system including operational planning (timetables, drive and vehicle rostering...), staff management (salaries, leave, etc.) and financial management (accountancy). However, many ERP (Enterprise Resource Planning) systems have been developed without considering the integration with fleet management systems that generally represent the "core business" of a PT company. There is the evidence of a first solution to this problem where a new special version of the SAP system has been developed targeted to the specific issue of a PT company.

Lack of comprehension about enlargement of bus priority systems

There is substantial evidence of the effectiveness of bus priority systems but many cities have developed limited applications only. In order to enlarge the systems there is clearly a wide range of issues to be considered by decision-makers, not the least of which is how to specify and select a system given the particular network, traffic and bus operating characteristics of their city and the

⁴³ see chapter 2.3.2 PT services in low-density areas

'legacy' systems which exist. There is little evidence of network wide strategic approaches being taken.

Some bus priority systems have demonstrated disbenefits

variety of surveys around the world proves that bus priority at traffic signals can provide good operational and economic benefits when conditions are favourable. Bus delay and regularity improvements can often pay for implementation costs within one or two years, with strategies able to cause minimal impact on general traffic. However, a wide range of results has been reported and some cases have occurred where benefits have not been achieved.

Lack of political support in providing bus priority systems

For bus priority at traffic signals to be feasible it is essential to have political support to provide priority to buses, perhaps at the expense of private traffic. They need to be backed up by adequate funding and commitment and co-operation from the authorities and bus service providers who would be involved in running the system. In this respect it is more and more evident that different institutional and operational 'models', which apply to different cities, can significantly affect the implementation options and commitment to bus priority.

There's also a lack of awareness concerning the variety of priority strategies that can be used, such as improving bus service speeds by providing priority to all buses, improving bus service punctuality or regularity by providing 'differential' priority, where different buses receive different levels of priority according to their punctuality/regularity at the time or according to benefits sought and levels of disbenefit acceptable for the private traffic involved.

Ineffectiveness of ITS tools due to the non-appropriate skills/commitment of the people involved in

This is true not only at the staff level but frequently also at the management level. It is vital that sufficient human resources are in place to keep the ITS working well. Without such commitment the system is likely to become inefficient and ineffective. ITS are always the combination of IT and management tools (combined with the needed human resources to carry on it) but sometimes the second part is underestimated.

Low level of co-operation between the actors involved at the time of the design and deployment of the systems;

For designing and purchasing traffic light equipment jointly used by public and private transport, the share of responsibilities for management and maintenance between the authorities overseeing the building phase, the transport authorities and the respective transport company is often not well defined. (I.e. who is responsible for both individual systems and the interfaces between the sub systems).

Few applications link in a synergic way the AVM bus fleet management with the UTC.

In many cities, due to the specific local context, the advantage of a combined use of the UTC and AVM systems is not sufficiently taken into account and only few measures associated with cooperative traffic management have been implemented. Actually there are some examples in Germany and in Italy (i.e. use of the bus speed derived from the AVM systems in order to give at the UTC centre information on the qualitative state of the traffic all over the city).

No formal feeding of operating cost savings into PT investment funds

Feeding operating cost savings into investment funds does not seem to be happening in many places in a formal way, especially in CEE where it is perhaps most needed given low public investment fund availability. It is perhaps a missed opportunity for sourcing substantial investment funds, but requires a legal and institutional basis which includes a driving mechanism to force/incentivise the savings *and* a catching mechanism to ensure the savings to some extent stay in the system (which can itself act as part of the driving mechanism). Municipalities for example are often under great financial pressure and there are rarely mechanisms, which eliminate the temptation to reduce subsidy in direct line with any savings. Transport Authorities represent a good institutional opportunity to implement such a feedback system.

2.1.7 ORGANISATIONAL AND PERSONNEL DEVELOPMENT

Development of management and staff

Staff development is an important part of a comprehensive quality approach that consists of mobilising all personnel of PT companies to provide satisfactory service to the customer. Furthermore staff development is crucial for managing the changes in markets, the development of new organisational structures, the introduction of new technologies, new management theories and work methods. Without a new management of their human resources and in particular rearranging the training and development of all levels of management, PT companies cannot meet their strategic objectives in the new competitive environment.

Therefore more emphasis should be placed on the development and implementation of so-called strategic Management Development (MD)-programs for new managers and managers who have been in their jobs for quite a while. Such strategic MD-programs are run in companies in various European countries, like for example in France (RATP/Paris), The Netherlands (Connexxion), Germany (Bremen/BSAG) and Romania (Bucharest/RATB). The MD-programs can be offered at company level, national level or even at a European level. Total investments in Management Development vary from 2% to 5% of the total wages, but in CEE countries this percentage is much lower.

Currently, many PT companies give special attention to middle managers, who feel particular pressures of having to implement most of the changes from the top to the bottom of their organisations. Their knowledge and skills (competencies) are critical in building and maintaining the right levels of innovation, service, quality and efficiency within their companies and to create the right organisational culture, which is needed for a modern service providing PT company.

Competency management

Due to the changing environment in which a PT company has to operate nowadays it tries to focus more on what it really has to deliver to the market, to the customer. In this respect we talk about the core competences of a company. The core competence could be for example “delivering an excellent service at a reasonable price and in an efficient way”. Such a core competence requirement means that there is a need for competent managers and employees, who have the knowledge, skills and attitude in areas such as “service provision”, marketing, pricing, customer-oriented behaviour etc. Job descriptions of managers and employees should therefore also contain a reasonable number of such competencies, depending upon the level at which they are operating in their company.

Especially in large PT companies, the use of competency frameworks is on the rise in Europe. Recently, the European Training & Development Foundation (ETDF/Paris/France) carried out a study on the use of competency management in large companies in various European countries

(France, Switzerland, UK, Belgium, Spain, Italy etc.)⁴⁴ This study has shown that there is an increasing interest in competency management. The currently used systems and applications of competency management vary considerably between the various European countries and/or companies. This is also true for PT companies in the various European countries and in CEE countries this approach is hardly being used so far. PT companies, like RATP (France), SAB (Italy), Connexxion (The Netherlands) have developed their own set of competencies for top-level people or even for front-liners.

A research report of the CIPD (Chartered Institute of Personnel and Development, London)⁴⁵ has studied the situation of companies in the UK, in particular those, which are operating on a more European or even global level. They are using competency management for a variety of reasons, such as:

- strategic planning of personnel (which competencies do we need for the future?)
- improvement of recruitment and selection methods(we look for new people with the right knowledge and skills, which are related to the core business)
- improving and adjusting training and development methods (we train our people in those competencies which are really needed in their job and at their level), etc.

Transport academies

Next to increasing training time and training budgets for managers, PT companies are co-operating more and more with external providers of training & development like universities, business schools, private institutions or so-called transport academies.

A well-known example of a transport academy is the PT Academy in Nuremberg, which was founded in 1998 and is the first specialist academy for PT in Germany. Its courses are aimed at public and private PT companies as well as local authorities, industry and consultants. The special feature of this type of academy lies in the self-contained further education concepts it offers for the whole range of staff of PT companies. Practitioners from the PT sector generally give the courses and lectures. An academy can offer various types of qualifications and further education courses for managers with operational experience, which enables them to channel their skills more effectively. Comparable initiatives are being taken by various universities in most EU-countries.

The EC has initiated various training programs in the urban transport sector through projects like PORTAL and TRUMP. Within these programs, training on PT issues plays an important role. The PORTAL project (Promotion Of Results in Transport Research And Learning) aims to accelerate the take-up of EU research results in the field of local and regional transport, through the development of new education and training courses and teaching materials. The beneficiaries of the project are mainly universities and other organisations providing courses and organisations. The TRUMP project (Training Programme for Urban transport Measures and Policies), which has started in September 2002, creates, based upon the results of EU funded research projects, a comprehensive European training programme for mid-career transport professionals working in local/regional authorities and for public transport operators.

In order to provide new knowledge and competences for managers in European PT-companies the International Union of Public Transport (UITP) has launched a tailor-made training programme for PT professionals in September 2002. It consists of major modules like "PT organisation and economy", "Management, Marketing and HRM" and the "Implementation of New Technologies" and emphasises the exchange of knowledge and networking between companies and regions.

⁴⁴ Geffroy, F., Tijou, R: "Le management des compétences dans les entreprises européennes, les différents approches", Insep Consulting Editions

⁴⁵ CIPD "Competency frameworks in UK Organisations", London 2001

Existing problems and solutions

Little money available for human resources development

Due to privatisation, reorganisation and cost reduction programs there is a tendency to dedicate less money to management development activities and Human Resource Development in general. In some cases (e.g. in Germany) standard budgets for MD and HRD are being defined in the case of tendering, mergers and take-overs, in order to ensure a minimum budget level for human resource related issues.

Difficulties to attract staff to the PT sector

PT companies have difficulties in hiring (top) managers as well as young academic managers, as they are competing with other industry sectors that offer better salaries and/or working conditions. This problem is even more apparent in CEE countries, where young potentials show very little interest in management or specialists jobs in PT-companies, as they find other private organisations more interesting in regard to salary and development offers.

Little attention for middle management

In terms of Management Development and competency management, little attention is paid to middle management, although they have a crucial role in (crisis) management and the management of change programs.

Lack of career and training programs

Small PT companies may have problems to set up special training programmes. Especially many PT-companies in CEE have no management development programs themselves and would therefore like to participate in programs of national transport academies or EU-wide initiatives such as the UITP Training Programs. The total amount of so-called Transport academies or "transport knowledge centres" is very low in Europe and European wide training programs are being developed at a very slow rate.

In the future a high percentage of new front-line personnel may have an immigrant background in various EU-countries. Special introduction and training programs will have to be developed for this purpose.

Low job profiles

The image of a job of a driver causes problems in hiring new personnel in various European and CEE countries. Drivers cannot obtain an official (national) diploma, only an internal certificate/diploma. There is a strong need to study and adjust EU-regulations in this regard, also to lower the age of drivers and to support achieving a better gender balance.

Lack of retirement policy

Many PT companies employ a high percentage of older drivers, who meet specific problems in their companies relating to health, stress and work-life balance. Furthermore these drivers are often not qualified to perform in other departments of the company. Since many employees will reach the age of retirement in the coming years, PT companies have to develop appropriate retirement policies, which are often still missing. Pension plans and age of retirement in various European and CEE countries show huge differences. No profound benchmarking study on the different pension systems exists at the moment, although the UITP Commission on Human Resources is trying to get a clearer picture of it this year.

Co-operation with unions and social dialogue

In a competitive environment the interaction with unions can be problematic as they tend to focus too much on social protection and organisation of work, which makes a company less flexible and can have a great impact on the total costs of an organisation (salaries, expenditure on pension, workplace improvements etc.). However, unions are also very interested in training & development of employees and support the idea of each employee having a Personal Development Plan (PDP)

Comprehensive reorganisation processes are necessary to improve the competitiveness of companies with high levels of acceptance among employees at the same time, including other social partners and stakeholders. Social dialogue and pacts of trust will have to be developed at national and EU-level to make further contributions to extending the freedom that companies have for the flexibility of action. In EU-reports there is a tendency that European Social Policy is structured around two 'strategies' involving employment and social protection and a "partnership" involving the organisation of work, which creates a large number of new guidelines for the various countries.

2.1.8 PT MARKETING

The success of a company in terms of revenues and market share is largely dependent on the satisfaction of the client. PT companies can make use of a range of marketing tools, which can improve the satisfaction of customers and therefore stop the decline of patronage, increase the number of clients or make passengers more loyal. Today, nearly all PT companies recognise the advantages of marketing and implement a number of single marketing measures. However, the use of general marketing strategies and marketing plans is still relatively new in the PT sector and can be found more often in bigger PT companies.

These companies often divide their marketing plan into a strategic plan for long-term measures and the information of the higher management and a detailed plan for the implementation of single marketing measures and the information of the staff. An important role in all marketing strategies plays the handling of the customers' perspective, which can be summarised with the term customer-relationship management. Since the handling of the customers perspective is so important this topic is treated in a special chapter⁴⁶.

Marketing strategies⁴⁷

Marketing strategies of big PT companies in general are closely connected with the global goals of the company, such as increase of PT patronage, sale of certain tickets, better customer relationship, quality approach, etc. Examples for marketing strategies that favour certain goals or a combination of goals can be found in Vienna (sale of certain tickets: loyalty programme of Wiener Linien), Barcelona (better customer relationship: sociological marketing of TMB), London (quality approach: service delivery standards of London Underground) and a lot of other cities.

Some smaller and medium sized PT companies also implement marketing strategies. However, in these companies the creation of a comprehensive marketing strategy is based on the initiative and qualification of single individuals, who are responsible for other things besides marketing. Therefore the marketing efforts of smaller and medium sized PT companies are more often limited to the use of single marketing tools.

Marketing in CEE countries still has to close the existing gap towards the situation in Western Europe. Quite some progress has been made, however, especially in large CEE cities (such as

⁴⁶ see chapter 2.3.4 Handling of the customer's perspective

⁴⁷ Nost K., 2001, What marketing does for public transport?, Key note speech at the 1st UITP Conference on Marketing, Barcelona (Spain)

Bucharest, Prague and a number of Polish and other Romanian cities), where it seems that local transport policy and economic necessity has driven a more positive approach to marketing and customer care.

Together with the start of comprehensive marketing strategies independent marketing departments were installed by the bigger PT companies only within the last few years. Compared with the expenditures for new infrastructure, rolling stock, maintenance and personal costs the expenditures for marketing are still marginal and not published as a single item in the annual company reports.

Branding

A certain form of marketing strategy, the development of an independent and specific *brand* for the company and its transport offer, has become increasingly important for most PT companies⁴⁸. There is a direct connection between branding, the degree of privatisation and the creation of a free market. The more advanced privatisation and the development of a free PT market have developed, the more efforts are put into the creation of independent brands.

As in other fields of marketing the big companies play a forerunner role. Intensive branding efforts in big cities started during the last decade. However, no common understanding exists regarding the introduction of one super-brand or a number of different sub-brands for PT in a city or region. Currently, both options exist, based on the local conditions (e.g. number of PT competitors or regional integration strategy).

In Stockholm, a strong brand for the authority and single brands for specific offers are used. In other cases, like in Vienna one brand is used for the entire company. For successful Branding it is crucial, that PT companies create and develop their own brands in order to use the advantages for both, their companies and also for the customers. Whatever brand is developed it must have a "personality" compatible with the people it is going to serve. Developing such brands takes many years and once created the 'brand' and its integrity must be defended and maintained.

Marketing instruments and methods

Successful marketing strategies should be developed based on the global goals of the company in close co-operation with the different departments of the company. This means that every department should know about the marketing strategy and that they should support it. Most marketing strategies include the use of different marketing tools, however, although it is better to use the different existing marketing instruments and methods as part of a comprehensive marketing strategy, it is also possible to use them separately.

With regard to marketing tools, there is a clear trend from the more conventional marketing measures, which only go into one direction from the PT operators or authorities to the customers (e.g. advertising, passenger information, etc) towards more targeted and interactive marketing measures, which include a direct dialogue with the customers (e.g. targeted campaigns, individualised marketing, etc).

Advertising

Advertising in this context means the publishing of information about PT in different media (e.g. advertisements in newspapers and journals, posters, etc.). It was the first marketing instrument used in PT and is still of high importance. However, most PT companies have noticed that this instrument is not sufficient to create a direct and real relationship with the customers.

⁴⁸ Lichtenegger M., Schillinger G., 2001, ÖPNV als Markenzeichen - Wiener Linien: Modernes Branding im Wandel vom Monopol zum freien Wettbewerb, in Nahverkehr (Der) 7-8, 51-52

Passenger information

Crucial marketing tools, which are actively used by most PT companies, are the different forms of passenger information. Besides the production and distribution of information material, such as timetables, this increasingly includes new forms of more personalised or real-time information traveller information via the internet or SMS⁴⁹.

Global awareness campaigns

Global awareness campaigns are important marketing instruments for public transport related umbrella organisations to show the advantages of PT in comparison with the use of cars. Besides them, also PT operators themselves have been developing more and more awareness campaigns during the last decade that try to change the public opinion about PT services (sometimes the term social marketing is used)⁵⁰. An example for such an awareness campaign can be found in Barcelona. The objective of 'Sociological Marketing' of TMB (Transport Metropolitans de Barcelona) is not to sell more tickets but to achieve both functional (utility) and psychological satisfaction (comfort, emotional well-being, symbolic representation of public transport use) of its captive users.

Targeted campaigns

Targeted campaigns⁵¹ have a clearly defined target group, whose accessibility and social inclusion regarding PT should be significantly altered or increased. In the example of business-to-business marketing practised in the industrial area of Hølsfyr near Oslo it was possible to initiate a targeted campaign with an already selected possible user group. The employees got specific information about PT and advice about the advances of PT-tickets versus the extra costs of new parking spaces. Targeted marketing campaigns can also focus at certain districts of a town or single PT lines. The basis for all kind of targeted campaigns is the selection of a clearly defined target group, therefore an appropriate segmentation of the population according to use patterns, origin-destination relations, time of usage, etc. is very important for such campaigns.

Individualised marketing⁵²

The most important aspect of individualised or dialog marketing is the building of a dialog between the PT operator and its customers. As a part of this dialog individual information needs of the customers are met. Individualised marketing does not start with a specific target group, instead it targets the entire population of a district or city. Only during the implementation of individualised marketing segmentation into interested and non-interested inhabitants takes place. Practical applications for individualised marketing can be found all over Europe (e.g. Nuremberg, Vienna, and Paris).

Product marketing: Ticketing and pricing

Marketing in PT has to fight with a special problem that is unique in marketing. As the product (transport offer) produced by PT is substantially the same for all customers it is not easy to create or promote a special product for different user groups. The use of different tickets for different user groups (social tariffs, job tickets, tourist arrangements, combined tickets and other ticket forms) is therefore a common marketing instrument in most PT companies to create individualised products.

⁴⁹ see also chapter 2.3.3 Traveller information services

⁵⁰ Charles-Tolra J., 2001, Sociological marketing: Marketing that doesn't want to sell, Paper presented at the 1st UITP Conference on Marketing, Barcelona (Spain)

⁵¹ UITP, 2001, CORE BRIEF Business-to-Business-Marketing, Brussels

⁵² Brög W., Schädler M., 1999, More passengers, higher profits for public transport - (im)possible expectation, Paper presented at the 53rd UITP Congress, Toronto (Canada)

Internal marketing

For a successful marketing strategy internal marketing is as important as marketing for the customers. Customer satisfaction can only be achieved through customer orientation from top management to service operation. Internal marketing is an important issue in many PT companies. However, for systematic internal marketing the whole staff of the company has to be involved in the marketing measure, which is not often the case⁵³.

Merchandising⁵⁴

Another important marketing tool is merchandising, which becomes increasingly important as a tool for image building, an additional source of income and as a tool for the promotion of the brand. Merchandising concentrates on selling of products that are not part of the core transport offer (e.g. replicas of transport vehicles, t-shirts, mugs, calendars, toys, etc.), but that have some kind of connection with the selling PT company for example through the PT companies logo on the product.

A lot of PT companies sell some merchandising products, however a systematic approach with a separate shop as practised by Regionalbus Braunschweig in Germany or with a museum, separate shops and online shopping as practised by Transport for London is not really common. There is a close connection between merchandising and branding as the selling of merchandising products will strengthen a brand and a strong brand increases the selling of merchandising products.

Existing problems and solutions

Underestimation of marketing impact

While most PT companies have realised the value of a great variety of marketing measures, some others still do not pay sufficient attention to marketing activities or, after certain success, reduce their effort to simple advertising and the production of information material.

In the public transport sector marketing often is seen as a cost factor mainly, but not as a measure to increase the income of the company. In order to change this point of view some PT companies have made the marketing departments responsible for part of the income they generate (e.g. London Underground) or they have increased the quality of accounting (e.g. RATP). Another method used by a lot of companies is to carry out comparative surveys before and after a marketing measure for the evaluation of its success.

Still few CEE PT companies have a formal marketing strategy or specialist marketing experts, the ones that do are based in the larger cities. Few policy or research programmes seem to pay attention to the need for marketing in PT companies, thus most PT companies in CEEC still have too little information on their customers. A survey of Vilnius PT professionals for example revealed that marketing and promotion is regarded as one of the least performing areas in public transport (narrowly behind financing and policy).

Little integration of marketing departments

The integration of marketing departments into the overall company structure of PT companies is often very limited. Especially better connections with the human resources department and the sales department would be very important. Through these connections marketing should not only promote an existing transport offer, but also help to make the transport offer more customer-

⁵³ see also chapter 2.1.7 Organisational and personal development

⁵⁴ De Boer J., 2001, Ein starker Auftritt des RBB - Regionalbus Braunschweig: Ein Verkehrsdienstleister in der Fläche nutzt die Möglichkeiten des Marketings, in Nahverkehr (Der), 5, 34-39

oriented. Interesting integration schemes that fulfil this criterion can be found at RATP (Paris) and Wiener Linien.

Lack of marketing strategies

Marketing is not only a tool to promote current activities, but also tries to increase the future PT ridership and is therefore a visionary instrument. Thus it is essential to underpin operational marketing measures by a comprehensive marketing strategy. As a part of such an approach the population should not only receive information about the present situation of PT in a town or region but also about the vision for the future of PT.

Some good examples have already been developed, such as the homepage of the SaarBahn, where the planned extension of the network is described, or the personalised marketing strategy of the VAG, the PT operator of Nuremberg, where a systematic long-term approach is used to set up a dialogue with the PT users. Also the “site marketing”, a strategy developed by LVB, the PT operator of the city of Leipzig, can be mentioned in this context. Objective of this strategy is to initiate a dialogue with users and affected inhabitants or shopkeepers and to promote the benefit users and inhabitants will have from the construction measures that are currently disturbing their environment and mobility.

Unclear responsibilities for marketing

Along with the PT market liberalisation the allocation of responsibility for marketing and especially branding will need to be re-discussed. This debate mainly involves PT authorities and operators. In Austria PT contracts include agreements on how marketing and branding should be handled between different PT operators or between PT operators and a PT authority.

Another possible solution is a voluntary co-operation involving strong partnerships and co-branding, which is very difficult to reach between independent competing operators. An example for such a solution can be found in Stockholm.

2.1.9 SUMMARY: KEY PROBLEMS

In the different areas of the chapter “Public transport and economic sustainability”, which are all relevant for achieving more economic efficient and effective PT systems many existing problems have been identified. The key problems can be summarised as follows:

The analysis of the **PT market and customer’s perspective**, which is an important basis for PT systems planning and design, is often characterised by weaknesses in terms of using and comparing the results of the surveys. Those departments who are responsible for carrying out the surveys are often not aware of the potential benefits of their surveys and therefore communicate the results to other interested actors only slowly or not at all. As a consequence the comparability of data on the performance of different PT operators or modes is often limited.

Only some PT companies use a direct counting for their users to learn about the distribution of passengers within their network. This means that PT can often not respond adequately to the changing activity patterns of the customers.

Furthermore, many PT companies do not take the detailed analysis of customer’s reasons for using public transport or not (which is an important condition for planning more customer-oriented services) seriously enough. The importance of subjective reasons for and against PT use compared to the more visible objective reasons, but also the specific needs for different user groups are often neglected when planning PT services.

With regard to the **organisational aspects of PT** many problems related to the introduction of competition, contractual arrangements, emergence of new actors and the organisational integration of PT have been identified.

With the introduction of a form of competition there is a general fear, that due to cost saving pressures, social and wider community needs will lose attention. A second problem related to the introduction of competition is a preferential position of the former, mostly public owned PT operator in the market, who tries to block competitive tenders. This means also that present PT operators hinder the access to important market information for potential competitors. The introduction of competition in the PT sector also includes the danger of an unfavourable PT market environment, when not enough potential PT operators are bidding. In this case the benefits of introducing competition can be lower than expected. Another danger of unfavourable PT market conditions is the trend of a few large international companies dominating the opened markets, which can lead to unbalanced market forces between manufacturers, operators and authorities.

Related to contractual arrangements a main difficulty can be seen in combining the binding nature of a contractual agreement with the flexibility for the operator required for developing better services. Another problem is linked with the defining the right duration of contracts. While longer contract periods allow for more stability on the operator side, a short duration ensures more flexibility for the authority.

The organisation of PT is characterised by an increasing number of actors due to the diversification of PT services. With an increasing number of different PT actors, who can sometimes have conflicting interests the development of integrated customer-oriented services is getting more difficult.

Another weak point with regard to the organisation of PT is the missing organisational integration of PT in an overall integrating authority. Many authorities are reticent to transfer certain legal allocated competencies to an integrating regional authority. Moreover, the co-ordination of PT policies and other urban policies, such as land use, is not well established. Although widely discussed, examples of true integration are scarce.

Improvements of the **PT infrastructure** (PT networks, interchanges, and dedicated lanes) are often difficult to be implemented due to a lack of investment. In many cases, only limited financial resources are available for improving and maintaining PT infrastructure. PT stakeholders are often reticent about investing in the improvement of the design of interchanges due to high costs. The positive effects that new or redesigned interchanges can have on the efficiency of a PT network (due to time restrictions) are often not perceived. Especially the importance of small or "informal" interchanges for promoting intermodal trips are often not fully appreciated.

As regards the introduction of **new rolling stock systems**, which are considered to be important for diversifying the market offer and to be more competitive, the high investment costs are the major problem. Many new rolling stock systems (e.g. guided systems on tyres) are still in an experimental phase. Initial projects turned out to be more expensive than expected. Further assessments in terms of cost and reliability are necessary before wider introduction in the market is possible.

Within the area of **PT operation**, the low integration of operation management systems into overall company management systems, including operational planning (timetables, drive and vehicle rostering,...), staff management and financial management is seen as an important problem. Another key problem in this area relates to the lack of political support, adequate funding and co-operation between authorities and bus service providers for implementing traffic signal control and bus priority systems .

The key problem related to the area of **Training and Human Resources Development** is again the lack of financial resources. Due to privatisation, reorganisation and cost reduction programs, there is a tendency to dedicate less money to Human Resources Development, although much effort would be required to achieve a more customer friendly approach of staff. In terms of Management Development, many PT companies have difficulties in hiring high level managers, since they are competing with other industry sectors that offer better salaries or working conditions. Another problem in this respect is the little attention that is paid to the development of middle

management staff, although they are usually playing a key role in implementing changes in companies. A widespread problem, in particular amongst small PT companies and companies from CEE, is the lack of career and training programs.

Although nearly all PT companies implement **marketing** measures, the potential benefits that a comprehensive marketing strategy can have on the development of PT use are not fully appreciated. In the PT sector marketing is often seen as a cost factor and not as a measure to increase the income of the company. Moreover there is a general lack of integrated marketing strategies, especially in smaller PT companies. Co-operation between the marketing department and other departments of the PT company (especially the human resources and sales departments) is often very limited..

2.2 Public Transport and financial sustainability

2.2.1 INTRODUCTION

Financing urban transport systems includes all economic instruments that can lead to⁵⁵:

- more efficiency, that is any means to improve incentives to economic efficiency and internalise external effects of transport;
- raising additional funds (capital) to support the costs of the various elements of urban transport systems.

The different ways of increasing the economic efficiency and effectiveness of PT networks and operations have been treated in the previous chapter, whereas the possibilities and problems related to PT funding will be analysed here.

PT funding is an issue of highest priority, in particular in CEE countries. According to the CAPE survey⁵⁶, capital financing of PT infrastructure and equipment is perceived to be the most pressing transport problem of local authorities and PT companies in accession countries. Since the transformation to market economies, ageing rolling stock and existing infrastructure needs renewal or upgrading to modern standards.

The most common source of PT financing across Europe are PT users contributions (PT fares), although in most cities they cover only a part of the operating costs. In general, the costs that cannot be covered by the revenues of the PT users, are borne by the public authorities (the central government, regions or cities). The high investments of public authorities in funding operation costs but also PT investments are often justified by the overall socio-economic benefits of PT, like for example its contribution to the regional development or social inclusion.

With the increased competition of the PT market, many examples exist, where private actors have been involved in the financing of PT infrastructure. This has considerable effects on the efficiency and effectiveness of the PT service provision, since it may reduce the need for public financing/subsidising and may open the door to private capital. In addition, it may contribute to show real PT cost more clearly.

2.2.2 OPERATIONAL COVERAGE

Within the EU project FISCUS a clear overview of the use of PT fare in European cities is given. With the exception of the deregulated regimes, fare levels and structures are settled within limits established by the authorities. However, sometimes also PT operators are involved in the definition of fares.

Due to the public service characteristics of PT the establishment of concessionary fares for user groups, like students, elderly people, etc., are very common in Europe. Important from a financing perspective is the distinction between cases in which operators are compensated for such reductions, on the one hand, and cases in which operators are obliged to grant reductions without any compensation, on the other hand. Sometimes both solutions exist within one country (e.g. in Austria rail operators receive high compensations, bus operators do not). Specific ticket types, which make a distinction between peak and off-peak fares, are not frequently used. The possibilities for integrated fares and revenue sharing as well as for tariff differentiation over time of the day may be considerably increased by using smart cards and other advanced payment systems. The extent of public coverage varies considerably between the different European

⁵⁵ Transport Financing and Pricing (MARETOPE, D1 page 39, FISCUS)

⁵⁶ CAPE project (Co-ordinated Action for Pan-European Transport and Environment Telematics Implementation Support, funded under 4th Framework Programme of the EU): "Survey on Transport Telematics Applications in CEEC", 1999

countries and depends on the right to introduce new taxes, to determine tax rates and the responsibility for PT fares.

The PT fares can either be set for a single operator or more and more as an integrated tariff, which means that one tariff system is applicable for all PT services of a city or a region. Only in Great Britain PT fares are set by operators, with the exception of tendered services and concessionary fares.

The share of PT fares related to the overall costs of PT is in most European cities fairly low. According to Janes' Urban Transport in 1993, the coverage of operating costs by revenues varies widely across Europe. In the cities of Dublin and London with 96 % and 79 %, respectively, a very high operating cost coverage can be found, whereas in Athens, Amsterdam, and Rome the cost coverage reaches only 27 %, 25 % and 10 %. The cost coverage in most other European cities ranges between 30 % and 60 %. Over the last years a tendency to increase this ratio can be observed in most cities.

However in most cases public funding stays the main source for deficit coverage. They contribute to the stability of the service but are also seen as a major contributor to the productive inefficiency of the less competitive operators. In some cases the public transport operator is part of a general public service company which also includes the provision of utilities like water, electricity, gas and waste disposal. The loss of one public service is covered by the profit of the other.

Another source of public funding are earmarked taxes for transport purposes, which are collected either directly or indirectly from the employers, and aim to assure the mobility of their employees. Examples are the "versement de transport" used in France, and the similar taxes used in Vienna and in Brazil. The main drawback of the method relates with the increase in labour costs, and in turn has the merit of raising an additional source of financing, while keeping some competitive pressure on the operator for the improvement of the quality of the service, as the choice of mode and company are still left to the end-user.

Existing problems and solutions

Revenue distribution in integrated tariff and ticketing systems

Integrated fares are considered as very user-friendly service offers, they enable passengers to use a whole PT network without having to care for the service provider they are using. The downside of this integrated approach however is, to find a fair way of allocating the resulting revenue to the single operators according to the amount of service they have delivered.

An initial approach that can be used when setting up an integrated ticket and tariff system is to distribute the overall revenue according to the partners past revenue. Regular updates have to be made based on passenger counting in order to reflect changes in passenger distribution. A promising solution for this problem seems to be the introduction of electronic ticketing systems, which would allow for direct and permanent passenger counting⁵⁷.

The establishment of an integrated fare system on the basis of a rebate system, which removes a penalty that customers at present pay when making interchange journeys, can lead to a loss or revenues for the operating companies. However, this loss is likely to be compensated in some years, since an increase of the number of passengers is possible and likely.

⁵⁷ see chapter 2.3.4 Integrated tariff and ticketing systems

Unclear allocation of subsidies in a competitive market

An important question when introducing competition is how to divide in the most efficient and effective manner subsidisation and other financial incentives, treating all PT operators equally and enforcing the establishment of a sustainable PT network. In many cases the PT operator was subsidised through a gross covering of the operator's debts at the end of the accounting year. When introducing competition the idea is often that besides the operational risks the operator is bearing an increased part of the financial risks of the operational services. A detailed subsidisation scheme has to be developed, assuring equal treatment of all operators and has to be based on often-political choices of percentages of subsidisation of economical viable and non-economical viable, but social desired operational services.

Lack of reliable and sustainable operational financing models in CEE

In some CEE countries, operators still bear an unacceptable revenue risk and pressure on their financial negotiating position, due to unreliable loss coverage by local authorities and municipal or operator responsibility for remuneration of state ordained compulsory fare concessions.

General unreliability of loss coverage by municipalities (usually default on payment or refusal to pay full costs, because expected funds are not made available in the budget year) leads to reserve withholding of any spare funds in PT companies, to a chronic lack of funds for maintenance, renewal and to other internal debt which may degrade operations. It is a problem that can be reduced by further privatisation of PT organisations and a legal requirement on cities to close contracts which guarantee to cover costs agreed with the operator / or any losses incurred during to service delivery. A contract requirement helps to push transport up the payment priority list but of course does not solve the root institutional problems of municipal dependency on an unreliable central government source of funds.

To aggravate this problem, heavy state ordained fare concessions lead to a high proportion of lines being "loss making", require heavy remuneration of losses by municipalities, and contributes greatly to general unreliability of loss coverage. The concession problem is best dealt with by a clear transfer of direct fiscal responsibility to the state itself for state ordained concessions. This greatly improves transparency and reduces the local financial pressure on municipalities and PT companies.

Even when financial models are stable, financial pressure on municipalities means that compensation of losses often does not allow for sufficient profit for vehicle renew and other investments, which is not sustainable. Specific legislation enabling and guaranteeing reasonable profit in contracts, provided adequate performance, is one solution to this problem.

Distortion of competition through cross-subsidisation

- Cross subsidy could be a problem in terms of distortion of competition as it gives a clear advantage to public companies, mainly municipal companies with other activities (e.g. electricity, gas, interurban transport). The potential to distort competition is particularly high in regulated regimes where municipal companies detain a significant part of the market share.

2.2.3 INFRASTRUCTURE INVESTMENTS

There are several ways to finance new or upgraded PT infrastructure. Although here a division is made between Public and Private funding often a mixture of tools is used.

Public funding

Although the availability of public sources for financing public transport is generally decreasing, they are the main source for investment in urban public transport. Public funding can either come from the local authorities' own sources or from regional or central budgets.

In particular in CEE countries, PT infrastructure investment is quite slow and behind needs. PT companies as a rule do not have sufficient own funds to contribute to major investments and quite frequently do not have enough to cover vehicle renewal. For reducing the burden of own investment funds, many CEE authorities (e.g. Bucharest) make use of loans with international financing institutions (IFIs). IFI loans also have the advantage of committing the local authorities to co-financing, which helps stabilise longer-term financing. They also bring rewards in creating pressure for reform and cost-reductions within PT companies, as for example in Budapest and a number of Polish cities⁵⁸ illustrate the diversity of application and at the same time the restriction to larger cities, which have a credit rating.

Private funding

Due to the decreasing availability of public funds, the economic trend to go "off balance sheet" (a reduced public sector borrowing requirement adds stability to fiscal policy), the wish to see more innovation in projects and the increased competitive environment on the PT market, the search for private funding sources is getting more important. Within the private sources of financing, private loans, public private partnerships and private finance initiatives are the most relevant ones.

Private loans

Private loans are a traditional form of financing. They are mostly used to solve cash-flow problems, and its main advantage is enabling the division of costs between more than one user generation. Private loans are mainly used for investment purposes (rolling stock and infrastructure). The loans, including the interests have to be repaid within a determined period and the financing risk is taken by the transport operator (public-owned or private).

Public authorities usually get loans under better conditions than private companies, since the financing risks for public authorities are considered to be lower. The European Bank for Reconstruction and Development, the European Investment Bank, the European Investment Fund and the World Bank (IFIs) are examples of institutions providing private loans for financing transport projects in Europe. The IFIs are however influenced by the public sector which support them and therefore assess achievement of policy goals in their selection procedures.

Equity shares

The instrument of equity shares is normally used to set up operating consortia to operate PT systems. This can be the operation of new or already existing PT systems. Depending on the amount of the shares taken from the initial owner or specific arrangements also the management is taken over. An example is the case of Görlitz, where a private operator took over 74.9 percent of the shares and the management of the local authorities.

Public Private Partnerships

A special type of contracts can be found in Public Private Partnerships mainly for the financing of PT infrastructure and equipment and the sharing of knowledge - Public Private Partnership

⁵⁸ Examples of IFI loans can be seen in the Voyager working paper "state-of-the-art of PT in CEE".

(PPP's)⁵⁹ are contracts between the public and the private sector, normally used to provide urban mobility solutions. PPPs are about establishing arrangements, often a legally binding contract that will bring benefits to both sectors. The private sector needs to earn a return on any investment and product/service delivery, which it supplies as part of the package. The public sector wants to deliver services to the standard specified and to make the best use of public resources. The main advantages of these arrangements, when correctly implemented are:

- Introduction of innovation which the public sector is not as well set-up to deliver
- Relief of the pressure on public budget and consistency of funding and/or the macro-economic benefit of going “off balance sheet” with investment;
- Sharing of risk and responsibilities with private partners;
- Increase in efficiency through competition for the concession and application of commercial practices (the private investor is forced to optimise the use of efficient forecasting and appraisal techniques)

The overall framework (including the conditions of financing, and operation) is generally defined by the public sector in consultation with expert consultants and then with short-listed private partners. The private partner on the other hand is planning, building, financing and operating the project at his own risks and often has the right to collect user charges. An example of this can be found in Porto, where a private consortium is carrying out a won BOT (Build, Operate, Transfer) contract for a new metro network.

Examples of PPPs in local transport with investor financing are so far almost unknown in CEE. Only few of the CEE countries (Poland, Czech Republic) have made limited progress in creating PPPs, but not yet for any local transport.

Private Finance Initiative

The Private Finance Initiative (PFI) is another important mechanism through which the public sector can improve value for money in partnership with the private sector. The aim of PFIs is to deliver higher quality and more cost-effective public services by encouraging partnerships and by involving the private sector more directly in asset provision and operation. PFI are widely used in Europe whenever new Public infrastructure has to be built. The main triggers for the introduction of PFI projects are the lack of public financing and the belief that certain public services (e.g. transport) can be delivered with a better value-for-money and with better innovation by the private sector.

In most cases a Special Purpose Company (on paper) is founded that serves as the entity that deals with the authorities. In this SPC the several partners of the consortium are united. All consortium partners provide equity to the SCP and according to the type of the partner, specific contracts are established. Nowadays some models exists where the Authority itself provides equity to the SPC for being more involved and has more influence on the different processes. The following diagram shows a general model for setting up a PFI. However, many other models are existing.

⁵⁹ MARETOPE, D1 page 39

The general model for the set up of a PFI is presented in the following figure:

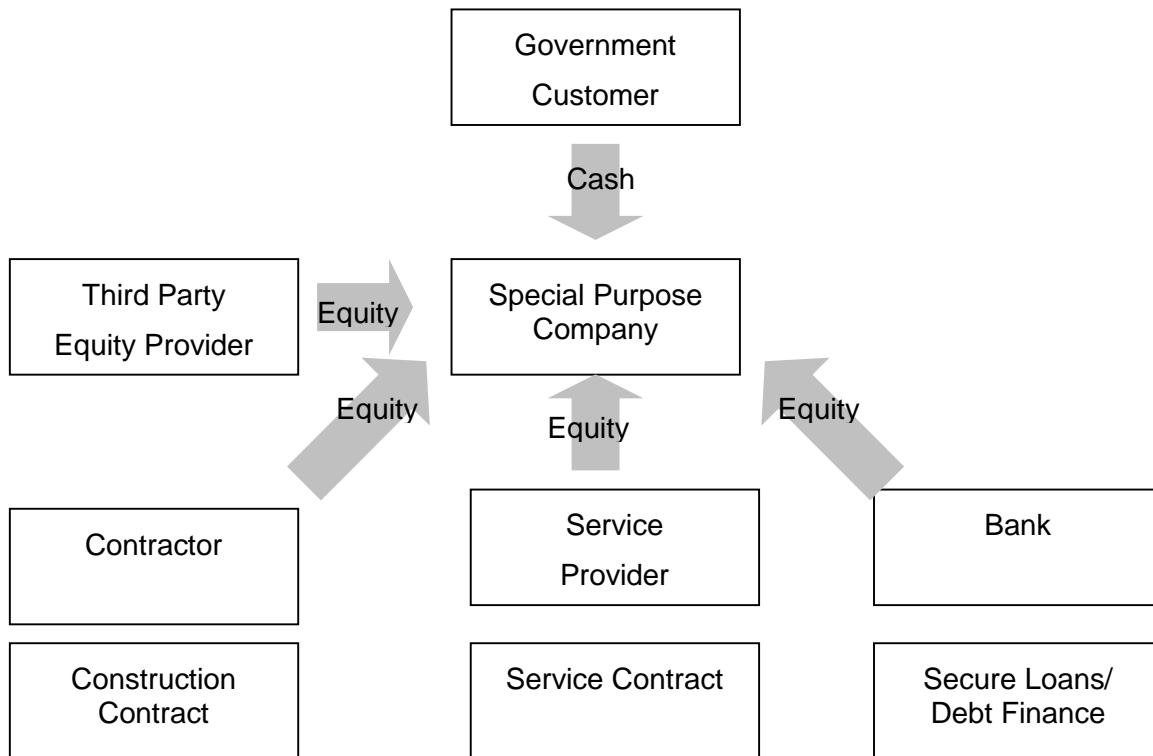


Figure 6 Schematic set up of a PFI

The difference with PPP is related with the level of involvement of the authorities. In general within a PPP the authorities are one of the full responsible partners and bear a large share of the financial and organisational risks. On the contrary within a PFI the risk are fully covered by the participants of the Special Purpose Company, while the Authorities are customer. There are several mix forms available that include the advantages of PPP and PFI. For instance in cases where the authorities are partner within the Special Purpose Company, instead of just customer, they bear a defined part of the risks of the development.

Value capture

Value capturing is a range of tools that enable the capture of external economical gains due to the elaboration of PT infrastructure or operational services. For instance the development of new PT infrastructure might influence positively the values of surrounding properties. When there is no Value capturing tool applied, the owners of these properties gain significant windfalls without covering part of the costs. The increased value can for instance be captured through the operators ticketing or special taxes for surrounding areas. Value capture, which entails a low risk of distortion of competition, presents the following advantages:

- Value capture through operators' revenue: Internalises the external benefits produced by transport facilities and reduces the need for subsidies. Additionally, some of the diversified services can be a stimulus to increase patronage (e.g. commercial areas, vertical integration of services, etc)

- Value capture through taxes: Besides internalising the external benefits of transport facilities, some taxes (e.g. land owners) stimulate the systemic approach to urban planning, with a significant impact in the scope of action of the authorities responsible for the mobility system.

Non core business (real estate, etc.) and private cross subsidisation

The use of non-core business related forms of funding are very rare and the existing examples are mostly unsystematic, for instance when the real estates of PT companies are managed. However examples for a systematic effort to increase the importance of non-core business related income do exist.

*In **Leipzig** the different non-profit services, which surround the PT service like maintenance, vehicle cleaning, education, the continuation of education training and others were separated from the main company and restructured as independent daughter-companies. These companies have to make profits not only with their provision of services for the mother-company but also for other transport operators. In order to give the different daughter-companies a better market position they are operated in cooperation with Siemens an multinational group of companies.*

In some cases the private operator uses cross subsidisation to finance its loss-making PT services. For instance in the case of Görlitz the conglomerate Vivendi took over all public utilities of the Municipality. Its different subsidiaries are taking care of the operation and delivery of the different utility services, like electricity, gas, waste management and public transport. The loss of one subsidiary is covered by the profit of the other.

Existing problems and solutions

Allocation of risks

The major concern in PPPs for transport investments is the allocation of risks between the partners. Due to long planning and construction periods and high durability of infrastructure investments associated (political, financial, construction, operational and commercial) risks can be very high and considerable uncertainty is also involved, in particular if external benefits, and respective value-capturing are to be taken in account. If too much risk is transferred to the private sector, projects can become much more expensive than if the public sector procured it in the normal way.

In general are the private partners bearing more risks in case of a PFI, however also here difficult process of best-balancing of the different operational and financial risks have to take place.

The main disadvantages of PPPs are complex arrangements concerning the division of risks, tariffs, etc., higher financing costs compared to the public sector and, due to private goals, only "second best" solutions may be possible from a welfare economic point of view. This depends of course on the willingness of the public sector to "top-up" any shortfall in self-financing investment levels to ensure a more policy compliant solution.

PPPs are more difficult to apply in local transport when the system cannot raise enough revenue to cover even operations costs due to municipality imposed tariff restrictions and/or a lack of adequate demand, which is a quite common in local public transport. In these cases it is necessary to agree on a subsidy regime, which still provides incentives and brings some benefit from the private solution.

None of this is impossible but increases the risk and cost for the private sector as the public sector gains more control over revenues and effectively the PPP turns more into a “shadow tolling” type solution where an effective investment “loan” and operations subsidies are repaid variably according to the service performance on stated criteria. For the investor’s bank backers to accept such a project, a credit rating of the city or state guarantee in the case of default may be required.

PPPs are most suited and in fact most applied in local and regional transport to largely self-financing projects such as new airport links with a fairly stand alone position in the integrated transport system (another source of external influence risk).

Shortage of public investment funds and lack of viable alternative sources (especially in CEE)

A general shortage of public funds available for transport at the local level, largely drained by high levels of direct fare subsidy and fare concessions and coupled with inefficient operations, leaves little space for adequate direct investment from public sources. Against this plays the acute need for renewal of neglected infrastructure, rolling stock and creation of new services to meet changing mobility needs.

For large cities, IFI (international financing institution) loans are a serious and increasingly used option, but not for smaller cities who most often have no credit rating, because the institutional relationship with central government does not warrant one (not enough income guarantees or own sources of income. Other possibilities include PPPs, which are most suitable for specific stand-alone projects, which are operationally profitable. If the project is not operationally profitable then again a credit rating or default guarantee may be required. Promising solutions for raising funds seems to be specific transport taxes on companies, possibly road pricing and the issuing of city bonds, all things which the city can have direct control over. Many of these, however, require specific national legislation

Many of the solutions discussed in this document for increasing investment and operations efficiency (rigorous economic evaluation, competition effects, marketing, ITS etc.) coupled with reductions in direct subsidy and concessions will be effective for raising investment funds if a mechanism is created to catch some of the savings for investment purposes before they are lost back in the general city budget.

2.2.4 SUMMARY: KEY PROBLEMS

Related to PT **pricing** (which means raising revenues of PT users), the difficulty of revenues distribution in integrated tariff and ticketing system has been mentioned as an important problem. In integrated ticketing systems, which can include PT services of several PT operators, there is always the need to find a way of allocating the resulting revenue to the single operators according to the amount of service they have delivered. With respect to the introduction of competition, an important problem is the unclear and unequal allocation of subsidies and other financial incentives amongst the PT operators. Very often the allocation of subsidies amongst PT operators is not based on the types of services offered by the operators, but consists of gross covering of the operator’s debts at the end of the accounting year. A particular problem of PT operators in CEE countries is the lack of reliable and sustainable operational financing models. Many operators are facing high revenue risks due to unreliable loss coverage by public authorities.

The **financing of PT infrastructure and equipment** is considered to be a really important problem of local authorities and PT companies. Especially in countries from Central and Eastern Europe there is a great need to upgrade the ageing rolling stock and existing infrastructure to modern standards. At the same time local authorities or PT operators in CEE have a chronic lack of public investment funds and viable alternative sources for maintaining or renewing neglected PT infrastructure and rolling stock or creating new services.

Private funding options, such as PPPs, can only be used for specific stand-alone projects, which are operationally profitable. The major concern, when using PPPs for transport investments is the allocation of risks between the partners.

Public Transport and social sustainability

2.2.5 INTRODUCTION

PT is a business sector, where economic interests and societal requirements are widely overlapping.. The development of PT services cannot purely depend on market forces alone, since it has an important impact on promoting local economic development and improving the quality of life of citizens. Public transport can be considered as a collective mode of transport, which has to respond to a wide range of different needs and expectations. Therefore it is often considered as necessary, that Public Authorities intervene in PT, in order to balance interests and to ensure a minimum level of services for particular areas and social groups.

In a society, where car ownership is the norm in most of the households, individuals without access to a car can be considered as transportation disadvantaged, since their travel alternatives are limited. The limited travel options makes them “socially excluded” to some extent, since they do not have the possibility to fully participate in all day-to-day activities or cannot behave as the vast majority of society, who has access to a car.

Age, income, disabilities, gender, ethnicity and education are all factors affecting mobility. Individuals who are minor, elderly, poor or with disabilities are highly represented amongst the transportation disadvantaged. Especially in peripheral areas the “social exclusion” of non-car owners and non-drivers is obvious, since access to most facilities is almost impossible in some areas without a car.

Clearly, general policies to promote the quality of PT services will have benefits for all citizens, in particular for the socially excluded and can therefore largely contribute to social sustainability. PT can be very supportive in providing better travel opportunities and better access to day-to-day activities of all people, such as employment, education, and health services without being dependent on the car. In order to provide high quality services PT can be improved regarding to:

- Availability
- Accessibility
- Attractiveness

2.2.6 AVAILABILITY OF PUBLIC TRANSPORT

The availability of public transport depends on the PT network and on the frequency, timing and capacity of services. In densely populated urban areas of larger cities, the availability of PT services is mainly guaranteed by metro, light-rail or bus systems for smaller cities, which offer services with high frequency. A frequent service means that the waiting times are short so that it does not matter so much, if a vehicle is missed. In these areas, the availability of PT can be limited due to capacity problems mainly at peak-hours, which can be solved through the increase of frequency and capacity of services.

However, these high frequencies of PT services cannot always be maintained. As a consequence, the influence of waiting times on the total journey increases, which means the degree of availability of PT decreases. An important availability factor is the timing or the integration of different PT services and the development of personalised, flexible and customer-oriented mobility services, which are complementary to the PT network.

In less populated peripheral areas with a lower PT demand, PT networks normally consist of bus systems, which provide the best area coverage. Very often in these areas the PT availability is considered to be insufficient, since the frequency of services are low. Especially at off-peak hours, at night hours and on weekends, the availability of PT is often limited in these areas. Usually, minimum frequencies to be achieved across the network have been adopted and increasingly frequency is co-ordinated through demand oriented transport services.

Integrated PT services

The co-ordination of services and the synchronisation of timetables of different PT modes are increasing within PT networks, which are run by only one PT operator. Automatic Vehicle Monitoring of the PT fleet has been widely applied in order to get better-harmonised and more reliable services and reduced waiting times for customers at PT interchanges⁶⁰.

However, in large parts of Europe, the great number of different actors (various operators for different modes, several authorities, etc.) hinders the planning of integrated intermodal transport networks within a city and its surroundings. This makes the development of harmonised, intermodal services and integrated tariff and ticketing for a region often very difficult.

There are considerable differences in the level of co-operation of local and regional PT services in Europe, which are largely dependent on the legal and institutional framework and on the market environment for PT services⁶¹. A regulated PT market with a strong co-ordination role of the public authority often means a higher degree of integration of PT services of different operators. On the other hand, a deregulated market solution may improve the productivity of the PT operator's services, but often at the cost of less co-ordinated services.

In the UK, integrated planning of PT provision, including common travel cards and tariff systems are in general not very common, partly due to an unfavourable legal framework. Efforts of operators to establish a greater co-ordination of PT services or integrated ticketing have been hindered by the 1998 Competition Act, which makes an agreement of operators on common fares very difficult. However, the Transport Act 2000 indicates the possibility for more co-ordinated ticketing by allowing local authorities to establish common tariff schemes. Another way of improving the co-ordination of PT services is given by the "Quality Partnership" concept⁶², which has been developed in the U.K. in response to its particular structure of PT operation.

In more regulated markets, like in Germany, the total number of passengers and the revenue has often increased, due to the improved interoperability of local and regional PT services. An advanced status of PT service and timetable integration can be found in various German "Verkehrsverbünde", which are regional transport associations that organise PT within conurbations and commission transport from the private and municipal transport operators.

⁶⁰ see chapter 2.1.6 PT operation

⁶¹ see chapter 2.1.3 Organisation of the PT sector

⁶² see chapter 2.3.4 Service standards in contracts

*The **Verkehrsverbund Berlin-Brandenburg**, which includes 36 PT operators of whole region Berlin-Brandenburg, has developed an integrated timetable for all PT services.*

*In the **region of Northrhine Westfalia** in Germany, the “Integraler Taktfahrplan”⁶³ (integrated timetable) shall lead to a complete synchronisation of timetables of local and regional PT services at defined interchange zones in order to reduce the waiting times of the customers to a minimum. The plan is to expand the already existing fully integrated timetable of the rail-based traffic in the region to local PT services. The integrated timetable for the rail-based traffic in Northrhine Westfalia has resulted in an overall reduction of travel times of 5%. A good example of the implementation of the “Integraler Taktfahrplan” can be found at the regional railway line “**Haller Willem**” near Bielefeld. This example highlights that it is not sufficient only to synchronise the timetables of the line and its feeder services. Furthermore, the stations and interchange zones have been modernised and P&R and Bike & Ride facilities have been established in order to facilitate the interchange.*

*The **Swiss National Railways (SBB)** have achieved within their “Rail 2000” programme significant nation-wide improvements in the integration of services of Inter-City trains, regional trains and urban transport in interchange stations.*

In CEE countries, integration varies considerably but is starting to become an important issue and some progress is being made, especially in cities/regions where transport organisers have been set-up to oversee a number of operators and plan the PT network to ensure co-ordination. Integration of regional with urban transport is less common and co-operation with national railway companies is particularly difficult.

Intermodal mobility services

Another interesting way of increasing the availability of public transport is to link PT services with individual means of transport. In various cities and regions in Europe, local and regional PT stakeholders have started to develop innovative services in the areas of car sharing, car rental services or combined use of bicycle and PT.

Car sharing

Transport authorities often promote car sharing as an innovative mobility service expanding the PT service offers, where public transport, walking and cycling alone are not adequate. Today, car-sharing concepts are already in operation on a large scale in Austria, Germany, the Netherlands and Switzerland⁶⁴. Small-scale operations exist in other European Countries, such as Italy, Spain and France. At present, about 100.000 use Car Sharing services in Europe. Until now, car-sharing applications have been mainly established in medium-sized or large cities, whereas only a few examples of car sharing in rural areas are known.

An increasing number of PT operators are getting aware of the benefits to offer additional mobility services for their customers. PT managers start to realise that PT can gain attractiveness and car-sharing customers might use PT services more frequently. Evaluation studies in Switzerland and Bremen have shown positive effects of Car Sharing systems on PT use⁶⁵. The existing co-

⁶³ Ministerium für Wirtschaft und Mittelstand, Technologie und Verkehr des Landes Nordrhein Westfalen, 1999, “Der neue Nahverkehr in NRW – Vernetzte Mobilität”

⁶⁴ MOSES Project, (City of Tomorrow Programme of the 5th Framework Programme of the European Commission), Editor: Roy Traue, 2001, “State-of-the-art report – Car Sharing in Europe”

⁶⁵ Berweger, N./ Rupprecht, S. (TOSCA project).:“Car Sharing in practice – the TOSCA Take-up guide”, 2002, Energy 2000, „Car Sharing: the key to combined mobility”, Bern, September 98

operation between PT and car sharing companies mainly consist in offering common discounts to special tariffs or organising joint marketing initiatives.

Only a few examples are known, where PT operators are directly involved in the operation of car sharing schemes. In Germany, car-sharing services are currently by the PT operators in Wuppertal and Hagen for instance.⁶⁶ In other European countries, where the implementation of car sharing schemes have started only recently, a strong interest of PT operators can be identified to offer car sharing services (like for example in Bucharest, Barcelona, Bologna and Strasbourg).

During the last years the European Commission has been actively promoting the concept of car sharing in all Europe through the financial support of research and demonstration projects, such as INTERCEPT⁶⁷, MOSES⁶⁸ or TOSCA⁶⁹. In these projects, particular effort has been put in developing and demonstrating new Information and Communication Technologies as well as new service features for improving the overall quality of car sharing services. With these projects, the integrated development of public transport and car sharing services could be initiated or extended in a number of cities or regions, such as: Bremen, London, Genoa, Turin, Bologna, Stockholm, Walloon Region, Strasbourg, Bucharest, Barcelona.

*In **Switzerland**, the integration of car sharing and public transport services has been implemented on a large scale. **Mobility CarSharing Switzerland** is the world's largest CarSharing organisation. The number of customers of Mobility CarSharing, which was founded in 1997, has increased continuously over the last years and has achieved 50.000 customers in 2002. The continuously growing vehicle fleet of Mobility CarSharing currently consists of 1.770 cars at 990 locations in 400 communities all over the country. The size of the company has paved the way for an increasingly professional organisation. The company Mobility CarSharing is now employing around 190 people. In the last years it has changed from a Car Sharing organisation to a modern Car Sharing system provider making use of advanced IT systems for easy car booking and for keeping track of the bills each member runs up.*

*Another example of integrating public transport and nation-wide rail passenger transport and Car Sharing has been developed in Germany. In 2001 the **German Railways ("Deutsche Bahn")** has announced to create a nation-wide Car Sharing system. Potential customers for this service are expected to be those passengers, who need a vehicle in combination with long- and short haul rail travel.*

Car Pooling / Car rental services

The "Greenwheels" concept of the Dutch Railways, which offers a car rental service for their customers at major railway stations, shows another possibility to integrate PT and car use. With a phonecall, subscribers of the "Greenwheels" system can easily order a car, which will be released at the arrival station. By using a contactless smart card, which is also an identification of the "Greenwheel" membership, the car can be opened. The subscriber receives a bill for membership and usage on a monthly basis.

Some national railway operators and large PT operators (e.g. RATP, Paris) have found agreements with car rental companies for offering a rebate for regular rail or PT users.

An interesting example of how the private car can serve as a feeder to main PT lines in low-density areas is the "Ho & Go" system of the Hermes Group in the Netherlands. The idea of the system is that registered car drivers can pick up passengers and drop them at the closest bus station and

⁶⁶ Traue, Roy (MOSES project): "State-of-the-art report", 2001

⁶⁷ INTERCEPT project (Intermodal Concepts in European Passenger Transport), co-funded by the EC

⁶⁸ MOSES project (Mobility services for urban sustainability), co-funded by the EC

⁶⁹ TOSCA project (Technological and Operational Support for Car Sharing), co-funded by the EC

therefore replace small, inefficient PT feeder lines. Requests or offers for a “lift” can be made by phone or SMS and are automatically managed and dispatched by a central computer.

Combination of PT and bicycle use

In various European countries, the share of cycling within intermodal travelling is very low. In Britain, for example less than 1 % of all rail journeys start by bike compared with 15 % in Germany, 35 % in Denmark, and 38 % by bike and scooter in The Netherlands.

Facilities to promote Bike & Ride, such as supervised cycle parking and the possibility of taking bicycles on to trains or buses are not common in most of European cities. But there are some examples of promoting bike carriage and better cycle parking facilities. In cycling-friendly countries like the Netherlands, Belgium, Germany, Denmark, Austria, facilities to promote Bike & Ride, such as supervised cycle parking and the possibility of taking bicycles on to trains or buses can be found at many places. Only a few modern trains have dedicated space for bikes, which means that the possibility of cycle carriage on trains is generally very limited. If Bike and Ride is possible, information about bike facilities on board or at stations is often not sufficient. The low level of cycle facilities shows that operators often consider cycle and walking access to stations as a minor concern. Licence and franchise conditions concerning walking and cycle access to stations and bike carriage on trains are generally weak.

A number of good practice examples for developing cycle friendly and pedestrian friendly infrastructure elements and other measures to promote cycling and walking are presented in the European RTD project ADONIS⁷⁰ and WALCYNG⁷¹.

*The **City of Copenhagen** is an example, where bicycles in PT vehicles are admitted. In addition to the possibility of taking the bicycle into the light rail-train, 25 of the 81 S-train stations in the metropolitan area of Copenhagen have guarded bicycle storage facilities. These facilities are built first and foremost for people who ride their bicycle to and from the S-train, and who want to protect their bicycle. At some of the stations, a facility for repairing bicycles has been established.*

*In the **City of Graz**, the service “Chip’n Bike” provides the possibility for PT users to hire a bicycle at stations and to leave the bicycles at another destination in the city. For the hiring services electronic payment devices have been installed in order to facilitate the use of the bicycle at stations 24 hours a day.*

*The key objective of the project “**park & bike & ride & walk**” of the **City of Salzburg** is to increase the accessibility of the city centre by facilitating the interchange to environmentally friendly transport modes, especially the bicycle. The concept includes the following elements:*

- park & bike: installation of automatic bicycle hiring services and bicycle boxes at car parking places.*
- bike & ride: installation of bicycle storage facilities, bicycle boxes as well as automatic bicycle hiring services at PT stations*
- ride & walk: automatic luggage lockers at central PT stations and market places*
- bike & walk: bicycle service stations and bicycle boxes in the city centre*

⁷⁰ ADONIS project (Analysis and development of new insight into substitution of short car trips by cycling and walking), co-funded by the EC

⁷¹ WALCYNG project (How to enhance walking and cycling instead of shorter car trips and to make these modes safer), co-funded by the EC

*At the beginning of the 90s, the **German Railways** launched the “**Bahn and Bike**” concept. A ‘bicycle hotline’ telephone enquiry service to answer questions about cycling and train travel has been established. With this concept the number of bikes carried by train has roughly doubled to 1.6 million bikes carried per annum. Inter-regional trains carry an absolute minimum of eight cycles and many can carry up to 30 cycles in a specially designed compartment. A similar example is known from the Swiss Railways (SBB).*

PT services in low-density areas

In low-density or peripheral areas, where demand is low, there is a clear trend of using more Demand Responsive Transport (DRT) services, which bridge the gap between classical PT services and personal taxi services in terms of both flexibility and costs. DRT services, which are characterised by flexible routes and schedules responding partially or fully to requests of individual passengers, have largely increased and can now be found in many regions all over Europe. They often address the needs of specific groups, such as the elderly, children and the disabled by providing a viable transport alternative to the single occupancy private car.

Types of DRT services

In the 80s, various new operations (mainly using minibuses or taxis) have been developed which should mainly serve as PT alternatives for times and areas with low demand. These services have been usually integrated into the existing PT timetables and tariff systems. In parallel, first demand-responsive services have been established, which replaced the timetable based services. Examples, where the economic viability of these services could be proven are scarce.

The EU projects VIRGIL and SAMPLUS⁷² have demonstrated various examples in developing DRT services with emphasis on door-to door mobility. As the VIRGIL project has shown, different models of demand-responsive mobility services are existing in Europe:

- Systems that follow scheduled routes but divert on demand. The Belbus (Meetjesland, Belgium), for example, operates between recognised stops, but routes are flexible and are adjusted as appropriate. The service provides good connections to the hourly rail services at the local station.
- Systems that follow pre-determined routes, but only run when booked (e.g. Taxibus in Germany). The Taxitub, in Douai/France and the Taxibus in Germany are examples of taxi-based on-demand services utilising fixed routes, stops and timetables. However, vehicles only operate when a booking has been made.
- Systems that are completely flexible with regard to times and routes. The Mobimax service in Achterhoek/ The Netherlands is a demand-responsive service using easily accessible minibuses. It is completely flexible with regard to timetables, routes and stops.

⁷² The VIRGIL project (Verifying and strengthening rural access to transport services) and the SAMPLUS project (Systems for the Advanced Management of Public Transport Operations) were co-funded within the 4th RTD Framework Programme of the European Commission

A particular new **DRTservice (called DRINBUS)** has just been launched in Genoa. DRINBUS operates in two residential areas where, due to the narrow streets, a regular bus route cannot be operated. The service is operative all days, except Sundays and holidays, from 7.00 am to 8.00 pm. The call centre is open in the same hours. It represents almost a door-to-door public service with a high number of bus stops and a distance of not more than 200 metres between them. Users can choose where to begin their journey and where to finish it, and can also choose the starting or arrival time without waiting times. They can make a reservation contacting the call centre, where an operator inserts the demand into the software that automatically suggests some solutions compatible with the request. The system elaborates, on the basis of received requests and available vehicles, the optimised itineraries and timetable. Reservation for the same day must be made 30 minutes at least before the departure. Occasional users are accepted only if there are still some free sites onboard and if deviations are not requested in regard to the planned service. DRINBUS represents a particular DRT application, since it is implemented in a hilly urban area, highly populated but not served by public transport. The first results are very encouraging: the new service is appreciated by every kind of citizens: students, housewives, workers, elderly persons.

Integration of taxis and minibuses

Various PT operators make increasingly use of minibuses and co-operate with taxi companies in order to replace low frequency bus services in peripheral areas or during night hours. This way demand-led taxis are taking over the function of large and inefficient buses or trams. The cost of using these taxis is comparable to a normal bus ticket. Today, examples of integration of taxis in the local PT system can be found all over Europe.

Home-Link is an innovative taxi service in **London** that has been linked to a large high frequency rail network at suburban stations. This service, which does not depend on operator subsidies, provides a link between the PT network and the passenger's home. The home-link service operates in co-operation with a taxi company. Customers register in advance to use the scheme through an existing travel information service, then contact the operator directly to pre-book a taxi to meet them at a station.

But also national or regional train operators have started to co-operate with taxis (e.g. in the Netherlands, Germany, France). Taxis are often used as a transport mode to meet the mobility needs of specific target groups, such as elderly or handicapped people. In particular in peripheral areas, taxis or minibuses are used on a demand-responsive basis in order to ensure an acceptable quality of mobility services without being fully dependent on the car.

The **"Trein-Taxi" concept of the Netherlands** is a successful example of a fully integrated intermodal mobility service, combining train and PT services with the taxi. At more than 200 train stations in the Netherlands, Trein-Taxi stands are existing, where the passenger can get a taxi for a fixed price. Passengers usually share the taxi with others and thereby travel at a reduced rate (about 4 €). Tickets can be bought at the station or in the taxi, but only in combination with a train ticket. Trein-Taxis are available from the first until the last train on the timetable. The Trein-Taxi concept turned out to be very successful in the Netherlands. Today, over 700 Train-Taxis are in operation and the number of taxi trips has increased continuously over the last years.

Similarly in **Bulgaria**, the **state railway** successfully offers combined **rail-taxi tickets** on the Sofia-Varna and Sofia-Bourgas lines.

Existing problems and solutions

Capacity problems at peak-hours

In densely populated areas of larger cities, the availability of PT can be reduced at peak hours, when the demand is higher than the offer. This can lead to capacity problems, which to a certain extent can be solved by increase of frequency and capacity of services, provided such flexibility still exists. Overcrowded PT vehicles at peak-hours might be a decisive factor for many people not to use public transport.

Lack of service supply co-ordination

Regional PT networks are often characterised by a variety of actors involved in the development and provision of services⁷³. This can result in a lack of co-ordination of PT supply in a region. Single operators might regard short-term costs and benefits higher than an overall network improvement and service co-ordination. Besides the policy conflicts between PT operators also the fragmented interests of other PT stakeholders (authorities, politicians, users, etc.) make an effective, region-wide management and marketing of the PT network as well as the introduction of an integrated tariff and ticketing system difficult. Existing examples as far as the creation of organisational structures (for ensuring a more integrated PT offer) are concerned can be found though at different locations in Europe, like in Madrid, Copenhagen, Athens, German regions, etc.

Missing sharing of operational data

A key condition for the integration of transport modes is the sharing of operational data; both offline planning data and real-time information on actual performance between different modes and operators. Linked with the problem are not only the questions about the organisation of transport markets and co-operation and competition of operators⁷⁴, but also the value and ownership of data, technical definitions and common standards for the exchange of data.

Slow adjustment of PT supply side to the changing demand

Mobility patterns and travel requirements have been changing a lot during the past years, PT services however, are only slowly adapting. This is partly due to system reasons, track-bound PT modes are depending on pre-installed infrastructure, and partly caused by extensive planning and co-ordination efforts. Thus, user demand and PT supply tend to drift apart, resulting in decreasing PT ridership.

Lack of flexibility of intermodal mobility services

Also innovative mobility services are often still too unattractive and inflexible. The fact that potential customers of car sharing schemes or demand-responsive mobility services have to become familiar with the system functions, reserve trips in advance and define returning times, make these services less flexible and thus less attractive. However, the use of Information and Communication Technologies in the field of innovative mobility services provides a great potential for improvements.

⁷³ see chapter 2.1.3 Organisation of the PT sector

⁷⁴ see chapter 2.1.3 Organisation of the PT sector

Innovative mobility services are not known enough

Many innovative intermodal mobility services are still unknown to the potential target groups. Customers are often not aware of the benefits of demand-responsive mobility services or car sharing systems. An important condition for increasing the number of customers of these additional services is to intensify the efforts of customer-oriented marketing⁷⁵.

Missing incentive to develop more efficient demand-responsive mobility services

In many cases demand-responsive mobility services are co-funded by the public authorities. But often these services have only been established, because they met the “political” objective of demonstrating that social inclusion objectives are taken seriously. Under these circumstances, neither the authorities nor the operators are willing to change the existing, deficit showing services to a network of sophisticated, flexible and attractive mobility services, well accepted by the public.

2.2.7 ACCESSIBILITY OF PT

The accessibility of PT services is defined as the ease of the physical access to stops, stations, vehicles and of the access to traveller information. Many stops are difficult or dangerous to access because they are not provided with safe access routes or waiting areas. Moreover, the physical design and facilities at the stops and interchanges can have a large impact on the accessibility of PT. This is particularly true for elderly or disabled people, or parents with children, when stations or stops are not at street level. For an accessible public transport is not only the physical accessibility important, but also the availability of high quality traveller information, accessible as easy as possible. Without the right information about different travel options, many potential customers might find the use of PT too difficult.

Accessibility of vehicles and stops, stations

Improving the quality of access points to the PT network as a key condition for a better and more integrated PT system has often been neglected in the past. However in recent years, many examples can be identified all over Europe, where transport authorities and PT operators have considerable effort to improve the access to stops, stations and vehicles. In the last 15 years a key objective was to achieve higher standards of passenger accessibility, especially for people with reduced mobility.

More and more, light rail coaches and urban buses are designed with a low-floor section or a full low-floor area. “Transport for London”, for example, has chosen a systematic approach, in which after a test phase beginning in 1994 the share of low-floor busses was continually increased to nearly 75 % in 2002 and it is planned to reach 100 % in 2010. Although similar efforts are undertaken by most European PT companies the overall share of low-floor busses is still below 50 % in a lot of towns. Accessibility of urban buses will be required soon by the EU Directive 2001/85/CE, which mandates a low-floor section and the provision of access amenities from 2003⁷⁶.

New bus stops configurations no longer require the driver to drive into the stops; raised sidewalk reduces the level difference between bus floor and pavement and an oblique kerb design provides guidance for the driver to dock close to the sidewalk. Stop configurations in line of traffic or with

⁷⁵ see chapter 2.1.8 PT marketing

⁷⁶ Directive of the European Parliament and of the Council relating to special provisions for vehicles used for the carriage of passengers comprising more than eight seats in addition to the driver's seat. It is a “whole vehicle type approval” amending Directives 70/156/EEC and 97/27/EC.

extended bays have proved to be very efficient in reducing stopping times and they provide a broader waiting area to passengers. More importantly such configurations do not impede operation with various vehicle models; the operator can check overhanging capability before finalising its specifications for bus stop design. France, Germany and the UK are countries where such developments have been successfully experimented and are going on progressively. The cities of Grenoble, Kassel and London were pioneers.

On the national and EU level, support activities have been undertaken to improve the quality of interchanges between PT and other modes. Italy, Denmark, the United Kingdom and Austria are examples, where national governments have provided guidance on how to plan public transport interchange locations. Policy statements of these countries underline the importance of planning and designing interchanges to promote integrated, inter-modal PT systems. In Austria, the national transport plan contains measures to improve the location and development of transport interchanges. Furthermore, this plan includes activities to increase the urban density in catchment areas of interchanges and to integrate cycling and pedestrian networks with PT interchanges. According to the UK "White Paper on the Future of Transport"⁷⁷, the UK government intends to support the development of better interchanges through local transport plans. The DETR in the UK has put great effort in developing best practice guidance, on how to design passenger interchanges and customer friendly environments for pedestrians and cyclists at these interchanges.

The European Commission has been very active in promoting RTD projects focussing on physical measures for improving interchanges between different transport modes. The RTD projects GUIDE⁷⁸, MIMIC⁷⁹ and PIRATE⁸⁰ provide detailed information on barriers, good practices and policy guidelines related to planning, designing and managing passenger transport interchanges and intermodal services. These projects include valuable information on examples of how develop comfortable and attractive physical interchanges.

The MIMIC project⁸¹ has identified a number of interchanges where solutions to these problems have been developed and implemented. Good examples for short walking links between transport modes at an interchange can be found in the Abando Interchange in Bilbao or at the Canning Town Interchange in London. Good and sheltered pedestrian links to interchanges have been implemented at Meadowhall/Sheffield. Further examples of easy walk links between the interchange and the city centre can be found at the Cardiff Terminus or at the Bus/Coach station in Leeds. For the provision of bike-and-ride facilities as well as cycle lanes, physically separated from motorised traffic and pedestrian flows the example of Copenhagen Central Station can be mentioned. At Copenhagen Central Station also a "bicycle centre" has been established, where bicycle parking and renting is possible. This centre also includes repair facilities.

Regarding the specific accessibility needs of handicapped and elderly people there is already a wide range of advice, pointing out the best ways to design vehicles and stops, stations catering for the needs of disabled and elderly people. Existing activities of transport authorities and PT operators are mainly focussing on improving the accessibility of physically handicapped, whereas specific devices for people with sensory and cognitive impairments are less visible.

Park and Ride

In order to facilitate the accessibility of car users to bus and rail, the majority of large European cities have been active in developing Park and Ride schemes. There is no doubt, that Park and Ride facilities can on particular axes from the hinterland to the city centre increase the patronage of

⁷⁷ DETR United Kingdom, 1998 The Government's White Paper on the Future of Transport "A New Deal for Transport - Better for Everyone"

⁷⁸ GUIDE project (Group for Urban Interchanges Development & Evaluation), co-funded by the EC

⁷⁹ MIMIC project (Mobility Intermodality and Interchanges), co-funded by the EC

⁸⁰ PIRATE project (Promoting Interchange Rationale, Accessibility and Transfer Efficiency), co-funded by the EC

⁸¹ MIMIC project (Transport RTD programme of the 4th Framework Programme of the European Commission), 1999, "Final Report"

PT lines and relieve city centres from congestion. However, the benefit of Park and Ride with respect to the overall local transport objectives is often debated. For many of the existing Park and Ride facilities it can be said, that they do not contribute to the reduction of car dependence, but to its increase.

There is increasing awareness of the need to develop more decentralised smaller-scale Park and Ride facilities relatively far from the urban area in order to intercept cars earlier in their journeys. These facilities should also serve as the central interchange between the interurban PT network and the more local feeder services (walking, cycling, taxis, buses and flexible route buses, etc.) In the city of York, it is planned that Park and Ride sites will also be used as interchanges between rural bus services and taxi-buses and the high occupancy shuttle to the city centre.

To what extent Park and Ride facilities can succeed in promoting PT use in inner cities to promote interchange is dependent on a number of quality standards with respect to signage, security, maintenance and lightning to instil confidence in potential users of park and ride sites. A number of examples (e.g. Newcastle, Rotterdam) have shown, that dynamic Park and Ride signage has considerable effects on using Park and Ride as an intermodal way of travelling. Information about the availability of Park and Ride facilities and parking places and PT services at the Park and Ride site are essential for car drivers to use Park and Ride.

The location of the Park and Ride site and the frequency of services are other success factors. This can be learnt from the example from Bologna, where the Park and Ride system did not achieve the desired effects, since the location of the Park and Ride sites were too close to the city centre and the frequency of the bus services was too low.

Another measure to improve the accessibility of car users to PT, which is now adopted more frequently is the planning of sites for cars which only drop passengers at stations for using PT (Kiss and Ride).

Traveller Information Services

At present a fairly broad variety of traveller information services in PT exists in Europe, regarding their

- constitution (institutional arrangements, funding, data sources, data processing, broadcasting),
- distribution stages (pre-, on-, post-trip),
- availability to the user (distribution media, spatial/network scope, costs),
- information contents (static/real-time, passive/interactive, modal coverage, etc.) and
- integration with transactional options (payment, reservation).

Two basic user groups and key service functions should be distinguished here: For the frequent PT user traveller information contributes to increasing customer satisfaction, accompanying her/his individual trip from door to door. In case of the random user it helps to overcome informational barriers and uncertainties about travelling by public transport services. Therefore, inter-modal traveller information facilitates both, the management and the promotion of PT network use. Additionally, if information for individual transport modes is contained (private car, motor-/bike), it can support overall traffic management strategies that pursue a modal shift towards public transport.

The development of information services is highly sensitive to the dynamics of technological innovation, constantly providing new solutions and applications. New technologies such as floating car data (FCD) and automatic vehicle location (AVL) have facilitated the collection of real-time data and allow service providers to inform their customers about delays or incidents. At the same time, the deployment of global mobile communication systems (GSM) and broad availability of mobile

phones has enhanced the distribution of information to the customer while travelling (e.g. through SMS, WAP, GPRS) and the integration of billing procedures for services.

Technological possibilities will become further multiplied with the operation of 3rd generation mobile communications (3G), enabling high-speed and bandwidth-intensive applications (UMTS), as well as with the use of floating traffic data generated directly by mobile phones and radio camera detection. Furthermore, in combination with Geo Positioning Systems (GPS), information contents can be personalised in reference to the current location of the user (Location Based Services – LBS), thus achieving a high degree of adaptation to individual requirements and interests. This development will probably limit the mid-term perspectives of other currently available dissemination technologies such as Digital Audio Broadcasting (DAB) or Radio Data System - Traffic Message Channel (RDS/TMC), which some key actors expect to become insignificant within 5-10 years.

The PT traveller information services can be differentiated according to the respective providers: urban and regional PT operators, national railway operators and private service providers .

Urban and regional PT operators

Most examples for provision of traveller information can be found in the large urban agglomerations. Here, the need for traveller information across different modes and multiple operators is obvious and has led to different approaches for service provision. By contrast, in small and medium-size towns or rural areas, intermodal information services still represent an exception, usually depending on particular public sector commitment or publicly funded demonstration projects.

As a basic service level, static information on schedules and tariffs, as well as pre-trip journey planning for the public transport network (buses, light-rail) are largely available on the internet. In many urban agglomerations, also an integration with regional railway information has been realised (e.g. RER in France, S-Bahn in Germany), but this does not yet represent a general feature (e.g. separation of Cercanías and local PT in Spain). Correspondingly, an integrated coverage of national rail connections is only offered by very few local PT information services (e.g. “Journey Planner” Helsinki). More advanced examples for PT traveller information services comprise extensions of this basic level in various directions. *Real-time* information is becoming more and more available, both *pre-trip* through the internet and/or phone enquiry lines (e.g. “Trafiken.nu” for the Stockholm region), and *on-trip* i.e. at stops and stations (e.g. Barcelona, Torino), on-vehicle (e.g. Vorarlberg), but also addressed individually to the customer’s PDA or mobile phone (e.g. “Wiener Linien” for Vienna, “Cité Futée” for Île-de-France). A well-designed example for this type of service in a deregulated context is the Greater Manchester transport information web-site.

Cycling and walking are increasingly being considered as complementary modes in PT traveller information services. So far detailed information about *cycling* has become integrated only in a limited number of cases, but it certainly represents a present trend fostered by public policies. In some cases, essential information about regulation for bicycle carriage in PT vehicles and the availability of parking facilities at stops is now being complemented by the integrated consideration of bicycle carriage in journey planning (e.g. “Trafikinfo” in Copenhagen, “Transbasel” for the Basel region).

Equally, the explicit consideration and calculation of *walking times and distances* as part of the transport chain is an emerging feature. It takes into account the specific design of the changeover locations and indicates the time required for changing the mode (e.g. “Trafikinfo” Copenhagen), sometimes even adaptable to individual walking speeds (e.g. “Journey Planner” Helsinki). Information about other modes is usually limited to providing links on the web-site e.g. to air-travel services (airports), ferry operators, or taxi services.

National railway operators

Amongst national railway operators there is a clear trend towards the provision of fully integrated traveller information of national railways and local PT. This development represents a general ambition of both railway and PT operators aiming to increase the attractiveness of their respective transport services by providing door-to-door information. Against the background of European integration and the liberalisation of the transport market (including privatisation of the operators), railway companies have been urged to develop competitive information services and inter-modal contents. Therefore, as in local PT information services, also information about ferry transport, taxi-rides, biking and walking are increasingly incorporated as integral parts of a transport chain.

*The **journey planner of Deutsche Bahn (DB)** for instance, allows to chose between multiple transport mode combinations (bus, taxi, ferry, different train types, light-rail), to include bicycle carriage, and to define preferences for the way to/from the first/last stop (min./max. distances for walking, biking, taxi, private car). Also car sharing and air-travel booking information are made available, although not in an integrated way.*

*At the national level, integration with local PT network and ferry information services has been achieved only in some countries. This is the case e.g. of the **Swedish Statens Järnvägar (SJ) journey planner**, based on a co-operation with the national PT operator's association.*

An interesting feature represents the (automatic) comparison between travelling by different PT modes and the exclusive use of the private car in terms of travel time, costs and emissions (e.g. DB, SJ). Here, the comparative advantages of PT are actively promoted to raise individual awareness and influence the weighing between different modal travel options (especially SJ).

*Another good example for a full integration of national railways and local PT is the **Dutch "Openbaar Vervoer Reisinformatie - OVR"**, which started as a publicly funded service provided commonly the respective operators, but eventually became an independent, privately operated service.*

Private service providers

Clearly, the provision of traveller information services also represents an attractive market for private sector initiatives. A business case could result from demand growth, regarding the increasingly complex urban-regional mobility patterns, but also the growing share of long-distance travel for business and leisure purposes. The services could facilitate the use of different modes for door-to-door trips, integrating booking and reservation options, as well as personalised information on places or events, and therefore contributes to the generation of trips and revenues.

Various tasks and functions along the information chain can in principle be carried out by private agencies, providing value-added services to third parties or end-users. Important branches such as the automotive industry, original equipment manufacturers (OEM), telecom operators, device manufacturers, system and software developers, or transport operators have a substantial interest in the deployment of traveller information services.

Despite of this favourable context, the implementation of traveller information services in general, and intermodal information contents in particular, has not been developing with great dynamic so far. Although there is a growing awareness of the potentials of intermodal traveller services both, from a policy and a business point of view, an intermodal information service accessible through a single platform and offering door-to-door information across *all* transport modes is still only a vision.

Currently, the only national programme that pursues the ambition to develop a comprehensive inter-modal traveller information system is the "Transport Direct" initiative in the UK. Here, the

government intends to act as a catalyst for public and private partners and provides funding to enhance the delivery of new intermodal information services. Transport Direct envisages to provide basic services for free or at marginal cost (phone call), while personalised services should be offered by value-added providers from the private sector.

Starting from these premises, some *multimodal* private traveller information services have been launched in Europe, providing parallel information for individual and public transport. For instance, the “Walkie” service by Mizar Mediaservice for the Veneto region offers information on traffic condition, parking availability, incidents, as well as route planning and schedules. The “Citycompanion” by DaimlerChrysler additionally supplies location based information for seven major agglomerations in Germany. Both services are available through the web, WAP and SMS. An example for a private intermodal service based on call-center operation is “Airtel” by Vodafone in Spain. Besides information on PT schedules and the current road traffic status, this service allows booking of tickets, as well as reservation of taxis, hotels and restaurants.

In the Czech Republic, a high quality intermodal national, regional and urban PT schedule search engine has been created by a private sector company with the help of legislation which supports data collection by the contracted company. The engine is very heavily used and largely paid for indirectly by mobile phone users (through mobile operators who pay the schedule database manager), with a free internet service. One Czech mobile phone operator has combined this PT database with its own walk-navigator and offers intermodal walk-PT trip navigation (from truly local to national level) through SMS messages or a WAP text or map (although at a price too expensive for most PT users !).

Existing problems and solutions

Little improvement of accessibility of disabled and elderly people in existing vehicles, stations and interchanges

Although there are solutions to the majority of access difficulties in existing vehicles, buildings and in the pedestrian environment, these solutions are only partly implemented. In general, the requirements of disabled and elderly are well taken into consideration when planning and building new stations or interchanges. But the modernisation of existing stations, interchanges or vehicles with the aim to improve the accessibility of disabled and elderly is often lagging behind.

In order to limit cost expenditure, many PT operators develop intermediate solutions, which provide accessibility for people with reduced mobility only in one area of the PT vehicle. As an example, DB train operator has introduced a multipurpose coach in its train sets which is specially designed to fit platforms of 3 different heights with an access ramp; and Hamburg urban PT operator implemented light rail stations with partially raised platforms so that one low-floor coach can be accessed without any step.

Limited use of Park and Ride facilities

The acceptance of Park and Ride facilities is in many European cities still quite low. This means that the capacity of many Park and Ride stations is often not fully exploited. The limited use of existing Park and Ride facilities is often due to incoherent demand management policies (mainly parking policies) in city centres and unfavourable P+R facility location and frequency of linked PT services. Also, the improvement of information and signage for Park and Ride service could contribute substantially to increasing awareness and acceptance.

Insufficient consideration of the specific information

Traveller information is an important factor affecting travel choices and behaviour. Poor or inadequate information can be a considerable obstacle for using PT. However, information on PT services is often provided without sufficient consideration of the actual information needs of the customer in general, and special target groups in particular. Therefore, the design of both information *contents* and *interfaces* needs to be based on the identification of the different user groups of public transport. Regular PT users and random users, car-owners and PT customers without mobility alternatives have different information requirements that have to be considered and addressed in terms of information content and presentation. Additionally, also the specific needs of elderly and disabled persons (particularly those with visual, auditory and motor impairments) have to be considered. The individual cognition and perception of the traveller have to be targeted in order to influence the image of PT services and the mobility behaviour of travellers. For instance, waiting time is estimated up to 30% longer if no real-time arrival information is provided.

It is expected that the smart card technology will also enhance traveller information provision as it can be used to access and exchange this information. It will therefore be possible to carry digital journey-plans or provide the traveller with on-trip information if contactless smart cards are introduced e.g. into a mobile WAP phone or PDA's. In combination with Satellite-based positioning technology this would also allow to personalise the information according to the location of the traveller.

Neglect of basic and static information

Another widespread example of inadequate provision of information services is the neglect of basic and static information. Driven by technological innovation there is currently a tendency to provide a maximum of information on multiple distribution platforms. The provision of too many information details and choices, however, might lead to an *information overload* and eventually dilute the actual message for the customer. The fact that travellers are most of all asking for basic and static information (such as timetables) is often not taken into account seriously enough. Yet, compared to real-time information services, the provision of basic and static information of PT services is relatively cheap.

Low usability of information services

Of particular importance for the interaction between the user and the information service are the design qualities of the human machine interfaces (HMI). Considering the specific potentials and limitations of each interface technology (internet, mobile phone, PDA, VMS, radio/loudspeakers, teletext, TV, info terminals, etc.) information provision needs to follow basic rules in order to ensure utility and usability. Logic and unambiguous proceedings that are easy to follow and the use of common pictograms/terminology are fundamental requirements. Information provision should also be multilingual and make use of alternative channels.

Neglect of importance of personal contact for information requests

Despite of the continuous refinement of HMI's, personal contact is a significant aspect of traveller information provisions that no media can replace. Indeed, for their information requests many travellers prefer to rely exclusively on personal contact with call centre staff, operator staff at the stops, but also other travellers. Travellers may seek personal contact when looking for information because they are not familiar with using electronic media.

Lack of policy goals related to traveller information services

Local and regional PT stakeholders are often undecided about the establishment of integrated traveller information services, because of other investment priorities and uncertainties about the impacts of traveller information services. A lack of evaluation results from successful service implementations and little transnational exchange of experience sustain this situation. As a result, very often preference is given to visible “hardware” investments, like for rolling stock and infrastructure renewal or upgrading.

Lack of interagency co-operation

The development of common mechanisms for the exchange and integration of data for different transport modes is often hindered by a limited co-operation between the relevant actors. Organisational structures that clarify responsibilities for inter-modal data collection, processing and dissemination, as well as entities in charge of managing these processes are missing in most cases. The interest in providing inter-modal traveller information services is contrasted by a fear of losing competitive advantages and a perceived risk of informational transparency, in the case that mode comparison would be enabled.

Limited data availability and quality

Traveller information services essentially depend on the availability and quality of traffic data. In practice, reasons for a lack of data can be that it is simply not (yet) collected, or that it is not (or only partially) accessible to agencies interested in providing services due to current data sharing regulation and/or practice.

Today, availability, quality and modal coverage of traffic data largely differ between countries, regions and cities. Even within urban areas considerable disparities can be found. This is due to the fact that the collection of data is carried out by multiple agencies for different reasons, using different technologies and standards often with diverging interests.

Missing standards and regulation for data formats and data exchange

The missing definition of EU-wide standards for data quality and (inter-modal) data exchange between public and/or private agencies present an important obstacle for new information service development. The practices of data sharing and accessibility need to be defined commonly, in particular regarding inter-modality and cross-border operation, in order to enable actors to improve the quality and availability of traveller information services. Furthermore, in the case of roaming access to services across various network operators, the billing references need to be clarified (who pays for what?). Without a common regulation, especially data owners do not see any need to share their data, or might do so based on (arbitrary) bilateral agreements only.

Uncertainty about how to establish a business case

A major drawback for developing economically sustainable services is the considerable uncertainty regarding demand development. Although in principle the necessary demand seems to exist and even grow as market studies indicate, intermodal information is not yet a factual priority, since transport mode choices are very rigid. Furthermore, user expectations are very high regarding information quality (real-time) and reliability, whereas their willingness to pay has not proven to be sufficient for establishing a business case. These issues have been examined e.g. by the EU-projects CONCERT, PROMISE and INFOTEN. In addition, the often very high level of public information services provided for free leaves only narrow margins for private initiative.

High investment costs traveller information services

An important obstacle to business development is the costs for service start-up. The initial investments in data collection equipment, processing systems, dissemination media, etc. are comparatively high and contrast with the slow demand development, while especially public resources are well-known to be restricted anyway. Additional risks result from the necessary technology choices (fixed/ floating sources, data exchange, broadcasting platforms, etc.). The highly dynamic development of technological innovation creates uncertainties about systems to follow, if flexibility and adaptability are to be maintained.

Reticence about investment in traveller information services

Since there is also only limited up-to-date knowledge about the effects of information services on traveller behaviour (and therefore about revenue development expectations), agencies are often reticent about investing in high-quality information services. As long as the cost-benefits ratio is unclear, also private financing continues to be difficult, additionally hampered by the limited trust in traveller information service market and a general scepticism concerning “e” related business development.

2.2.8 ATTRACTIVENESS OF PT

Besides availability and accessibility, the use of public transport is largely dependent on the perceived attractiveness by potential users. Issues like journey comfort, customer care or safety and security are playing an important role in choosing the mode to travel⁸². Bad experiences that passengers have made when using PT, such as overcrowded buses, uncomfortable or dirty buses, rude and inconsiderate drivers, etc. may deter them from using PT again. For improving the overall attractiveness of public transport, a wide bunch of messages is important, such as maintenance of infrastructure, user friendly ticketing systems or customer oriented behaviour of staff members. Furthermore, personal security is an important issue for public transport.

Physical design and additional services at stops, stations, interchanges

Since stops are the showcase for public transport, considerable attention needs to be given to their design. Stations or bus terminals are often seen as neglected, worn-down places, where nobody feels comfortable or safe to stay for a longer time. Waiting facilities and travel information are in many cases obsolete and insufficient. However, bus stops and light rail stations are increasingly equipped with shelters and seats providing a more comfortable wait. City authorities and PT operators are settling implementation programmes, starting with the equipment of the more frequently used bus stops.

Various guidelines or policy recommendations exist on how the design of PT stops or stations can be improved. Recommendations have been developed by ECMT and the COST research actions 322 on low-floor buses and 335 on heavy rail systems as well as by the three European research projects PIRATE, MIMIC, GUIDE (FP4 Transport RTD Programme of the European Commission). Those recommendations refer for example to:

- Functionality of each concourse and routes between modes. The walk environment should not be neglected. Cleanliness, good lighting and the maintenance of floors are among the necessary provisions.
- Accessibility for people with reduced mobility will gain from short walking distances and provision of lifts, ramps and escalators.

⁸² see chapter 2.1.2 Reasons for and against the use of PT use

- Shelters and seats should be provided. Cleanliness and lighting of these amenities enhance the customers' comfort waiting for the PT services.
- Signage needs to be clear and continuous; information should be provided in a simple, symbolic, pictorial and colour-coded manner.
- Acoustic signal messages and tactile maps can significantly help visually impaired travellers.
- The feeling of security can be enhanced by comfort-oriented design, lighting and appropriate location of various amenities.
- Emphasis should be put on the provision of bike parking facilities within interchanges and close to major stations or bus stops, as they are incentives for transfer of bike users to the PT network.
- Luggage handling facilities should be provided in large interchanges, in places where there may be tourists or infrequent users. Luggage forwarding to other destinations should also be provided at large interchanges and where long distance travel is possible.

Services at stations, interchanges

An important factor for the attractiveness of interchange zones is the availability of services that are not related to transport, but integrated in the passengers journeys. These services allow PT customers to use their waiting times for other purposes. In many interchange zones, "complementary" services, such as convenience services (e.g. toilets, phones, kiosks, and cash dispensers) or shops have been established. An increasing number of planning authorities have realised that the attractiveness of existing interchange facilities can be improved through the provision of additional commercial or social services. Sometimes multifunctional interchange locations are even considered as focal points of urban development, which provide important services for people living and working in the surrounding area.

Various large railway stations in Europe (Madrid, Stuttgart, Leipzig, Zurich, Stockholm, etc.) have been converted to centres of urban activities, including commercial, cultural and administrative services. In countries like Sweden, Austria and Germany, the national railways companies have launched huge national investment programmes for converting central railway stations to modern travel centres combined with commercial, social and leisure facilities.

For financing the construction or modernisation of interchange locations, private investors are usually heavily involved, who are mainly interested in incomes from commercial lettings of retail units⁸³. Another option is also to charge operators using an interchange facility for access to the interchange or departure. The construction of the Avenida de America interchange in Madrid, with an investment of 24 million €, is an example of an interchange, which has been fully financed by the private sector.

*With the redevelopment of the interchange complex **Paris - La Défense**, the "Service Village" has been created⁸⁴. The "Service Village" at La Défense includes local businesses, community and exhibition facilities, a communications centre with fax facilities, youth centre and neighbourhood services. An example for the combination of redesigning an interchange location and urban regeneration strategy can be found in the **London Borough of Newham**. The public authorities, in co-operation with the transport operators, the private sector and other partners developed a new high quality bus station with new facilities for National Rail and underground passengers. At the same time, this interchange can be considered as a new catalyst for the regeneration of the town centre.*

⁸³ see chapter 2.2.3 Funding

⁸⁴ Laferre, Public Transport International, "The organisation of multi-modal management in urban interchange points"

Safety and security of PT

Crime and personal security have become an important factor for PT travellers, staff and operators. Passenger surveys have shown⁸⁵, that personal security plays an important role for travelling or not travelling on public transport. Key outcomes of these surveys are for example:

- Passengers feel often insecure during the time spent waiting or walking to or from the stop or station. This is particularly true when the passenger has to wait at unknown, dark or isolated stops.
- The behaviour of other PT passengers is often felt to be intimidating or threatening
- Passengers consider public transport staff as very important in providing reassurance

An essential measure to improve personal security for passengers is the design and maintenance of infrastructure and vehicles. Other measures, which are frequently adopted, are the installation of formal surveillance through CCTV and communication with passengers through Help Points. Training of staff is important in order to improve their visibility and effectiveness in reassuring passengers.

The provision of technical fixtures, mobile staff, maintenance of facilities and staff training needs to be integrated in a global safety / security concept, which also involves other organisations. The involvement of national and local police, local authorities, education and youth services, as well as voluntary bodies such as help centres for victims and drug prevention centres are recommended in the Merseytravel “travel safe” strategic approach and in the security concept of Hamburger Hochbahn.

National guidelines for good practice in security of surface and underground rail stations have been established in the UK (‘Personal Security on Public Transport - Guidelines for Operators’ and ‘Secure stations scheme’). These guidelines provide comprehensive guidance for the operators to develop a strategy and implement a whole package of measures in the field of design of infrastructure and vehicles, staff training, information for passengers, working with other organisations, etc.

Design and maintenance of infrastructure and rolling stock

Infrastructure and rolling stock, which is clean and well maintained and which has an appropriate design can prevent criminal behaviour and reduce fears for the passenger. Situations differ in terms of the wider environment, usage, existing facilities, crime problems, resources and competing demands. Frequently applied measures include the design and lighting of vehicles, stops or stations and corridors, information and signage – as well as regular inspection and maintenance. All these measures have proven to be feasible and efficient for making travellers feel more confident in the transport system.

Physical security measures

Technical developments have made it possible to replace staff increasingly by machinery, for instance to replace security staff by cameras. However, the feeling of security largely depends on visible presence of staff. Human surveillance and rapid response in emergency are essential.

Technological systems such as CCTV surveillance, automatic detection of security problems, early warning systems are currently implemented and developed at many places. For example, the GVB operator in Amsterdam has successfully installed on-board cameras. The “Help point” concept has

⁸⁵ UK Department for Transport: “Personal Security on Public Transport - Guidelines for Operators”, 1998;
L’insécurité dans les transports urbains vue par les voyageurs (Insecurity in urban transport, French travellers’ opinion). Transport Public, jan. 2002, pp 26-30

been developed for emergencies happening on metro or train platforms. The system can manage SOS calls from persons who press an alarm button. The Turin PT operator started the implementation of a GSM audio-visual link at bus stops.

The European research project PRISMATICA⁸⁶ aims at delivering processes and tools to guarantee higher security levels of CCTV systems, for the detection, management and recording of events that affect safety and security. The systems and technologies to be integrated include a multi-camera surveillance system for a local camera network, an "Intelligent Camera" system capable to detect different situations simultaneously and the use of a contactless passenger pass to provide a personal mobile "help-point" facility.

Security related training of staff

Although already the simple presence of staff contributes to enhanced security, further improvement could be achieved in the training of staff members and drivers to handle difficult situations in an adequate way⁸⁷.

Technical safety

Crash safety is a much less acute issue for PT passengers than for car occupants. Even automated metro systems have proven very high operation reliability. Safety concerns arise from the road sharing of surface PT vehicles with other road users, mostly pedestrians and cyclists.

Lastly, the specific issue of crash strength characteristics of light vehicles is studied at present. Indeed efforts have been made for passive safety of automobiles and heavy train vehicles. The European project SAFETRAM⁸⁸ is under progress with the objective to make progress on the understanding of crash events and devise structural and interior design rules for a safe environment of occupants.

Prevention of terrorist attacks

Especially after the terrorist attacks of 11 September 2001, or the several attacks to PT systems directly, the importance of security in public transport has increased even more. The fact, that public transport systems can be considered as a potential target for terrorist attacks, forces PT operators to think about developing an effective response to the risk of terrorism and minimising risks of major system disruption. Every prevention strategy should however be carefully considered with regard to potential side effects. A high degree of equipment and dominant visibility of technical installations can lead to a loss of confidence in public transport services and a loss of patronage that cannot easily be reversed.

Integrated tariff and ticketing systems

Ticket and tariff integration is essential to facilitate the use of PT and can therefore improve its attractiveness. Many urban and regional transport systems strive to introduce tariff integration of several modes and integrated ticketing systems, which will encourage multimodal journeys without having to buy a new ticket for each mode.

Especially large metropolitan transport authorities have achieved considerable improvements with regard to the integration of tariff structures between different transport modes and areas. A series of region wide ticket and tariff systems, which allow unlimited use of modes across operators, e.g.

⁸⁶ PRISMATICA - Pro-Active Integrated Systems for Security Management by Technological, Institutional and Communication Assistance. European FP5 GROWTH programme, 'Sustainable mobility and intermodality' key action

⁸⁷ see chapter 2.1.7 Human resources development

⁸⁸ SAFETRAM - Passive Safety of Tramway for Europe. European FP5 GROWTH programme, 'Competitive and sustainable growth' key action

in a specific timeframe, are already in operation. In these unified ticket and tariff systems the traveller has to purchase only one single ticket to use all transport modes in a region. This allows easy access, especially for unfamiliar users and will reduce costs for travellers.

Examples for a strong increase of patronage following the introduction of multimodal passes are known from Madrid (1987) or London (1983)⁸⁹. The 'London Travelcard' ticketing scheme provides unlimited pre-paid travel within specified zones on bus, rail, underground and Docklands Light Railway services. In Brussels, price integration has been achieved only recently, which now allows using PT services of the four major transport operators of the Brussels region with only one ticket. Athens has studied the extension of one fare rate system over all modes with the option of also implementing an electronic ticketing system.

*A further well known example of integrated ticketing is the **STRIPPENKAART** from the Netherlands, which was introduced in 1980. This concept, which organised integrated ticketing with some 30 public transport operators, has led to a considerable overall increase of PT use. However, problems with regard to the division of the revenues over the transport operators had to be solved. The four major PT companies in the Netherlands are currently working on a pilot scale on the introduction of common smart card system. The objective is to establish a seamless ticketing system, which allows the use of all PT services nation-wide. The smart cards can be used by PT operators or by third parties, like banks.*

*Other examples of integrated ticketing and more customer-friendly tariff systems on a regional level can be found in **Switzerland, Austria as well as in Germany** (e.g. Verkehrsverbund Berlin-Brandenburg (VBB), "Hessenticket", "NRWPlusTicket").*

Combined tickets

Integrated ticketing can be expanded beyond the limit of PT services and also include the option to pay for parking, car sharing or cycling. Integrated Park and Ride charges have been introduced in various European cities like Strasbourg, Utrecht or Newcastle. In Strasbourg, travellers purchase a parking ticket and can then travel for free to the city centre with the tram. Here, free tickets to the city centre are not only given to the car driver, but also to other passengers using the same car. With this measure, car pooling to the park and ride sites is promoted. In Utrecht shoppers who come from outside the town into the city centre are offered a combined parking and bus ticket (shopping express bus line) on Saturdays, shopping-evenings and Sundays. Within the EU-project SWITCH⁹⁰ combined parking and travel tickets at Park and Ride sites have been developed for example in Newcastle.

*One well-known example of using **Car Sharing and PT services via one single ticket** exists in **Bremen**. In 1998, an intermodal card (called the "Bremer Karte plus AutoCard") has been introduced, which links Car Sharing to the public transport services of the local operator (BSAG) to offer a full intermodal mobility service⁹¹. This card represents a monthly or annual pass for public transport, and at the same time the card can be used as a electronic car-key for the "car-on-call". In Bremen it is planned to introduce a combined smart card for the chip-card based electronic PT ticket and the contactless functions for Car Sharing.*

⁸⁹ UITP Commission for Information Technologies and Innovation, 2001 "Contactless Ticketing"

⁹⁰ SWITCH project („Sustainable workable, intermodal transport choices"), Transport RTD programme of the 4th Framework Programme of the European Commission, 2000, "Final Report" (Deliverable 8)

⁹¹ TOSCA project (IST Programme of the 5th Framework Programme of the European Commission), 2002, "Car Sharing in practice – Proceedings of the TOSCA Final Conference"

*An example of facilitating the **combined use of the bicycle and PT through integrated ticketing** can be found in **Salzburg**. With their yearly PT ticket, PT customers can also make use of bicycle hiring services⁹².*

Another tool to increase the attractiveness of PT use, is to extend the range of fare products. Tickets or passes for specific segments of passengers, like school passes, student tickets or job tickets are being offered in many European cities. In other cities, like in Frankfurt, tickets for special occasions, called “Kombi Tickets”, are offered. Here, the PT ticket is included in the ticket for a sport event or a concert. The “Kombi Tickets” are arranged in contracts with the responsible organisations for the events

Electronic Ticketing

Following the trend of “electronic cashless commerce”, there is a growing demand in public transport, like in other service areas, to improve the customer convenience by reducing cash payments. Advancement in card technology will facilitate the acceptance of electronic payment media programs as a viable payment option for PT services.

Tokens and paper tickets are still widely used as a means of payment for PT services. Another payment system is the magnetic ticketing system, which appeared in the 70s and 80s. Already at the beginning of the 90s, the first contactless ticketing systems have been implemented⁹³.

During the last ten years, the use of contactless cards has increased rapidly and many cities and regions in Europe (and recently including CEE) have recognised electronic ticketing through smart cards as an efficient payment tool that can integrate various PT modes. Contactless ticketing offers considerable benefits with regard to cost reduction, reliability and security. A key advantage for the customers is the speed increase of transaction processes, which makes the use of PT modes and the interchange between PT modes much easier. Furthermore, automated ticketing through contact and/or contactless smart cards facilitate the tracking of kilometres travelled and reduces the problem of revenue sharing. It also makes ticket fraud more difficult and helps in reducing fare evasion.

About 80 major cities world-wide have developed or are developing electronic ticketing throughout their transport systems. Many of these cities have only started to introduce these systems during the last two years. In cities like Hong Kong, Nice or Perugia contactless smart cards for different transport modes have already been implemented. Large-scale applications of contactless smart cards are currently carried out in cities, such as Berlin, London, Paris, Rome and Moscow.

*In the cities of **Wels and Steyr (Austria)** a new electronic ticketing system has been established, combining the benefits of using reloadable contactless cards with a so-called “**Best Price Guarantee**” for the PT customers⁹⁴. At every check-in the card is registered and the best available price for the trip is calculated and automatically deducted from the card. The “**Best Price Guarantee**” ensures that the passenger never has to pay more than a day-or season ticket would cost. A similar electronic ticketing system combined with a “**Best Price Guarantee**”, called “**Get-In**”, has recently been introduced in the city of **Hanau (Germany)**.*

⁹² Bundesministerium für Verkehr, Innovation und Technologie Österreich, 2000, MOVE – Innovative Mobilitätsdienstleistungen: Ergebnisse des Wettbewerbes 2000

⁹³ UITP Commission for Information Technologies and Innovation, 2001 “Contactless Ticketing”

⁹⁴ Frantz, Hans-Georg (FH Kapfenberg), 2002, “Best Preis Garantie – Ein neues Fahrkartensystem für die Zufriedenheit der Kunden und Betreiber”

*In the region of **Dresden**, currently a contactless, electronic ticketing system is being developed, which will allow a flexible and electronic tariffing for all PT modes in the region. The objective is that the passenger neither has to worry about buying a new ticket when changing the mode nor about what tariff to choose. The contactless smart card (IntermobilPass) can also be used for other functions, such as parking and car sharing.*

*A very ambitious project of integrated, multimodal ticketing with a contactless smart card has been developed in **Switzerland**. The idea of the “**EasyRide**” project has been to introduce a common ticketing system for all regional PT operators and the national railways. The plan was, that by means of the “EasyRide” ticket, passengers could have the possibility to pay automatically (via innovative telecommunications technology) while getting on and off the PT vehicle. However, the project has been stopped after only a short trial phase. Main reason was a missing agreement between the different partner organisations on the allocation of revenues.*

The benefits of smart card technology are also increasingly used for other purposes, such as banking, public administration services, etc. Consequently, new forms of co-operation of different sectors to develop multi-application smart cards have been developed that use the same type of smart cards. In recent years, stored-value and multi-application smart cards are already in operation in the United Kingdom, Germany, France, Netherlands, Australia, South Korea and Hong Kong.

Within various EU RTD projects integrated, smart card based payment systems have been developed and demonstrated. Projects, such as CONCERT⁹⁵ and CALYPSO⁹⁶ have supported the implementation of several on-site demonstrations of smart card based ticketing schemes in European cities. The CONCERT project has demonstrated integrated payment systems using smart cards for parking fees, bus and rail fares and in some cases road tolls. The CALYPSO project has developed multi-application smart cards in different European cities for PT services (including payment for parking and taxis), banking, telephone and other services. Using the same microprocessor card, the system provides contact and contactless operations in a multi-service, multi-operator environment for payment, ticketing, identification, location, reservation, information and security functions. The introduction of multi-application smart cards has been tested and demonstrated in the following cities, Paris, Lisbon, Venice and Konstanz.

Handling of the customer's perspective

An increasing number of PT practitioners collect information about their customer's satisfaction in order to implement measures for a better service quality and for a higher customer satisfaction⁹⁷. Most PT companies in Europe have noticed that it is not enough only to produce a transport offer without closely analysing the customers needs and considering each of their customers as a single individual. Therefore the handling of the customer's perspective has become significantly more important during the last years and this development will continue with a further change of PT companies from simple providers of transport offers towards real service providers.

Interactive and direct forms of customer participation

One way of analysing and considering the customer's perspective are interactive and direct forms of customer participation like focus groups and customer panels, which have become more important in the last years. Focus groups are used mainly in the UK. In West Midlands they were

⁹⁵ CONCERT project (Co-operation for novel city electronic regulating tools), co-funded by the EC under 4th Framework Programme

⁹⁶ CALYPSO project (Contact And Contactless Telematics platform Yielding a Citizen Pass integrating urban Services and financial Operations), co-funded by the EC

⁹⁷ MOMENTUM Research Consortium, 2000, Mobility management for the urban environment, Transport Research – Fourth Framework Programme – Report

established to get insight in the customer's perspective and for the development of the 20 year public transport strategy for the West Midlands, the local transport plan and for the bus strategy. A customer panel with non-organised customers can be found in Bilbao and the implementation of a new one is taking place presently in Vienna. Besides customer panels with non-organised customers also customer panels with organised customers and mixed forms exist. A successful example for a co-operation in a customer panel between a PT authority and special groups (e.g. mobility handicapped, youth organisations, etc.) is existing in Stuttgart.

Customer-satisfaction and customer-relationship management

An increasing number of PT operators in bigger cities use the instruments of customer-relationship management and customer-satisfaction management. Customer-satisfaction management means a systematic approach to reduce the difference between the service quality perceived by the PT customers and the expected service quality (figure "Service quality circle").

The following diagram⁹⁸ shows the service quality circle from the PT customers point of view and from the perspective of the PT companies and connection between the two. Such a service quality circle can be the basis for a systematic customer-satisfaction management. Cities which use such a quality circle for customer-satisfaction management can be found all over Europe, for example in London, Copenhagen, Oslo, Paris, Nuremberg, Paris, Vienna, Turin and Madrid.

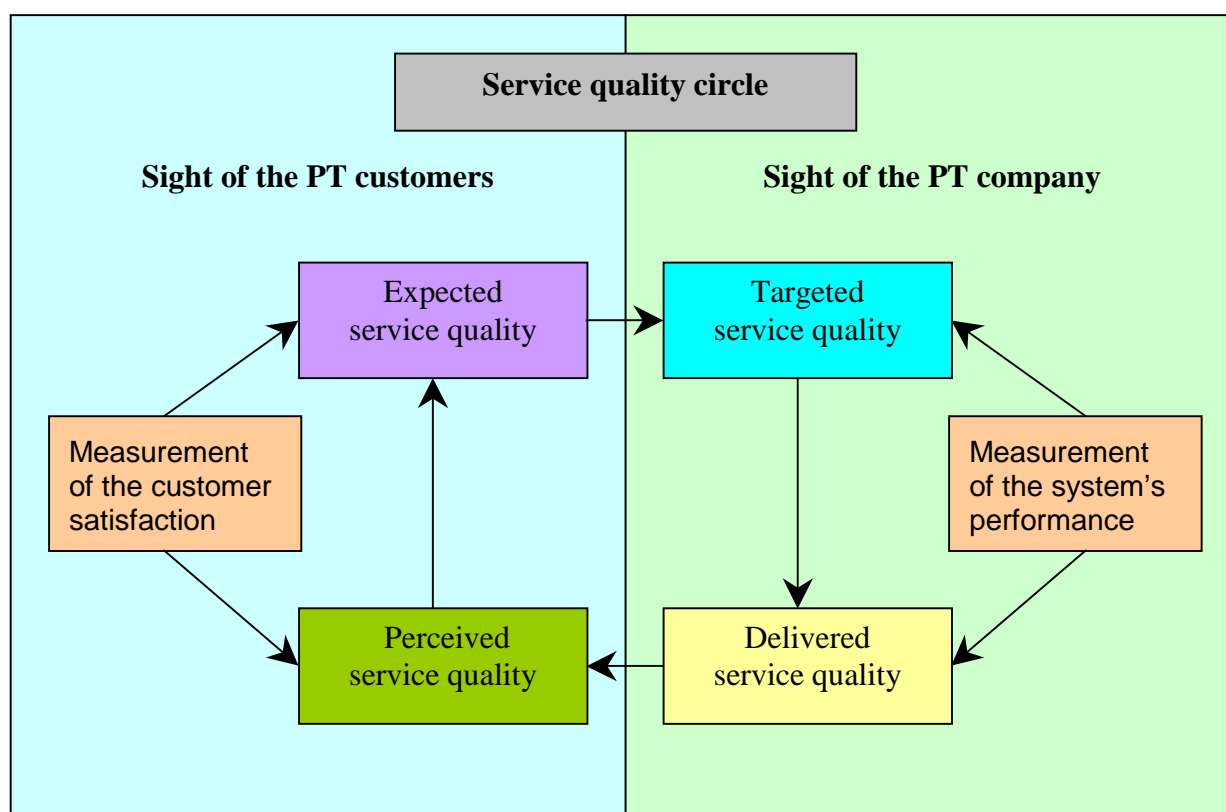


Figure 7 Service quality cycle (Source: EFQM European Foundation for Quality Management 2000)

The handling of the customer's perspective is crucial in the present debate about making PT more individual. Within this context, the establishment of direct contacts between the companies and their customers (customer-relationship management) plays an important role. The "Loyalty

⁹⁸ Vinck S., 1997, Qualität und Kundenzufriedenheit, 52nd UITP International Conference, Stuttgart (Germany)

Programme" of the Wiener Linien provides an individual addressing of 300000 annual cardholders, who are offered bonuses, tourism programmes, car-sharing and car rental services. Special offers for every month and a continuous extension of the included services take place. The share of addressed PT customers can be extended if the contact details of more customers are available. A high potential exists in this context with the use of smart cards, if the existing problems with regard to data security could be solved.

Customer complaints

Some PT operators (e.g. Vienna, Halle, Stuttgart, Wiesbaden) pursue innovative ways in the collection of customer complaints⁹⁹. The main instruments for the collection of customer complaints are contact telephone lines. Nearly all PT companies have some kind of contact telephone number for their customer's complaints while some companies also use e-mail-address. The use of complaint phone lines and complaint e-mail addresses is a fast way to get information about the customers perspective. However, most of the collected information is strongly distorted and emphasises one-sided only the importance of some complaints. Phone lines and e-mail-addresses are cost and work intensive and the especially the labour shortage in smaller companies makes them better suited for medium and big sized companies.

Depending on the PT company, the response time to complaints can vary considerably. Reasonable for a good customer-complaint management is only 2-3 days. The quality of the answer is a further quality criterion, which depends on the training of the used personal. In Vienna an interesting approach is practised with a division of the complaints / questions into general complaints / questions, which are answered by a front office and specialised complaints / questions, which are answered by a better-educated back office specialist. Whether and how the complaints are collected and evaluated are another criteria for a systematic customer-complaint management. Its crucial that a company has to react to the collected complaints within a reasonable time with a removal of the reason for the complaint.

A further possibility to collect customer complaints arises in the context of service guarantees and the refund in case of failures. With this method it is possible to get nearly all complaints, but it is also very expensive and only successful if the company reacts immediately to the complaints. The implementation of the new instruments like service guarantees and customer charters are driven by the idea of service management and is in theory very good, but the implementation and practical application is often not fully thought through.

Training in customer orientation

The development of attractive and more customer-oriented services can only be reached with the mobilisation and involvement of all staff members of PT companies¹⁰⁰. A PT company will have to become more of a service provider in the future. The characteristic of services unlike physical products is that the "human factor" plays a decisive role in their success. All levels of personnel should be involved in offering the right quality of services that meet the various demands of different groups of customers. People working in the back offices or in the frontline can play a vital role in their daily contacts with customers as they are the first to experience all their wishes and demands. Special training programs help to develop the right knowledge, skills and attitude for these employees.

Many PT-companies in Europe have spent a great deal of time, money and effort training its personnel and supervisors, how to improve customer-related behaviour and to handle conflicts and

⁹⁹ Brög W., Ferber G., 2001, Berücksichtigung des Norm-Entwurfs DIN EN 13816 „Öffentlicher Personenverkehr - Definition, Festlegung von Leistungszielen und Messung der Servicequalität" bei der Methodenentwicklung im Arbeitskreis Kundenorientierung, Beitrag zum Arbeitskreis Kundenorientierung, München (Germany)

¹⁰⁰ see chapter 2.1.7 Human resources development

stress situations. However, the effects of these training initiatives are only difficult to measure (return of investment).

Various examples of training programmes in order to improve customer orientation of staff members can be found in Europe:

TMB/Spain has applied over the past years a training policy to train its personnel in every aspect concerning the customer service. Following this strategic line, every year a complete working day is devoted to the training of every driver, to the relations with the customer, dealing with incidents, procedures, customer satisfaction, ticketing, non-aggressive driving etc.

RATP/Paris is supporting orientations on re-thinking staff assignments, in particular those of staff in contact with customers. Various training programs focus on increasing staff awareness about changes within their environment and their responsibilities.

Connexxion (Hilversum, The Netherlands), TEC Belgium has organised various types of training on how to handle conflicts for drivers and first line supervisors

The **"busdriver education" project in the county of Vasternorrland/Sweden**. A new person employed in a PT-company is educated in a 10 days training during the first year of employment. The content has much to do with induction, but also offers deeper knowledge in customer relations and how to deal with difficult customers.

Motivation and culture change programs

These programs are usually set up when companies want to change their strategy towards the market, implement a new organisation structure or culture or find out that there is a lack of motivation in using new working methods or implementing new ICT applications etc. In order to create an atmosphere of "service provision" in an organisation, so-called change programs can contribute to motivation and teamwork of managers and employees.

Experiments with so-called "self-managing teams" of frontliners (e.g. Connexxion, The Netherlands), that aimed at improving service levels, have proven to have a great impact on the motivation and the feeling of responsibility of staff members.

Another good example can be found at RATP Paris, where the new company policy of the "Courtesy Service" has been developed. The goal is to establish a corporate policy rooted in the organisation and working methods, laying the groundwork for new collective practices towards the customer.

Activities to improve the often bad working conditions of drivers and frontliners have gained importance, since the satisfaction of the customers also depends on the satisfaction of frontliners and staff. Therefore, improving the working conditions will be of mutual benefit for frontliners, staff and customers.

A good example of a project, which is aimed at reducing work stress of frontliners and staff, is the so-called Healthy Bus project in Copenhagen/Denmark. The goals of this project are:

- to integrate health promotion in the daily operations in order to obtain wide and quick results for a majority of the bus drivers
- to accomplish lasting improvement of health and well-being and to reduce and remove health risks
- to increase job satisfaction and to regain professional pride and a good reputation

Service quality standards in contracts

During the last years, service quality standards within contracts have become a more important and visible issue. One major reason for establishing service quality standards is to guarantee a minimum level of quality of services and incentives to increase the level of quality, in order to maintain PT passengers and attract new customers. The quality part of the contract generally consists of two parts, which are the setting of the quality standards itself and the assessment of the quality provided. Besides the technical quality of the vehicle, stops/ stations and other infrastructure, the quality of the services is dealing with a wide range of aspects, like for instance: punctuality of the services, cleanness of stops/ stations and vehicles, passenger information, etc.

A lot of efforts have been judiciously made to point out the need to improve the quality of PT services. The certification of companies (ISO 9000 and 9001, NF Services in France as an example) is a tool, which use should be recommended. Quality standards for customers also have to be sensible and this is not always the case. For example the Metro in Paris has a standard for its operators which says, that 1 m² is sufficient for 4 customers, however only 1/3 of the PT users is of the opinion that this is enough or comfortable.

On a European level, a general quality standard for customers of PT is available since April 2002. The standard DIN EN 13816 was issued by the CEN – European Committee for Standardisation – and includes a common measurement of quality in PT. Even before the final version of the standard became available a lot of European PT companies took it into consideration in their future planning. In Austria for example, it is planned to include this standard in all new contracts between public authorities and the PT authorities/operators.

The assessment of the different quality aspects are executed with the help of indicators, which can be shaped by instruments like for instance a customer satisfaction index and/ or a travel guarantee system as is the case in Oslo.

*A special type of 'contract' between the PT authorities and the PT operator are **the Quality partnerships in the UK**. This is an agreement between the two entities especially designated to improve the quality of PT bus services and to create an integrated high quality network of PT services. Both entities invest in improvements. In general, the PT operators invest in staff training and new, often environmentally friendlier, vehicles, while the PT authorities improve the infrastructure, including bus priority and facilities. Passenger information improvements are often an additional key issue. When an established contract between the two parties is settled, this will not only enforce the agreed investments, but also blocks the road for free riders. The respective operator obtains the exclusive right to provide the respective operational services in this case. The Quality partnerships could be considered as a step of retreat from the in the UK promoted full competition and is backed by the National Government, which designed the necessary legislation.*

Often a bonus/ penalty system supports the quality standards in a contract. An interesting approach is used in Copenhagen, where bus operators that produce a very good quality get a bonus added to their basic income. Considerations on quality have led to contracts between operators in many Polish cities, which offer some bonuses and fines on the basis of factors, such as reliability, punctuality, information and driver behaviour. This approach is, however, unusual in CEE countries, although slow trends towards contractual incentives in other CEE countries exist. Consideration of quality in contracts in turn requires its measurement through quality surveys. Thus, the quality based contracting system stimulates the collection of marketing data on customer service, satisfaction and preference.

In most cases the bonus/ penalty system is only binding a minor percentage of the subsidisation to the quality of service. Furthermore this instrument is only really effective in cases where the PT authority is not in the same time also the owner of the PT operator. A recently given fine for the

municipal PT operator of Amsterdam had to be paid by the fining authority itself, due to its 100% ownership of the respective operator. In this case the system is only a symbolic instrument and sometimes a preparation for future envisaged alterations of the institutional framework.

Existing problems and solutions

Limited implementation of physical design improvements

Many recommendations about how to improve the physical design of vehicles, stations and interchanges exist, but the implementation of these recommendations in practice is often fairly limited, mainly due to cost reasons.

Feeling of insecurity amongst PT customers

The subjective perception of security risks involved in using public transport is high in all European countries. However, in reality there is a far greater risk of being attacked, robbed or sexually assaulted within an urban area as a whole than within a public transport environment. Despite this fact, there is often a feeling of insecurity amongst customers, which can be caused by inhospitable conditions, such as vandalism, graffiti, dirt or dark stations. Another important reason for the feeling of insecurity, which importance might increase in the future, is the fear of hijacking or terrorist attacks in the PT environment. .

Limited competencies in minimising the risk of terrorism

Policies against terrorism and vandalism have to be clearly distinguished, since operators can address both the causes and consequences of vandalism through preventative measures, whereas related to terrorism there is much less local actors can do on their own account. Minimising the risk of terrorism lies mainly outside the field of sole competence of public transport operators and therefore needs the development of security policies, which involve all potential actors, such as police, health services, fire defence, etc.

Limited usability of electronic ticketing for specific user groups

Despite the obvious general advantages of using electronic ticketing, not every passenger can benefit from an electronic ticketing system. Often, it remains unclear, which type of PT customers can really benefit from electronic ticketing. It is likely, that “electronic barriers” are created. Users are often confused and worried by the technology and there might be difficulties in users comprehension. Especially, the usability of electronic ticketing for impaired people is not yet satisfactory.

Fear of lack of data protection

There is often a general fear of lack of protection of privacy related to the use of electronic ticketing. Data confidentiality should be strictly monitored both for the individual cardholder transaction records as well as for each individual service provider's financial and utilisation records.

Business case for electronic ticketing systems often doubtful

PT operators (especially in CEE countries) are often reticent about introducing electronic ticketing systems since the increase in ridership and willingness to pay are not proven. Generally, private operators are not really interested in having post-paid smart card applications because they are going to receive the money back after a certain period of time with the related cash flow problems.

There is often a gap between banks and transport operators that is not a technology gap but a 'business gap'. Banks and transport operators have different backgrounds, different company cultures and different objectives. In addition to that, there are serious differences in the geographical and demographic profile of their customer bases. Moreover e-purse services need a critical mass to make returns on investments that only PT by itself cannot make.

Lack of standardisation for interoperable smart card tickets

Many important standards for achieving interoperable smart card ticketing have not yet been developed. There is an increasing need to agree on smart card specifications that are fully compatible with international standards. A practical example of this need can be seen in the TRIANGLE project, funded by the European Commission that involves Eurostar, Transport for London, RATP (Paris), and STIB (Brussels) to develop interoperability of ticketing between Brussels, London and Paris. However, it is first of all important to get an agreement, for which areas and services common standards are really needed.

High costs of introducing an electronic ticketing system

The costs of implementing an electronic ticketing system, linked with an electronic purse application are often underestimated. Especially, the electronic purse system needs a critical mass to make returns on investments.

Lack of resources for introducing more customer-oriented services

Especially small companies do often not have the money or staff available to introduce an effective handling of the customer's perspective. In such cases it is necessary to show their decision-makers clearly the positive results of an effective handling of the customer's perspective.

Implementing results of customer satisfaction surveys

Results of customer-satisfaction surveys are often difficult to analyse and the implementation of the survey results within the companies often takes too long. Customer satisfaction surveys often provide only an assessment of PT attributes as surveyed and not necessarily a picture based on actual user situations. Therefore not all PT practitioners experience customer satisfaction surveys as a sufficient decision-basis. Most of the smaller PT companies use their regular surveys to ask the customer some questions in order to find out about the customer's perspective.

Thus, it could take weeks or even months in smaller companies until the results of the surveys reach the staff responsible for customer satisfaction management. Another form of praxis-oriented surveys is a mystery shopping survey. London Underground for example uses mystery shopping surveys to achieve an immediate elimination of identified problems. In mystery shopping surveys a number of PT users is selected and asked to test the PT service of a single line. The main advantage of mystery shopping surveys is that it is easier for the staff to react immediately to the results of mystery shopping surveys than with other surveys.

In most cases the outcomes of user needs surveys are used to solve already existing deficits. A better method is to get their input in advance before a problem can arise. A positive example can be found in Dublin, where PT users have been involved in the construction of busses.

Disregard of non-PT users

When dealing with the identification of the customer's perspective most efforts concentrate on actual PT users, while the group of defectors from PT to other modes is seldom included. On the other side often little attention is paid to the gaining of new customers.

High cost risks of service quality standards

A number of PT companies in Europe has introduced or thinks about introducing service quality guarantees for their customers. The main barrier for the introduction of service quality guarantees are the high following cost hazards (if combined with refunds) and the expected increase of complaints. If a refund for missed quality is given, such a refund is most often limited to 5 or 10% and to certain events like delays (e.g. Newcastle - Metro passenger charter).

2.2.9 SUMMARY: KEY PROBLEMS

The major problems on the way to achieve a more social sustainable public transport, this means PT services, which are available, accessible and attractive for all customers, can be summarised as follows:

The **availability of PT** is often curbed through the limited frequency, capacity and the bad timing or integration of PT services. Badly co-ordinated PT services often lead to long waiting times at interchange points. Since most operators in an open market are not necessarily interested in co-operating with others for sharing operational data and harmonising services, the development of a more integrated multimodal transport systems is very difficult.

Another key problem related to the availability of PT is that the supply of PT services is only adapting very slowly to the changing demand of the customers. Very often the provision of PT services is not flexible enough and inadequate to the requirements of the customers or specific customer groups. As a consequence, many potential PT customers consider PT as not sufficiently available for them.

Innovative mobility services, which try to better meet the individual mobility needs of the customers (e.g. car sharing or demand responsive transport services), are often not flexible enough. The need to become familiar with system functions, book trips in advance and define returning times, make these services unattractive. On the other side, many potential customers are not aware of all benefits of these innovative intermodal mobility services. But also from the perspective of the PT operators, there is certain scepticism towards the potential of these services for improving the overall attractiveness of PT. Many operators see these services as being outside their field of competencies, causing extra expense without direct benefit.

In terms of **PT accessibility**, the still very often limited access for people with reduced mobility to vehicles or interchanges is an important problem. Although there are solutions to the majority of access difficulties in existing vehicles, buildings and in the pedestrian environment, these solutions are only partly implemented due to cost reasons and missing political awareness.

Another obstacle for more accessible PT is the often poor and inadequate traveller information. Information on PT services is often provided without sufficient consideration of the actual information needs of the customer in general and special target groups. An example of inadequate provision of information services is the neglect of basic and static information. Driven by technological innovation there is currently a tendency to provide a maximum of information on multiple distribution platforms.

From the operators perspective there are many reasons, which make the decision on investing in high quality traveller information services very difficult (e.g. high costs, limited data availability and missing standards for data quality and data exchange). Since there is also only limited up-to-date knowledge about the effects of information services on traveller behaviour (and therefore about revenue development expectations), operators or agencies are often reticent about investing in high-quality information services. As long as the cost-benefits ratio is unclear, also private financing continues to be difficult.

The **attractiveness of PT** is heavily affected by a general feeling of insecurity amongst PT customers, which can be caused by inhospitable conditions, such as vandalism, dirt or dark

stations. Another important reason for the felling of insecurity is the fear of hijacking or terrorist attacks in the PT environment. As regards the minimisation of the risk of terrorism, the field of action and competencies of PT companies alone are limited.

From the customer's perspective an integrated fare structure and through ticketing by means of smart cards are an important element for improving the attractiveness of PT. However, despite the obvious advantages of using electronic ticketing, not every passenger can benefit from an electronic ticketing system due to "electronic barriers". Users might be confused and worried by the technology and there might be difficulties in user comprehension. Furthermore, users might be afraid of a lack of data protection when using electronic ticketing.

From the operators side an important problem is the often insufficient use of the outcomes of user satisfaction surveys which are supposed to provide information on the reasons for and against the use of PT. In many cases user satisfaction survey can only show a limited view of PT attributes and do not necessarily provide a picture based on actual user situations. When dealing with the identification of the customer's perspective most efforts concentrate on actual PT users, while the group of non-users is often neglected.

A problem related to electronic ticketing are the relatively high costs of introducing an electronic ticketing system and the uncertainty about the effects of such a system on the increase in ridership and willingness to pay. Furthermore, there is a lack of standardisation for interoperable smart card tickets.

2.3 Public Transport and environmental sustainability

2.3.1 INTRODUCTION

Public transport modes usually produce less negative environmental impacts per unit of transport output than private motorised vehicles. Even if the environmental nuisance of PT, compared to the entire transport market is relatively low, the concentration of PT in urban areas can reach to high levels of air and noise emissions.

Today, a number of technical, regulatory, planning and other options are available to reduce these negative environmental impacts of urban transport. Due to technological innovations in the automobile industry, air and noise emissions as well as energy consumption of motorised vehicles could be reduced considerably. Consequently, the formerly great advantage of PT concerning environmental nuisance, compared to the cars, has become smaller. This trend might continue when the latest technologies, such as fuel cell cars are entering the market. There is now a great need to maintain the advantages of PT related to emissions and energy consumption, which are key factors in further promoting the use of PT: Public transport has still an important role to play in improving the quality of urban life and the environment.

The positive environmental effects of public transport can either be direct or indirect. Direct effects can be achieved for example through the wider use of innovative energy-efficient vehicle technologies or telematics-based PT management systems, such as traffic signal timing, fleet management or bus priorities. These effects can be important at specific locations in the city, but the overall effect on pollution levels is relatively small. Positive indirect environmental benefits can be achieved through the wider consequences of policies, which strongly promote public transport.

These effects, however, can be significant, provided that the promotion of PT modes goes in hand with consequent transport demand management strategies (such as parking policies, access control, etc.) which reduce car traffic in cities. Only a consequent “carrot & stick” approach, which leads to an increase of PT ridership and at the same time to a decrease of the modal split of car traffic can reach noticeable environmental effects. This means, that all measures, which have the aim to promote the use of public transport do not necessarily have a positive effect on environmental sustainability, if they are not integrated in an overall urban transport strategy.

2.3.2 AIR AND NOISE POLLUTION

New power technologies and clean vehicles

Despite the growth of transport demand (more than twice over the last 25 years), huge improvements have been made for reducing emissions of some major air pollutants, following the development of pollutant regulations (related to lead, carbon monoxide, volatile organic compounds, nitrogen oxides and particulate matter). Whereas a decrease between 15% and 55% can be expected for all these above mentioned pollutants by 2020, OECD experts expect an increase of CO₂ emission by 45% from 1995 to 2020 in OECD countries¹⁰¹. In fact the gains obtained on engine performance are disappearing due to the increase of car traffic as well as of vehicles' weight and power and comfort equipment (such as air-conditioning).

¹⁰¹ Environmental outlook to 2020 for the transport sector, Low emission vehicles. OECD report, 2002, in press

According to various research studies¹⁰² public transport modes reach far better results in terms of emissions and energy consumption. CO₂ emissions as well as the emission of particles (despite the negative image of diesel buses) caused by PT modes are substantially lower than those caused by private motorised vehicles (per person kilometres). However, the emissions of NO_x are lower for PT as a whole, compared to emissions by car vehicles, but are much higher for buses. And also for SO₂ emissions the bus has a limited disadvantage compared to the car.

If in the future more vehicles with innovative technologies are introduced, the environmental benefits of the bus related to the emissions of CO₂ and particles and energy consumption will become smaller.

Diesel fuel is used by about 80 % of the urban PT vehicles and is still the most effective and the less expensive energy source, for investment as well as for maintenance costs per unit. However, due to its low mobility market share, PT accounts for a very small part of the whole air pollution in cities (around 5%). Since the 80's, the pollutant regulations (e.g. Euro X for EU countries) resulted in highly significant progress on all thermal engine technologies. The next Euro4, Euro5 and further regulations will motivate manufacturers towards further progresses.

Manufacturers of engines and PT vehicles as well as fuel suppliers have focussed and continue their research on a lot of technologies, some of them with the support of European project funding. They concern:

- fuels - petrol, diesel fuel, particulate filters, low sulphur diesel oil, LPG (Liquefied Petroleum Gas), CNG (Compressed Natural Gas), biofuel
- electrical power - batteries, trolleybus with hub engines and hybrid systems,
- energy storage - flywheel and super-capacity technologies.

The analysis of studies on new PT vehicle technologies (e.g. the comprehensive French evaluation programme "Clean buses program"¹⁰³, TEST Project - Technical and Financial Characteristics of Public Transport Systems, UK¹⁰⁴) show the following trends for each technology:

- **Euro 3 diesel technologies** with post treatment filters have made great progress from Euro2 stage. The current exhaust treatment technology is able to reduce the emissions from diesel engines of most air quality pollutants (NO_x, PM₁₀, HC, CO) to at least Euro 3 standard (often to Euro 4, which comes into force the end of 2005, but not Euro 5, after 2008). An important condition for using this technology, however, is the use of ultra low sulphur diesel (ULSD). Post treatment filters require careful maintenance in order to keep good performance levels, mainly in case of low commercial speed. Consequently, the use of low sulphur diesel fuel (50 ppm) will increase and vehicles fleets will be equipped with post treatment filters.
- **CNG** (Compressed Natural Gas) and **LPG** (Liquefied Petroleum Gas) technology: Internal combustion engines running on CNG and LPG are in direct competition with diesel technology. Buses running on CNG and LPG with dedicated engines (i.e. *not* converted from petrol or re-engineered from diesel) achieve at least the Euro 4 standard. A key advantage of the CNG and LPG technologies are the much lower PM emissions and lower NO_x emissions when compared to diesel technology. In terms of CO₂ emissions per kilometre travelled, LPG is slightly worse than diesel while CNG performs roughly similar. This is due to increased emissions of CH₄ (methane), an important greenhouse gas, both during vehicle use and during production, refining and distribution of natural gas. There are huge natural gas resources existing around

¹⁰² Gommers, Michael – Netherlands Economic Institute: "Towards the green environment – Comparison of environmental impacts of urban public transport and automobiles", IFEU Institute Heidelberg: "Bus, Bahn und Pkw im Umweltvergleich - Der ÖPNV im Wettbewerb"

¹⁰³ A comprehensive evaluation programme "Clean buses program". Rapport Ademe (French Agency for Environment and Energy Management), June 2002.

¹⁰⁴ Brand, C./ Preston, J. (Transport Studies Unit, University of Oxford): "TEST Project - Technical and Financial Characteristics of Public Transport Systems", UK, 2001

the world, therefore it is a strong argument for many countries to favour this energy. However due to its higher cost, this fuel must be subsidised to be competitive, as it is the case in France for instance.

- **Biogas and Biodiesel** can reach to large reductions in both local air pollutants and greenhouse gases. For example, with the use of biogas in Linköping, Sweden 90% reduction in particulates and 85% reduction in NO_x could be achieved. Vehicle tests have shown, that bio-diesel has lower emissions of carbon monoxide, soot (insoluble particulate matter), and polycyclic aromatic hydrocarbons (PAHs) than conventional diesel. NO_x emissions can be higher, but with adjustments in the engine's injection timing, it is possible to reduce the NO_x emissions. Similarly, engine adjustments can reduce the particulate emissions relative to those from mineral diesel.
- **Aquazole technology** (addition of water in diesel fuel) is appropriate for old buses and provides some good results at a very low cost.
- **Electric power vehicles** with batteries are frequently used in city centres but remain expensive (around twice the cost). For this reason, electric vehicles are mostly mini-buses operating on short routes. New battery technologies using lithium must be rapidly perfected because the use of cadmium could be prohibited after 2003. Electric vehicles have virtually no pollutant emissions at point of use. There are, however, emissions at sources of electricity generation (mainly coal, gas and nuclear power stations).
- **Hybrid electric propulsion** is developed with two different approaches: the thermal generator with electrical engine on the one hand, the electric engine with energy storage in batteries and diesel engine on the other hand. Hybrid electric propulsion has the advantage of 'zero'-emission operation in restricted-access zones of a city. Until now, buses with hybrid diesel and electric propulsion have not been a great success as carrying two sources of power in one vehicle is both more expensive and comes with a weight penalty. There are, however, ongoing research, pilot and demonstration project which aim at demonstrating the viability of hybrid propulsion in commercial operation in European cities. For example, the EC targeted transport projects (e.g. CENTAUR, ENTIRE, JUPITER-2, SAGITTAIRE and ZEUS, all funded by JOULE-THERMIE programme) aimed to address energy related problems of the urban transport sector and demonstrate practical solutions, including hybrid propulsion for public transport vehicles.
- **Energy storage** solutions like flywheel and super-capacity technologies are still very expensive and not available on the market. Manufacturers keep on research efforts in this domain, mainly for short or complementary applications (for rail transport); e.g. flywheel ULEV-TAP European project FP 4 BRITE-EURAM 3 programme.
- **Fuel cell technology.** Expensive researches and experiments are performed for the development of fuel cell engines using hydrogen, with zero pollutant emission (except CO₂ emission during the stage of H₂ production). However, this technology seems to be very expensive (approximately 1.25 million € per bus) and will not be available before 10 or 15 years. The CUTE project¹⁰⁵ - Clean Urban Transport for Europe, European FP5 'Energy, environment and sustainable development' - plans the experimentation of fuel cell powered urban buses. These Mercedes-Benz Citaro low-floor buses will operate in nine cities: Amsterdam (Netherlands), Barcelona (Spain), Hamburg (Germany), London (Great Britain), Luxembourg, Porto (Portugal), Stockholm (Sweden), Stuttgart (Germany), Reykjavik (Iceland).

¹⁰⁵ CUTE project - Clean Urban Transport for Europe. European FP5 'Energy, environment and sustainable development'.

Noise pollution and vibration

The noise level of light rail at acceleration and braking is considered to be lower than for buses due to comparatively quiet electric propulsion and steel-on-steel traction. However, in contrast to rubber-wheeled vehicles light rail has the disadvantage of the possibility of vibration affecting nearby buildings and residents.

All the projects of new PT systems include the objective of noise reduction, relating either to rail tracks (vibration emission) or to engines (noise emission), but progresses are still very difficult to obtain. Currently, the performance of the tramways related to noise emissions is unsatisfactory, mainly in curves (problem of wheelset hunting). Some evaluation performed in Strasbourg indicates a level between 90 and 100 dBA for curved track sections, so that a high level of wheel maintenance and lubrication of the rails is necessary. On straight-lined sections, the noise levels were measured between 70 and 75 dBA.

Research is continuing on several aspects - infrastructure (quality of track building, surface material), bogie design and vehicle weight (e.g. Alstom experimentation in La Rochelle under progress). The choice of grass for tramway lanes provides a nice visual aspect but impact on noise emission is not clear compared to asphalt or other covering. The benefit of this measure seems to lay in reducing the share of sealed surface in PT infrastructure.

Impact studies of the new tramway routes in Lyon and Strasbourg showed a slight noise decrease during the day and a small increase at night on some sections. However, the use of analysing the noise decrease effect of a new tramway line, which takes some car traffic out, must be questioned.

Many PT vehicles running with alternative fuel technologies can reach a reduction in noise and vibration compared to conventional vehicles¹⁰⁶. This has a particular benefit in densely populated city centres and for early morning/evening transport in residential areas. Electric and hybrid-electric vehicles are extremely quiet, but gas powered vehicles (with dedicated internal combustion engines) also offer noise and engine vibration reductions.

At the regulatory level, a European directive (2002/49/CE dated 25th June 2002) specifies measurement processes for noise evaluation. Before 2004, the EU members will have to carry out noise mapping with temporary processes. Afterwards the objective is to regulate these processes and define noise emission limits.

Existing problems and solutions***High competition between clean technologies and less polluting diesel engines***

It seems still hard to make a good choice for clean buses. Diesel engines may keep the leadership for many years. Autonomous electrical power could increase its market for buses operating in town center or short distance routes. At present fuel cell technology is a too expensive solution for transport sector and raises safety issues both for the H₂ production and for storage onboard the vehicle. Evaluation results are highly waited to better know the CO₂ balance for H₂ production strategies (in a factory or onboard).

Many PT stakeholders are under increasing pressure to provide high quality mobility services at low costs, which forces them to reduce the costs of buying and running vehicles. For this reason, fleet operators may be reluctant to invest in alternatively fuelled vehicles which are often more expensive to purchase and for which maintenance and service needs may be difficult to estimate.

Difficulties to introduce new “low level emission” technologies in a small market

¹⁰⁶ Brand, C./ Preston, J. (Transport Studies Unit, University of Oxford): "TEST Project - Technical and Financial Characteristics of Public Transport Systems", UK, 2001

The hub-engine (or wheel-engine) is a new electric power technology for buses or trolleybuses. It is unclear, whether the costs of this technology will decrease enough to be affordable and attractive? Flywheel and high-capacity technologies are still under development. One drawback is their large occupancy in the vehicle. So that they will be more appropriate for rail vehicles and not for the whole traction need.

Technical difficulty to reduce PT noise levels

Noise is the most important trouble for inhabitants of big urban areas. Increasing mobility demand is conflicting with the request of peaceful urban environment. Decreasing noise levels of all PT modes is still difficult.

Noise pollution is an increasing issue for rail transport, particularly for light rail. These systems are more suitable in straight-lined routes or needs high level of maintenance. In concurrence, project of tramway on rubber tyres, as the Translohr, could offer better results in curves

2.3.3 NATURAL RESOURCE CONSUMPTION

Energy consumption

Considering the present consumption rates, estimation of energy resources in the world show that the reserves availability would last for 50 years for oil, 65 years for gas and 260 years for coal. Renewable energy resources should have no limit, except due to major changes in land use¹⁰⁷.

Within the RUBENS project¹⁰⁸ a broad variety of energy saving potentials in public transport operations have been identified. These energy saving potentials can be categorised in the following areas:

- Vehicle and fuel technologies, comprising fleet replacement, renewal and refurbishment alternative fuels, filters, regenerative braking and other technical interventions
- Operating practices including, driver training, fleet management, the use of innovative operating tools and software, preventive maintenance

Vehicle and fuel technologies

According to the RUBENS project, vehicle technologies and fleet renewal are considered to be of high importance in terms of energy saving. An increasing number of documented examples exist on the use of hybrid buses focussing on batteries, charging stations, low floor techniques and vehicle weight. But also the use of electronic minibuses as well as light rail, guided bus and light transit, tram systems, rail technologies and trolley buses can obviously contribute to significant energy savings. However, the environmental benefits of these vehicle technologies are mainly seen in terms of emission reduction and not energy consumption.

The use of alternative fuels (gas fuelling, biofuels, fuel cell technology), engine technologies and particle filters are other areas with high potentials of energy saving. Again the major benefit is seen in emissions reduction rather than energy saving.

¹⁰⁷ French national debate about energy, 2003

¹⁰⁸ RUBENS project - (RUE -Rational use of energy – Best Practice guide for urban public transport in European cities) funded by the European Commission under the SAVE Programme, 2001

Operating practices

Many PT operators are aware of the positive energy saving effects that can be achieved by PT traffic management (e.g. bus priority, dedicated lanes, fleet management or flexible bus services). Driver training in bus and rail operations for achieving energy efficient driving is seen as another measure with a potential for energy savings. The positive impacts on the reduction of energy consumption or emissions are usually not the major reasons for implementing these measures. The major driving forces behind the implementation of PT traffic management measures lie in the field of economic efficiency and effectiveness. This explains, why in many existing project evaluation studies, the measurement of energy savings or emissions reduction is hardly included.

Space consumption

Social trends like, changing lifestyles with a increasing individualisation, and following transportation trends like urban sprawl and increased need for mobility are the drivers of the increased intended consumption of space. It is up to the respective transportation and urban development authorities to understand these demands and to guide towards a sustainable urban environment.

The need for space for different transport modes depends on the space needed for driving and parking the vehicles. Indirectly, further space is used for fuel stations or garages. But also the negative effects of a transport system, such as noise, reduce the availability of certain areas in a city and are therefore another form of indirect space consumption. Studies have shown that the car requires a lot more space per person travelling than other passenger modes, not to mention the parking spaces required at homes and destinations. In urban areas, which provide for a high degree of access and mobility by car are inherently incompatible with structures served predominantly by other modes of transport

As regards the space consumption of PT systems, busways need most space (8-13m), trams (5-6.5m) and guided buses (5.8-6.2m) the least, for two lanes in all cases¹⁰⁹. The difference between the two latter modes is only marginal. The very narrow vehicles of about 2.2m that are currently commercially available can achieve the low width requirement for trams. Buses running on bus lanes will need minimum widths of between 6 and 8m. Suburban railways and metros need about 5.5-7 m (for two lanes). The ULTra system is claimed to require only 1.4 m for a single lane track (elevated or at grade).

Alternatively fuelled vehicles (buses, trams) require some sort of additional refuelling infrastructure. Depending on the fuel, this could mean a new fuelling depot with pressurised gas storage tanks, additional fuel supply, fast charging units (for batteries) or modifications to conventional refuelling stations (e.g. for ethanol and methanol).

Existing problems and solutions

Risk of rarity of energy resources

The risk of rarity of standard energy sources will be added to the green house effect and reinforces the need for a higher energy efficiency of transport, which are expending their consumption quickly. Even if public transport is a cornerstone of the problem, the search of other energy resources, renewable and available on a large scale, remains a major objective. Island shows the

¹⁰⁹ Brand, C./ Preston, J. (Transport Studies Unit, University of Oxford): "TEST Project - Technical and Financial Characteristics of Public Transport Systems", UK, 2001

way by choosing to develop the use of hydrogen [to replace all their fossil consumption with hydrogen by the year 2050] (European project ECTOS¹¹⁰).

Lack of integrated mobility planning

Another major reason for the failure in creating an attractive and highly integrated PT network is that the development and implementation of comprehensive, integrated plans addressing all related aspects of urban mobility (land use planning, public transport, road transport, parking, etc.) is often missing. As long as the measures for designing a region-wide PT network do not go hand in hand with complementary measures to reduce the accessibility of the private car in urban areas (demand management strategies) and land use strategies for limiting and controlling the development of large residential areas and industrial or commercial retail centres, the chances for achieving sustainable transport are fairly limited.

2.3.4 ENVIRONMENT RELATED MARKETING CAMPAIGNS

Environmental marketing campaigns for the use of PT exist in all European countries and are very useful for umbrella organisations (e.g. VDV in Germany) to show the entire population and the PT customers that PT is more environmentally-friendly than motorised private transport. Such marketing campaigns are less well-suited for PT authorities or operators as most surveys have shown that the higher environmental value of PT only has a marginal influence on the decision of PT customers to use this means of transport.

Therefore PT authorities and operators in Europe do not and should not build up their entire marketing strategy on environmental arguments, instead they use other arguments which are more suitable for increasing the market share of PT. This does not mean that environmental topics should be neglected in PT marketing. In order to defend the position of PT against car traffic it is still necessary to preserve a public awareness that sees PT as the more environmentally friendly mode.

Existing problems and solutions

Benefits of PT with respect to environmental nuisance, compared to the cars, has become smaller

The main problem regarding environmental marketing campaigns for PT is that technical developments have reduced the emissions of cars and the car industry has used its extensive resources to promote this development. In order to counter this development it is necessary to reduce the emissions of PT vehicles and to show the public these efforts. Special attention has to be paid to the problem of green house gases (especially CO₂) in the transport sector, as no economically feasible solution is available today. The public also needs to know that not only the amount of emissions makes a transport vehicle environmentally friendly besides this topic space consumption plays a very important role.

2.3.5 DEFINING ENVIRONMENT RELATED QUALITY STANDARDS IN CONTRACTS

Most EU member states promote environment friendly transport through contracts between PT Authorities and Operators. For instance in the UK this is incorporated in the Quality partnerships. Often the PT operators also adopted or obligatorily implemented environmental reporting.

¹¹⁰ ECTOS: Ecological City Transport System, European research programme "Energy, Environment and Sustainable Development. www.ectos.is/ectos.asp

However, in most cases real environmental standards in contracts remain at the level of technical definitions, as for instance the obligation to use a certain EURO standard type of busses.

2.3.6 SUMMARY: KEY PROBLEMS

The introduction of **clean vehicles** in order to reduce the environmental impacts of PT, is still difficult due to the high competition between clean technologies and less pollution diesel technologies. Many PT stakeholders are forced to reduce the costs of buying and running vehicles. Therefore fleet operators may be reluctant to invest in alternatively fuelled vehicles which are often more expensive to purchase and for which maintenance and service needs may be difficult to estimate.

Noise from traffic can be considered as an important disruptive factor for inhabitants of big urban areas. For rail transport and in particular light rail noise pollution is an increasing issue. Various technical difficulties to reduce PT noise levels still have to be overcome.

As a consequence of the technological innovations in the automobile industry, the pollution levels and energy-efficiency of motorised vehicles could be improved considerably. Therefore the environment related advantages of public transport have become smaller in the last years. This means that environmental friendliness as one major argument for using PT is less convincing than in the past and environment related marketing campaigns for PT have become more difficult.

A key problem for achieving more environmentally sustainable transport in general is the lack of **integrated mobility planning**. As long as the measures for designing a region-wide PT network are not accompanied by demand management strategies for car traffic and land use planning the chances for achieving considerable improvements of PT and therefore getting closer to a more environmentally, socially and economically sustainable transport are fairly limited.

3 Conclusions

The objective of the state-of-the-art review, carried out during the first phase of the VOYAGER project, was to identify the major current trends of PT in Europe and analyse the existing key problems and solutions of PT on the way to more efficient and effective PT systems and increasing PT patronage.

A great number of problems, that have been identified in the state-of-the-art review, can be considered as solvable at present. However, what is seen as a minor problem at one place (and solutions have been developed), might at the same time be considered as non-solvable at another place. In many cases the existing solutions or good practices are not sufficiently promoted and therefore not known to other actors or potential transferability of successful policies has not yet been analysed. Clearly there is a need for promotion of good practices and successful measures in order to make the whole sector benefit more efficiently from existing experiences.

Besides the problems identified as solvable at present, there is a range of problems, where no solutions seem possible at the moment, as they require changes from outside the PT sector in the future. These problems are often linked to missing political, financial or legal provisions that leave PT in uncertainty. The political and financial support of measures for achieving a considerable improvement of the quality of PT services (e.g. frequency and capacity of services, innovative customised mobility services, improvement of security and comfort for travellers, customer orientation) often involves many actors from outside the PT sector. The further discussion of these identified problems will be subject to WP3, which will not only focus on the PT sector itself, but will investigate more closely the interdependencies and interaction between PT and overall future developments.

The strategic discussion phase in WP3 will start with an initial analysis of external but transport related megatrends. These megatrends, together with their potential impacts on the future PT sector, will establish the new reference background for discussing future challenges and barriers that the PT sector is likely to face.

In order to focus the strategic discussions, the scope of the VOYAGER Working Groups has been reconsidered and narrowed to the following key issues, which turned out to be crucial for the future development of PT in Europe:

WG1 Public transport market and customer relations

Most of the marketing strategies of PT companies consist of isolated communication and promotion activities and do not follow a comprehensive marketing strategy, which allows the improvement in all customer relation activities, like advertisement, sales, customer services, complaint management, network design, product specification, etc.

The state-of-the-art analysis clearly identified the need to implement more strategic marketing approaches in the PT sector. WG1 will focus on future customers and their expectations, future partnerships in the marketing field and future reasons in order to highlight ideas how strategic marketing could look like in future.

WG2 Public transport infrastructure and rolling stock

Amongst PT customers, there is often a great feeling of insecurity, which can be caused by inhospitable conditions, such as vandalism, dirt or dark stations or increasingly by the fear of hijacking or terrorist attacks. Policies for minimising the risk of terrorism lie mainly outside the competencies of the PT sector and need the development of global security policies.

In response to these recent and current developments this WG will look into security issues in public transport with a particular focus on terrorist attacks. The discussion will emphasise prevention and response strategies, design issues, evacuation plans and potential

partnerships. The area of action for the PT sector should be outlined in order to prepare the ground for future security strategies.

WG3 Roles and structures of public transport actors

The financing of PT infrastructure, rolling stock systems and services is one area, for which many still unsolved problems have been identified. In all European countries and especially in countries from Central and Eastern Europe there is a great need to search for innovative financing solutions for investments in rolling stock, infrastructure and services. In this respect, the missing investments of the private sector is an important problem.

The focus of the WG will be to discuss new challenges in the area of pricing and financing, public and private funding as well as innovative and sustainable funding solutions.

WG4 Seamless intermodal networks and services

A major problem for achieving a higher PT market share, which remains unsolved at present, is the great gap between the provision of PT services and the demand of the PT customers. The needs and requirements of PT users or potential PT users are often not sufficiently taken into consideration when developing the PT services. The in general rigid supply patterns and poor service quality of public transport systems has led to a significant loss of market share over the last decades, since it could not offer a certain level of comfort, safety, speed, reliability and flexibility at a relatively low marginal cost, as the car can.

The work of the group will focus on integrated intermodal transport services as response to the increasing gap between PT demand and supply. The discussion will concentrate on how to adapt and customise the supply side in order to better meet the passengers needs, but also on how to influence the demand side to achieve a modal shift towards PT.

WG5 Public transport and ITS

At many places in Europe, the use of ITS in the PT sector has achieved an advanced status and the potentials for improving the efficiency of PT operations by using existing ITS have been exploited to a large extent. This means that the room for further efficiency improvements through ITS is often considered to be limited. However, in the coming years the possible impacts of the GALILEO system on public transport are expected to be considerable.

This workgroup will discuss the potential impacts of IT solutions on public transport operation, with some emphasis on the potential impact of the GALILEO system on European urban public transport. Focus should not be put on technology development itself, but rather on the discussion of technology implication on the public transport sector, on its potential to make public transport systems more efficient, but also taking into account the opinion of users towards new technology developments.

WG6 Training and human resources development

The state-of-the-art review made clear that the importance of developing a proactive human resources development strategy for PT companies, which helps to improve the customer-oriented behaviour of all staff members and defines new skills and job qualifications, is not widely recognised.

The workgroup is set up to discuss the potential of Strategic Management development programs. It will look into developing a service approach among staff as well as into the development of skills, such as security competence and stress handling. Also issues like benefits of staff presence versus cost reduction by staff minimisation will be addressed.

4 Terminology and abbreviations

AVL	Automatic Vehicle Location. A system that continuously tracks the location of buses.
BOT	Build Operate Transfer
CEE	Central and Eastern Europe
CEEC	Central and Eastern European Countries
CEN	<i>Comité Européen de Normalisation</i> (European Committee for Standardisation)
CH ₄	methane
CNG	compressed natural gas
CO	carbon oxide
CO ₂	carbon dioxide
COST	European cooperation in the scientific and technical domain
CRTM	Consorcio Regional de Transportes de Madrid (PT operator of Madrid)
Differential priority	Any priority strategy where different buses receive different priority levels according to some criterion (such as punctuality).
DIN EN 13816	European norm (quality standard for PT customers)
DRT / DRTS	Demand Responsive Transport Systems. Flexible bus services.
EC	European Community
ECMT	European Conference of Ministers of Transport
EFQM	European Foundation for Quality Management
ERP	Enterprise Resource Planning
EUROSTAT	Statistical Office of the European Communities
GPS	Global Positioning System. Location of vehicles using satellite technology.
GSM, WAP, GPRS, UMTS	Mobile communication technologies (defined in the WG5 report).
HC	hydrocarbon compound
Headway	The time gaps between buses. Normally used in measuring the time spacing between different buses running on the same route.
HRD	Human Resources Development
HRM	Human Resources Management
IFIs	International Funding Institutions
ISO 9000/9001	International Organisation for Standardisation (international standard / norm)
IT	Information Technology
ITS	Intelligent Transport Systems. A generic term for systems that are

	considered in some way to be ‘intelligent’ or use high-technology.
KONTIV®	Continuous survey of travel behaviour
LPG	liquefied petroleum gas
MD	Management Development
NOx	nitrogen oxides
OECD	Organisation for Economic Cooperation and Development
OEM	original equipment manufacturers
PDA	Personal Digital Assistant
PFI	Private Finance Initiative
Ppm	parts per million
PPP	Public-private partnership
PT	public transport
Punctuality	The extent to which a bus is on time, early or late; the difference between the actual arrival time and the scheduled arrival time.
RATP	Regie autonome des transports Parisiens (PT operator of Paris)
Regularity	A measure of how well spaced out the buses are. Regularity is optimal when all the buses on a route have the same headway.
SMS	Short message system
TMB	Transport Metropolitans de Barcelona (PT operator of Barcelona)
UK	United Kingdom
UTC	Urban Traffic Control. A centralised system that controls and co-ordinates a network of traffic signals.
VCD	Verkehrsclub Deutschlands
WP	Workpackage