Toolbox for Public Transport Innovation

Booklet version

CIPTEC

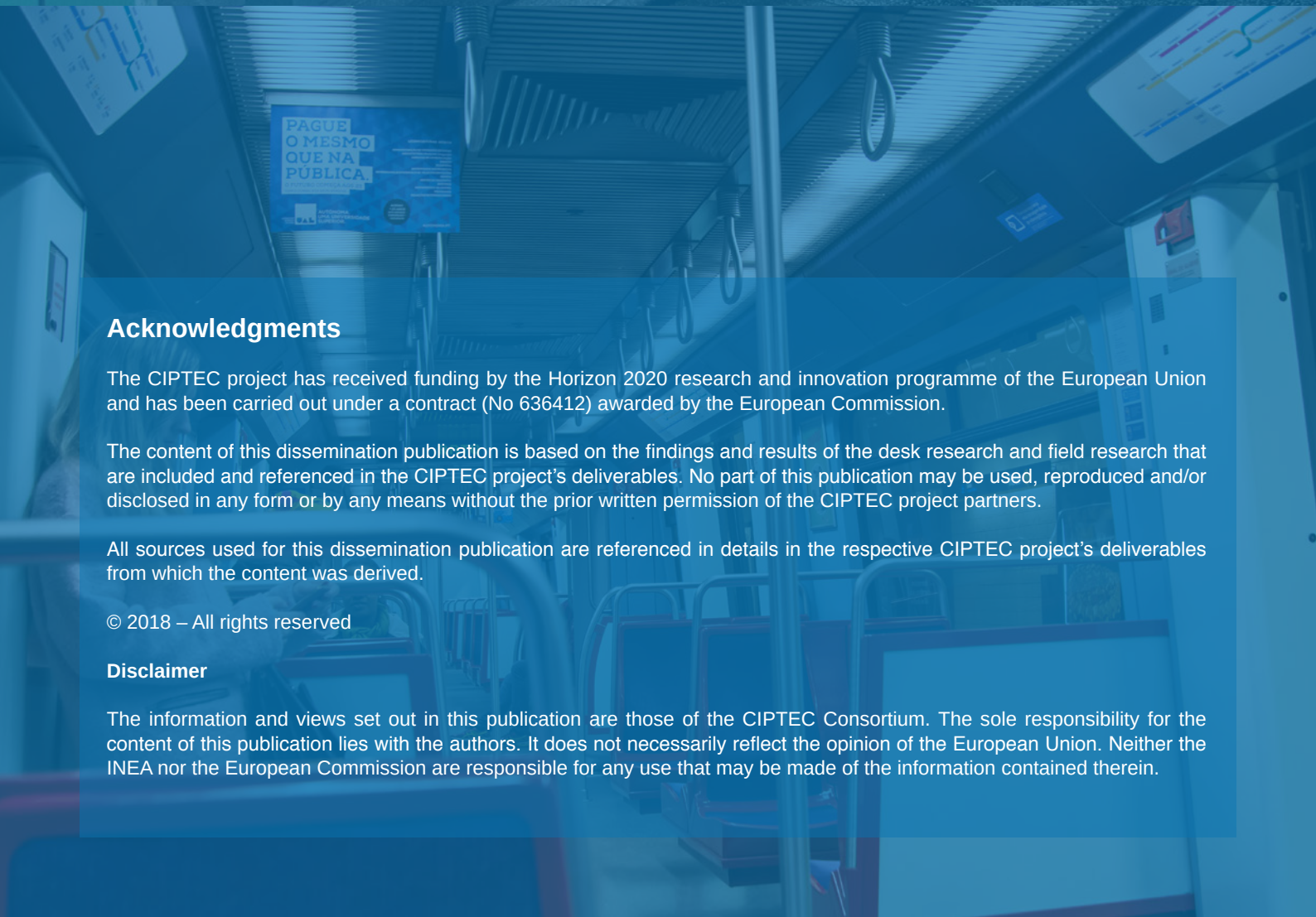
COLLECTIVE INNOVATION FOR PUBLIC TRANSPORT IN EUROPEAN CITIES

Funded by the Horizon 2020 research and innovation programme of the European Union (No 636412)

2020 CiViTAS

Cleaner and better transport in cities

www.ciptec.eu



Acknowledgments

The CIPTEC project has received funding by the Horizon 2020 research and innovation programme of the European Union and has been carried out under a contract (No 636412) awarded by the European Commission.

CIPTEC
COLLECTIVE INNOVATION FOR PUBLIC TRANSPORT IN EUROPEAN CITIES

Contents

1. Why should you be innovative?

Cities suffer most from congestion, poor air quality and noise exposure. In the urban context, a mixed strategy involving land use planning, pricing schemes, efficient Public Transport services and infrastructure for non-motorised modes and charging/refuelling of clean vehicles is needed to reduce congestion and emissions. An efficient framework for both Public Transport users and stakeholders, whereby innovation is a strategic essence, can play a crucial role in provoking a modal shift in favour of Public Transport.

Experience shows that great companies that failed to innovate have collapsed. There are various obstacles to consider along the path towards innovation, such as physical (e.g. outdated equipment/ technology), psychological, and strategic ones (e.g. failing to see future market dynamics). The Public Transport sector is characterised by a lack of business orientation, low motivation for innovation, as well as poor intra- and inter-sectoral dialogue. This raises a pressing need for a cultural transition in the sector, promoting its re-orientation towards a more open, user-centred and innovative approach. To make breakthroughs, Public Transport providers and experts need to become more 'disruptive' in their thinking, introducing innovation not only as a means to address the needs of current customers, but also as a vehicle to reduce non-use of Public Transport.

If Public Transport becomes innovative and efficient, then...

- service quality in Public Transport will be increased
- new customers will be attracted
- current users' satisfaction will be increased, and as a consequence...
  - the Public Transport market share will be increased
  - congestion and environmental impacts will be reduced
  - peoples' quality of life will be improved.

Public Transport has a mountain of challenges to overcome in order to play an even more decisive role in combating congestion. A shift towards a more user-centred marketing approach can be beneficial, but Public Transport has to move beyond an outdated recipe of "conventional marketing for transport suppliers" in order to unlock the potential of innovation.

Shifting towards **a marketing orientation** means that top priority is given to the **creation and maintenance of superior customer value** while the **interests of the other key stakeholders** are also considered.

How can Public Transport stakeholders introduce innovation in their processes and make Public Transport more innovative and attractive to everyone?

This is precisely the concern that is addressed in the handbook you are reading, entitled "Toolbox for Public Transport Innovation"!

The **CIPTEC "Toolbox for Public Transport innovation"** aims to empower Public Transport stakeholders to adopt a more favourable approach towards innovation in the Public Transport sector. It attempts to capture the generated knowledge and provide strategy advice on innovation introduction to Public Transport stakeholders.

The CIPTEC Toolbox is delivered under three different versions:

- Full version report (see relevant deliverable D5.1)
- Booklet version report (the current document)
- On-line digital tool **(visit: http://toolbox.ciptec.eu)**

The **target audiences** of the CIPTEC Toolbox are:

- Public Transport stakeholders, such as Public Transport Operators and Authorities
- Policy makers & Decision makers
- Transport experts, planners & researchers
- Citizens/End-users Associations

Two **levels (types) of content** have been defined for the Toolbox:

- **General purpose content:** open and suitable for all target audiences/groups.

- **Targeted content:** specifically addressed to Public Transport Authorities/Operators and Decision makers, as they mainly refer to the selection, the desig and the implementation of innovative concepts and solutions in Public Transport.

The Toolbox s**upports Public Transport stakeholders,** providing them insights on how:

- to instil and increase the marketing orientation of Public Transport actors,
- to change their culture to adopt a more collaborative approach
- to fuel their motivation for innovation
- to co-create value with their customers instead of relying on costly increases in Public Transport capacity
- to enhance the interaction between Public Transport organizations, citizens and service users, and also between other stakeholders from within or across the Public Transport sector.

2. Adopt the CIPTEC approach towards innovation in Public Transport!

Which steps, methods and approaches should you follow when you decide to make Public Transport in your area more innovative?

Empower yourself to adopt a more favourable approach towards innovation in the Public Transport sector!

The **"Innovation Flow"** proposed by CIPTEC maps the toolbox and provides a graphical representation of the process that you can follow in order to introduce innovative concepts and solutions to stimulate innovation in Public Transport.

The **activities** in the **'vertical'** columns indicate the steps that you should take to plan a structured strategy for the promotion, adoption and implementation of innovation.

The **activities** in the **'horizontal'** bars represent actions that could be either applied as stand-alone steps towards the final aim of innovation promotion, or implemented in order to serve the targets of the 'vertical' actions. The activities in the horizontal bar form a grid together with the activities in the vertical columns, which flows from left to right.

The **'Innovation Flow'** adopts an integrated approach and favours its realisation in a variety of applied areas and topics, such as: (i) marketing, (ii) consumer behaviour, (iii) innovation and (iv) evaluation.

How does it work?

The understanding of the existing situation of Public Transport demand and supply related to your area is quite crucial in order to identify the needs that new concepts and solutions should cover.
After having analysed trends and needs, you will be able to set your organisation's objectives and select the most suitable innovative concepts and solutions for your specific case.
These concepts that can be selected will be either the result of a top-down approach from the CIPTEC "Toolbox for Public Transport Innovation", or will be developed by the crowd through the implementation of collective intelligence processes by adopting a bottom-up approach (as it was done also in the frame of CIPTEC).
The top-down and bottom-up approaches to investigate needs, identify gaps and define potential solutions can be complementary to one another, overcoming the inherent limitations of each approach when used in isolation.
The Toolbox also puts forward a certain amount of supporting evaluation and decision taking supporting methods.
All or some of the above actions should be implemented in order to model and manage your "Innovation Strategy Plan" to successfully introduce innovation in Public Transport.
Bear in mind that the sets of steps proposed are indicative and you can select the most suitable for your case and form the appropriate mixture of methods and approaches, by skipping some or putting more emphasis on others.

All the above proposed actions are analysed in more detail in the next pages, while more information can be found in the CIPTEC Deliverables available on the CIPTEC website: http://ciptec.eu.

INNOVATION FLOW

Understanding the existing situation

- Global market & societal trends
- Needs of passengers (the 'demand' side)
- Needs of PTAs/PTOs (the 'supply' side)

Objectives

Considering existing available innovative concepts & solutions

- Public Transport
- Other Transport systems
- Other Business sectors

Planning the implementation & management of innovation *(Innovation Strategy Plan)*

- Innovation mix selection
- Pre-feasibility & feasibility analysis
- Implementation plan, business models (e.g. social entrepreneurship)
- Realisation & evaluation

Implementing collective intelligence processes

- Crowdsourcing
- Co-creation/ Co-desing

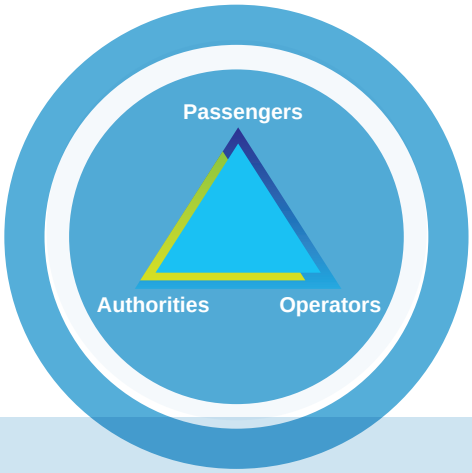
- Involving users & experts
- Co-creating new innovative concepts
- Co-adapting existing innovations
- Applicable in any stage or step of the innovation flow

Evaluation & decision taking supporting methods

- Analytic Hierarchy Process
- Conjoint Analysis
- Lab & Field consumer experimentation
- Delphi method

3. Understand the current situation and the future challenges

The main stakeholders in the Public Transport industry are represented by the triangle formed by passengers (demand side), Authorities and Operators (supply side).



But what are the existing needs of these important players?

What are the main changes that the influence of the global and local market and societal trends are expected to bring to the industry?

Who will influence the stakeholders' decision on what kind of innovation they should introduce in Public Transport?

The first step when you decide to promote innovation in Public Transport in your area is to explore and understand the main market and societal trends that are at play, and then investigate the needs of the parties involved.

Market and societal trends play an important role in how different consumer groups define or adjust their behaviour. Hence, having an overview of these trends is paramount in the innovation process. With this in mind, the next section will focus on those global market and societal trends identified in the CIPTEC project that are expected to have a significant influence on Public Transport over the forthcoming years.

The classification of passengers into groups, as well as the **identification of their needs** per customer group is one of the crucial parameters for mapping the current Public Transport situation. Particular attention should be paid to taking into account the special needs of vulnerable groups, including not only people with mobility and sensory restrictions, but also people affected by social, financial or gender issues. Addressing these needs may have considerable implications in the Public Transport industry.

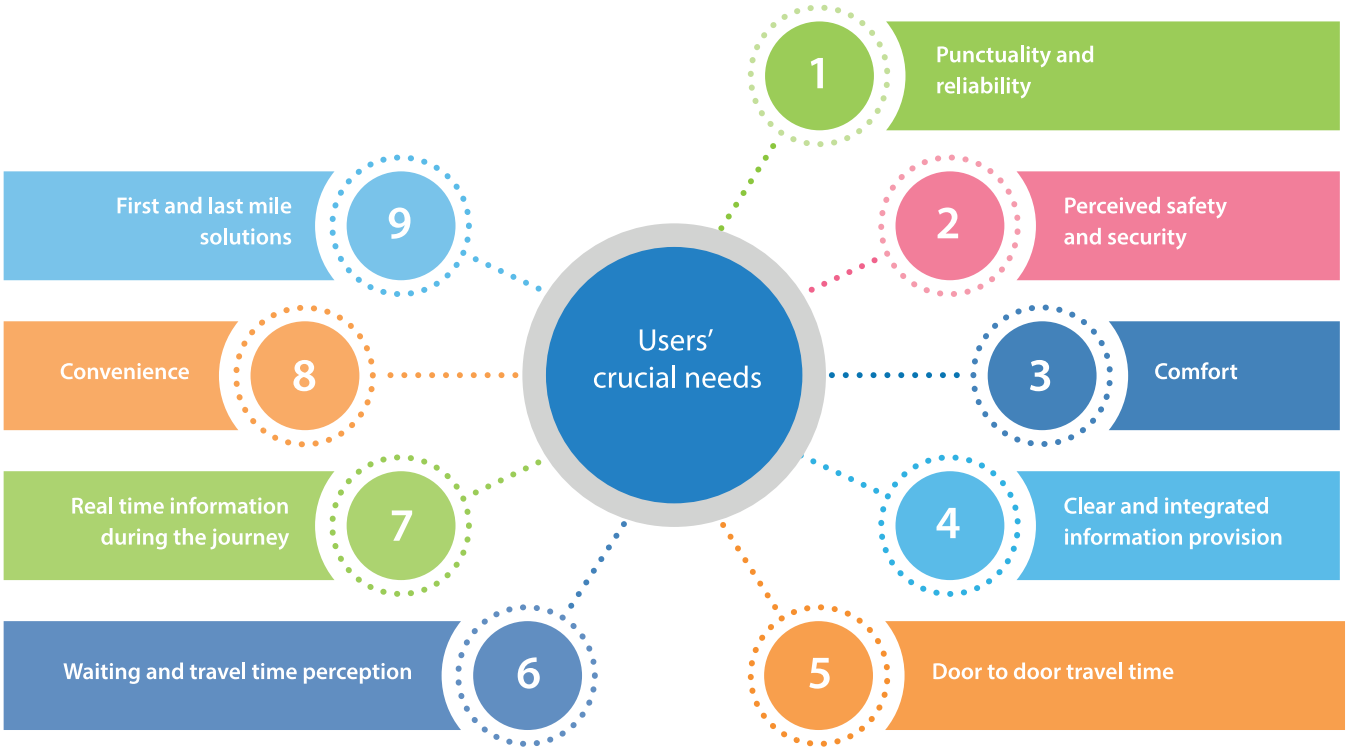
Note!
People with limited or no access to certain technological innovations should also be considered as vulnerable groups, as the potential access level to innovation is a determining factor when introducing new solutions and concepts.

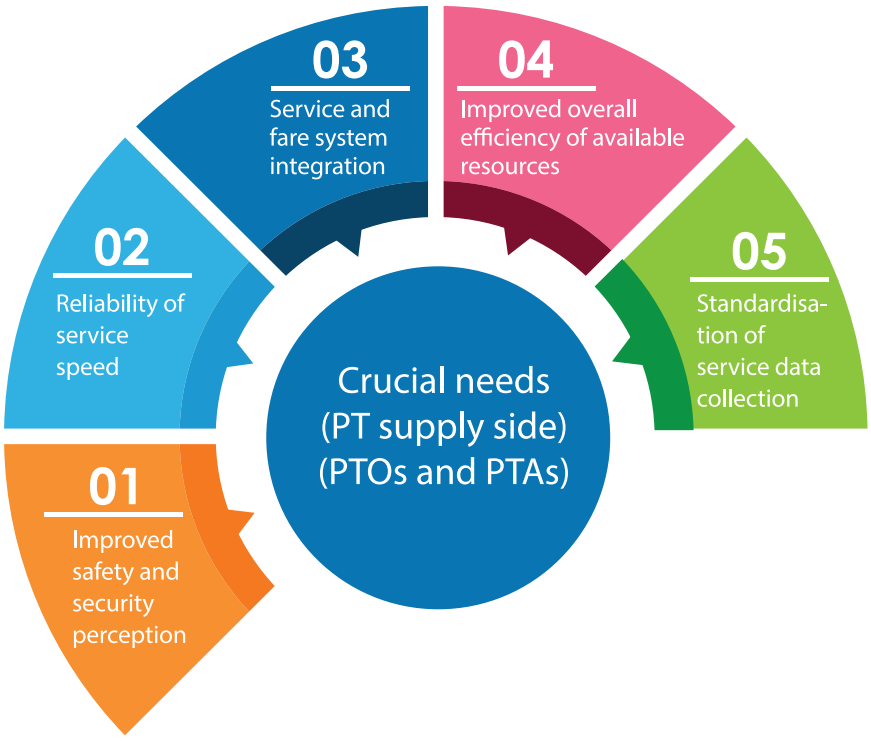
Other than the users' classification and the understanding of their crucial needs, it is also key to perform **a mapping of the main Public Transport stakeholders** (e.g. Operators, Authorities, terminal managers, trips' generators, etc.) at local level and an **analysis of their requirements**. Such an analysis could take into account various parameters, for instance: transport modes' fleets, ownership status (public or privately owned), division of responsibilities, etc.

This represents a valuable method to identify the gaps between supply and demand and facilitate the generation of solutions to bridge customers' and authorities'/operators' needs.

The next two figures highlight the main needs of users and Public Transport Operators and Authorities that have been identified by CIPTEC.

Consider them as 'food for thoughts', and bear in mind that each local context comprises a very unique and special case, with its own characteristics and peculiarities!





After recognising which trends are expected to influence Public Transport in your area, and prioritising the crucial needs of both the users and the Public Transport stakeholders, you are ready to set your organisation's objectives and continue with the identification of the most suitable innovative concepts/solutions to meet your targets!

More information about **the main needs of passengers,** as well as **the main needs of PTAs and PTOs,** reviewed within CIPTEC project, can be found in the relevant CIPTEC Deliverables (D1.2, D1.3, D1.5).

4. Which are the global market and societal trends influencing Public Transport?

Any organisation can be seen as a distinct existing entity, exposed to the influence of its external and internal environment. Since the business macro-environment is not stable and is changing continuously over time, its factors should be regularly considered by firms, organisations, etc., when setting up their strategy for meeting changing demands and facing new challenges.

Global market and societal trends play an important role in the way different consumer/passenger groups define or adjust their travel behaviour. These trends refer to **Legal, Technological, Political, Economic, Demographic, Geographical, Societal, Cultural and Ecological changes.**

If you wish to make the Public Transport in your city more innovative, you should recognise these trends and try to introduce innovations with a view to address them.

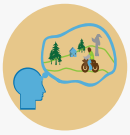
CIPTEC has identified a number of major market and societal trends that are highly likely to affect the demand for Public Transport services in European cities over the next years. These trends were evaluated in terms of their expected increase and impact on the Public Transport demand.

Based on the results of this CIPTEC survey, Public Transport Operators and Public Transport Authorities have been recommended to adopt specific policy instruments over the next 10 years to effectively meet these trends (at EU level).

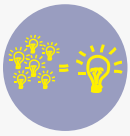
Innovative Technologies: technological advancements render the travelling experience more efficient and enjoyable. Transport users plan their trips more effectively. Vehicles are cleaner and safer.
Main Policy instruments: Vehicle Technologies and Design, Digital Services and Marketing and Mobility Management

Population ageing: life expectancy increases, while birth rates decrease. Cities and Transport are called to accommodate a higher proportion of elderly people with distinct requirements.
Main Policy instruments: Vehicle Technologies and Design, Marketing and Mobility Management, Network Infrastructure

Globalisation: social, economic and physical boundaries fade. The mobility of goods and people increases. Travelling becomes easier and more affordable for Europeans.
Main Policy instruments: Business models, Network Infrastructure, Organizational changes



Sustainable Lifestyles: people are becoming increasingly aware of their energy consumption and their carbon footprint. More and more individuals consciously opt for healthy, sustainable and 'alternative' lifestyles and travel options.
Main Policy instruments: Vehicle Technologies and Design, Marketing and Mobility Management, Digital Services supporting Public Transport



Social innovation: an increasingly high number of individuals and organisations from the public and private sector, as well as from civil society, are developing new products and services to meet social needs. New ways of thinking urban mobility emerge.
Main Policy instruments: Marketing and Mobility Management, Business models, Digital Services

Flexible Economy: a growing number of companies offer flexible work schedules and remote working options to their employees. Travel patterns are changing.
Main Policy instruments: Business models, Marketing and Mobility Management, Digital Services

Urbanization: towns and cities become larger as more and more people move to city centres. The inhabitants of those areas demand shorter and more frequent journeys.
Main Policy instruments: Network Infrastructure, Vehicle Technologies and Design, Digital Services

Urban governance: more decisions are made at the city level. Regional and local authorities strive to come forth as innovators and develop a distinguished brand, promoting 'sustainable' and 'smart' transportation.
Main Policy instruments: Organizational changes, Business models, Network Infrastructure

Shared Economy: people increasingly share human, physical and intellectual resources. Travellers can now share vehicles using social networking platforms for car-pooling and car-sharing.
Main Policy instruments: Business models, Marketing and Mobility Management, Digital Services

Individual Empowerment: people are better educated, more entrepreneurial and tech-savvy. They claim their rights and pressure transport authorities to accommodate their needs and demands.
Main Policy instruments: Marketing and Mobility Management, Digital Services, Business models

Corporate social responsibility: a large number of businesses, including Public Transport Operators, voluntarily commit themselves to behaving ethically and promoting end users' health and quality of life.
Main Policy instruments: Business models, Marketing and Mobility Management, Organizational changes

Transforming households: a growing share of the population remains childless or has children at a later age, while divorce rates increase. As the average size of households diminishes, families display different transportation needs.
Main Policy instruments: Marketing and Mobility Management, Network Infrastructure, Vehicle Technologies and Design

Urban Sprawl: parts of the population move away from central urban areas into low-density, monofunctional and car-dependent communities. The 'last mile' issue becomes more critical than ever.
Main Policy instruments: Network Infrastructure, Vehicle Technologies and Design, Marketing and Mobility Management

Environmental degradation: natural resources become depleted, ecosystems are destructed and climate changes. Oil prices increase. Environmental policies of all scales include measures affecting transport.
Main Policy instruments: Vehicle Technologies and Design, Business models, Network Infrastructure

EU Legislation: the European Commission puts forward regulations for building a competitive transport system that will increase mobility, remove major barriers in key areas and fuel growth and employment. National governments are called to comply.
Main Policy instruments: Business models, Organizational changes, Network Infrastructure

Consider the peculiarities of your city and its special characteristics in order to understand which global trends may be more critical and influential at your local level.

How do you think that a particular trend will influence the behaviour of the travellers? How should you respond to this evolution?

Try to answer these questions, as these considerations will affect how you will prioritise the objectives of your organization and thus, the innovation strategy that you will plan.

5. How can you find innovative concepts?

After understanding the existing situation and setting your organisation's/city's objectives, the next crucial step is to identify the most **suitable innovations** for Public Transport in your area.

What is the most appropriate way to identify innovations for making Public Transport more attractive to current and potential passengers?

The CIPTEC toolbox provides an appropriate portfolio (inventory) of innovations.

…but what do we mean by the term "innovation"?

This word has various definitions and interpretations. In the frame of CIPTEC, with a focus on Public Transport, the meaning of the term "innovation" was extended to include 'every idea coming from other fields that is currently not applied in Public Transport, or even any idea that has been developed and/or is being deployed in some areas of the world and that has not yet been adopted in other areas'.

In people's perception, innovation is often interpreted as coinciding with technology, especially high technology. This is not quite right. Innovation concerns every original idea that changes the way things have been done so far. It can simply combine existing applications and technologies in an arbitrary way and at the lowest possible cost.

Considering existing available innovative concepts & solutions

Public Transport

Other Transport systems

Other Business sectors

One group of innovations consists of currently available innovative concepts and solutions coming from the **Public Transport (PT)** sector that target both traditional customers and new groups of customers in order to better respond to customer's needs, requirements, expectations and new lifestyles adopted. This group also includes innovations (e.g. concepts, services, business models) derived from or applied in **Other Transport (OT) systems** and/or **Other Business (OB) sectors**, that are considered promising for the Public Transport sector. For instance, the transport sector features a variety of interesting concepts and innovations that have not yet been applied in Public Transport, (e.g. in air transport, car leasing or parcel delivery services).Some of them have a high transferability potential, and their cross-sectoral impact is extremely promising.

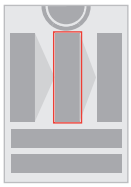
Another group includes entirely new innovative concepts and solutions, or certain existing innovations that can be further improved or elaborated by implementing **collective intelligence** processes and methods,(that usually involve both experts and users).

Given its user-centred nature, collective Intelligence is growing increasingly popular, and is being applied in many projects and organisations to generate innovation.

For more information on the main collective intelligence processes and how they can be implemented, see page 41.

The CIPTEC project carried out a detailed desk research with the aim of identifying existing innovative concepts/solutions with the potential to create a favourable environment for a significant growth in public transport at limited extra costs. However, as technology is rapidly evolving, you can always come across new innovative concepts and solutions from all around the world!

Consult the full CIPTEC Toolbox report to be guided on how you can implement innovation in Public Transport (D5.1, available through the CIPTEC project's website). Consult the interactive online toolbox, and use the filtering criteria to fine-tune your research and find the innovation that is most suitable to address your needs.



Do not hesitate to add to the digital toolbox the promising new innovations that you have experienced, share your knowledge with everyone!

None innovative concept can be directly transferred from one context to another, even though the cases may share some similar characteristics.

Innovations (solutions/measures) should be selected, evaluated (in a pre-feasibility study stage) and customised (in a feasibility study stage) based on your local targets and requirements.

Their specifications will be determined through the analysis of the 'reference context' where they will be applied, the organisation's planned objectives and the operational conditions, all of which are interrelated.

The reference context is a complex mix of a wide range of elements, among others, the operational and organisational schemes of Public Transport; the composition and features of the targeted end-users; the urban area dimension (size), reflecting on the type of services operated (e.g. metro, light/urban railways, tram); the Public Transport network (e.g. main corridors/trunk and feeder connections, radial lines), etc..

Are you looking for an easy way to find innovative concepts? Become part of the CIPTEC online Toolbox community!

The CIPTEC online Toolbox (www.toolbox.ciptec.eu) is a mobile (or tablet) device friendly platform, a 'living product' specifically designed for web interaction. It provides information on the adoption, introduction and implementation of innovations in the Public Transport sector.

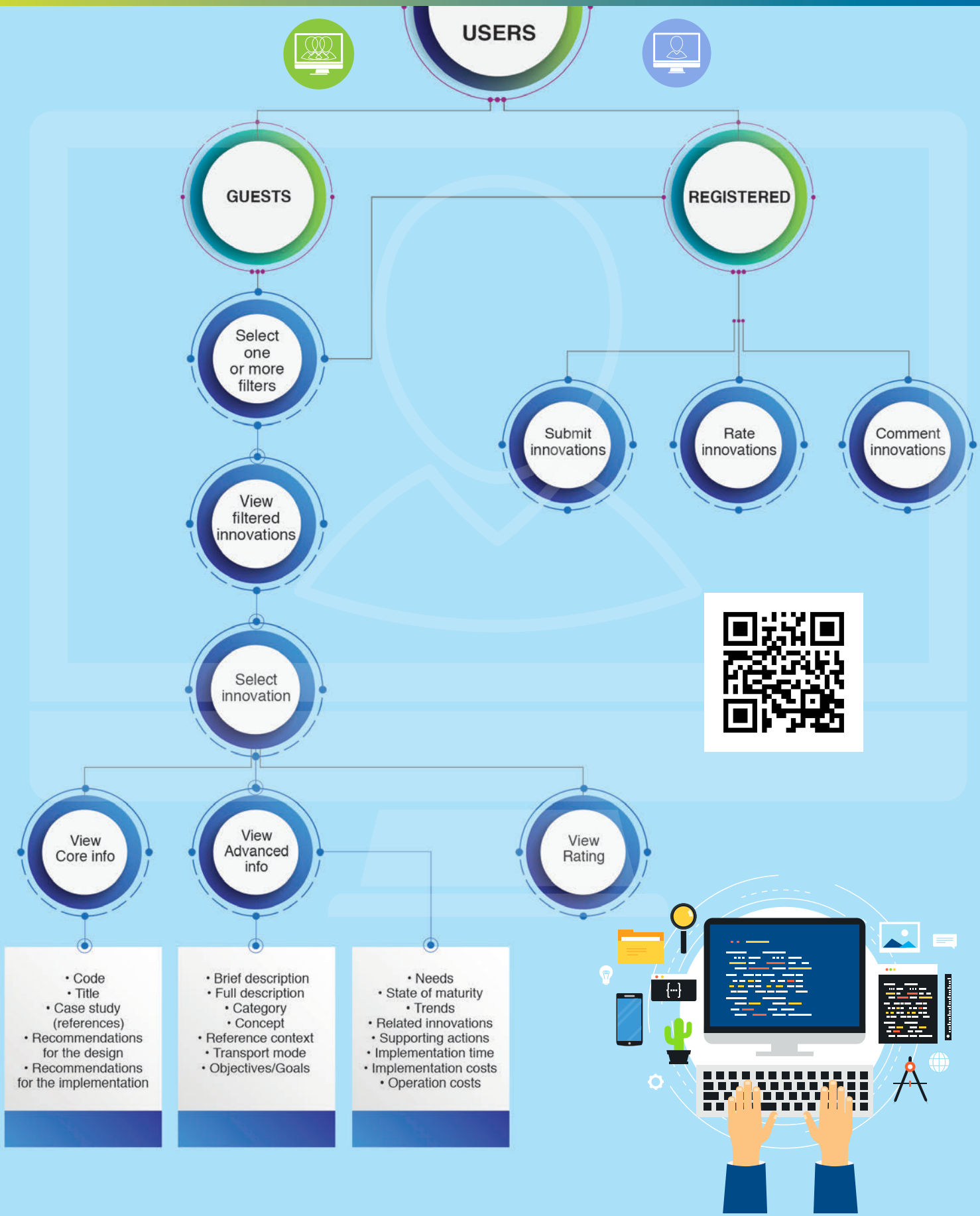
If you feel you are 'lost in the shuffle' when considering potential innovative concepts, don't give up! The CIPTEC online toolbox for Public Transport Innovation can help you find what you are seeking in an easy and interactive way.

- ✓ Through a dynamic tool, you can identify the innovative concepts that suit your case-specific needs and requirements. You can filter your search by using an interactive tool in the platform. Select the attributes of your application context by applying one or more filters, such as: Reference context, Category, Transport mode, Goals, Needs, Trends.

Are you willing to share your experiences with the rest Public Transport community?
Are you involved in the production, design, implementation of an innovative concept that could be applied in the Public Transport sector?

- ✓ Don't miss out on the opportunity to contribute with your feedback and knowledge!
- ✓ Comment on the demonstrated innovations or add your own one!

The core features (functionalities) of the CIPTEC online Toolbox are:



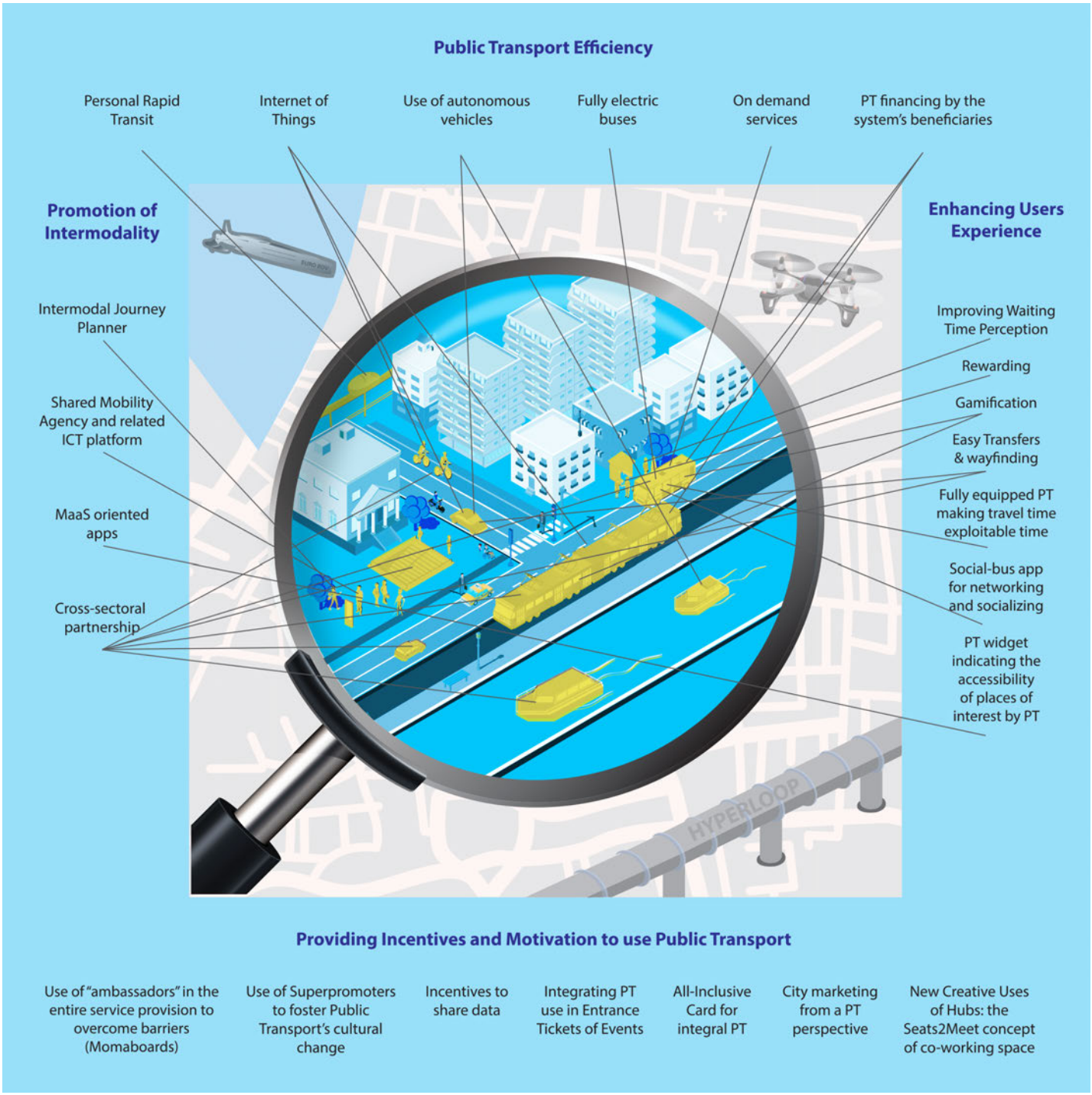
6. Wish to know more about innovative concepts? Just have a look at some selected by CIPTEC!

Technological and organisational initiatives of the present day become mainstream application systems of tomorrow. New global and local issues, trends, demands arise continuously.

But cities have unique characteristics, local problems, challenges and priorities resulting to the development and predominance of a particular mix of transport services, as an answer to global and local needs.
In this section, we present and describe certain innovative concepts resulted from our review and evaluation of existing ones and also from the ones resulted from the CIPTEC co-creation workshops and crowdsourcing campaigns.

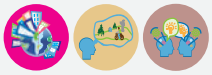
6.1.The Future City Public Transport Services

Any attempt to describe an ideal mix of Public Transport services and innovations in a Future City would be very subjective and abstract. Our attempt, to select promising Public Transport innovations and present them as a possible application mix in an idealised future city, should be considered under the light of the aforementioned elements, subjectivity and abstraction. The concepts selected for the Future City have been classified in four fields of application concerning Public Transport.



6.2 CIPTEC list of innovative concepts

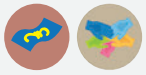
	Title (code*)	Reference context	Transport Mode	Category	Objectives
1	Personal Rapid Transit (PRT) (PT1.12)	ME LU	T IN	IV	IQ AC
2	Computer and Human Interaction Improvement (OT2.20)	ANY	ANY	IV ITS SO	GO
3	Use of autonomous road vehicles in Public Transport (PTE.5)	ANY	BU	IV SO	IQ GO
4	Fully equipped Public Transport: making travel time exploitable time for leisure, work, etc. (PTA.2)	ME LU	MT/LR TR BU	IV	IQ AC
5	Bus Lane with Intermittent Priority (PTC.11)	ME LU	T BU	IV	GO
6	New creative uses of Hubs (OB1.8)	ME	ANY	IV FB MP	AC
7	QR-Shopping at PublicTransport Stations (OB1.10)	ANY	ANY	IV FB MP	IQ
8	Paperless payment of travel (PTA.3)	ANY	ANY	ITS IN	IQ AC GO
9	Data Mining (PTA.6)	ANY	ANY	ITS SO	GO
10	Passengers counting (PTA.4)	ANY	ANY	ITS	GO
11	Passengers (re)distribution (PT2.16)	ME LU	TR MT/LR T	ITS SO IV	IQ GO
12	Internet of Things (PT4.18)	ANY	ANY	ITS	IQ GO
13	Innovative "light" system for fleet monitoring and provision of users information (PTN.9)	ANY	BU	ITS	GO
14	Improving easy transfer and wayfinding by effective signage, indoor-navigation and robots (OTA.1)	ANY	ANY	ITS SO MP	IQ
15	Public Transport Seats (PTC.8)	ME LU	MT/LR T BU	ITS	IQ AC
16	Ridesourcing: letting vehicles with drivers for short time (OT2.13)	ME LU	IN	SO FB IN	AC GO
17	Changing starting and end times of certain city services to balance demand (PT4.12)	ME LU	ANY	SO	GO
18	Use of new social media for re-design end-users services (PT3.7)	ANY	ANY	SO MP ITS	IQ

Needs/targets	Related Trends	State of maturity	CIPTEC score	Implementation time	Implementation costs	Operation costs
IS IC BE AM		B	4			
IS PO CO		E	3.8			
IC BE IP		V	3.7			
IC BE		M	3.7			
IR IT PO		V	3.6			
IP AM		E	3.4			
BE IP AM		E	3.1			
IT IA BE CO		C	5			
IR PO CO		L	4.5			
PO CO		V	4.3			
IT IA BE PO CO		L	4.2		?	?
IR PO		V	3.8			
IR IP		V	3.3			
IS IA IC BE IP CO		C	3.6		?	?
IT IC BE CO		V	3.3			
IA IC BE CO AM		L	3.8		?	?
IR IT BE IP PO AM		L	3.6		?	?
IA BE IP CO AM		M	3.5			

6.2 CIPTEC list of innovative concepts

	Title (code*)	Reference context	Transport Mode	Category	Objectives
19	Driving monitoring and training tool (PTN. 4)	ANY	BU	SO ITS	GO
20	Rewarding (PTMiles) (PT3.20)	ANY	ANY	FB MP	IQ AC
21	Increasing flexibility in tariff and ticketin (PTA.13)	ANY	ANY	FB	AC
22	Companies taking part in financing better Public Transport connections to their sites (PT4.17)	ANY	BU	FB	AC
23	Travel Bonus (PT3.22)	ME LU	IN	FB	AC
24	Crowdfunding (OB1.34)	ANY	ANY	FB	AC GO
25	City marketing from a Public Transport perspective (PTC.6)	ME LU	IN	MP ITS	AC
26	Individualised mobility marketing (PT2.17)	ANY	ANY	MP	IQ
27	Assistance for Special User Groups (PT1.4)	ANY	ANY	MP SI	IQ AC
28	Mobility as a Service (Maas) (PTA.1)	ME LU	IN	IN ITS	IQ AC
29	"Combi ticket" - Integrating Puplic Transport use in entrance tickets of events and venues (PT3.13)	ME LU	ANY	IN SO FB	AC
30	Shared Mobility Agency (OT2.7)	ANY	BU	IN ITS SO	IQ AC GO
31	Involvement of end users in the service assessment (PTC.12)	ANY	ANY	SI ITS MP	IQ GO
32	Crowdsourcing (OB1.19)	ANY	ANY	MP	IQ GO
33	Gamification (OB1.22)	ANY	ANY	SI ITS MP	IQ AC
34	Cycling Allowance Scheme (OT2.14)	ANY	ANY	FB MP SI	AC
35	Use of local 'ambassadors' to guide Public Transport users (OB1.21)	ANY	ANY	SI MP	IQ AC

Abbreviations:
PT: Public Transport, OT: Other Transport systems, OB: Other Business sectors

Needs/targets	Related Trends	State of maturity	CIPTEC score	Implementation time	Implementation costs	Operation costs
IC PO CO		M	3.5			
BE IP CO		M	4			
CO AM		L	3.7			
IA		M	3.7			
IA BE CO		B	3.6			
PO		E	3.1			
IA BE IP CO AM		L	3.8			
BE IP CO AM		L	3.6			
IA BE		M	3.5			
IA BE AM		B	4.5			
IA IP CO		M	3.8			
IA IC BE PO AM		B	3.8			
CO AM		L	4.5			
BE PO CO AM		L	3.6			
BE IP CO AM		L	3.6			
IP CO AM		B	3.5			
IA BE IP CO		L	3.3			

** You may use the code cited in the 1st column of the CIPTEC list of innovative concepts in order to find the detailed description of all innovations in the full CIPTEC Toolbox report and in the online Toolbox (http://toolbox.ciptec.eu)*

6.3 Legend of the CIPTEC list of innovative concepts

Reference context

- ME — Metropolitan area
- LU — Large Urban area
- SU — Small/Medium sized Urban area
- ANY — All contexts

Transport Mode

- TR — Train
- MT/LR — Metro/Light rail
- T — Tram
- BU — Bus
- ANY — All transport modes
- IN — Integrated network

Category

- IV — Infrastructure and vehicle
- ITS — ITS
- SO — Service models, organization and management (planning, control, delivery)
- FB — Procurement, contract management, financing, fare policy, business models
- IN — Integration with other services
- MP — Marketing and promotion, customer care
- SI — Societal involvement, new entrepreneurship

Objectives

- IQ — Higher customer satisfaction
- AC — Attracting more customers (i.e. end-user oriented)
- GO — Goal-oriented / efficient organization (i.e. PT industry stakeholder oriented)

Needs/Targets

- IS — Improve safety and security
- IR — Improve punctuality and reliability
- IT — Improve travelling time
- IA — Improve accessibility
- IC — Improve comfort
- BE — Better experience
- IP — Increase promotion
- PO — Performance orientation
- CO — Customers oriented
- AM — Adaptiveness to evolving market needs

Related Trends

- Enhancement of urban governance
- Globalization
- Urbanization
- Individual empowerment
- Corporate social responsibility
- Urban sprawl
- Environmental degradation
- Transforming household
- EU legislation
- Flexible economy
- Shared economy
- Social innovation
- Sustainable lifestyle
- Population ageing
- Innovative technologies
- ANY — All trends

State of maturity

- E — Explore
- V — Validate
- B — Build
- L — Launch
- M — Maturity
- D — Decline
- C — State of maturity depends on the case

Implementation time

- Low implementation time
- Medium implementation time
- High implementation time
- Implementation time required depends on the case

Implementation costs

- Low implementation costs
- Medium implementation costs
- High implementation costs
- Implementation costs required depends on the case

Operational costs

- Low operational costs
- Medium operational costs
- High operational costs
- Operational costs required depends on the case


10
ODLEGŁOŚĆ
Piotrkowska Centrum


SER AUTOR É TRAZER-NOS INÉDITO O QUE AINDA PERTENC
SABER EXACTAMENTE
O QUE ESTOU A DIZER.
A NOSSA
MEMÓRIA VÊ-
MELHOR
QUE OS NOSSOS.


Saída
R-620
metro

6.4. Short descriptions of innovative concepts

1. Personal Rapid Transit (PRT)

Personal Rapid Transit is a unique Public Transport system that uses small, automated electric 'podcars' to provide a taxi-like service for individuals or small groups of travellers. The podcars run on a special segregated guideway, ensuring unhindered direct trips between origin and destination. These guideways are arranged in a network topology with frequent merge/diverge points. Personal Rapid Transit allows fast, individual, point-to-point travel and short waiting times. It has also the potential to reduce noise and environmental pollution locally by using electric energy. Therefore, it provides a potentially sustainable first and last mile solution for urban mobility in areas with poor access to the main Public Transport lines. Main implementation areas of existing Personal Rapid Transit systems are airports, tourist attractions, shopping parks and malls, universities, eco towns, etc. In 2003, the 1km ULTra PRT test track was implemented in Cardiff, while in 2011 the first commercially operational pod system was launched in Heathrow airport.

Recommendations for design/ implementation

- Can accommodate moderate up to medium passenger flows
- Long testing time needed
- It requires a combined infrastructure and vehicle development
- Extensive studies should be carried out in the areas where it can be implemented, taking into account the different travel demand patterns
- Research, development and validation are needed before implementation of Personal Rapid Transit in complex wide-area networks

2. Computer and Human Interaction Improvement

Developing better links between human senses and natural computer interfaces is nowadays possible with the usage of new technologies. A representative example of this concept is the FANCI system, which is still at research and development level (initiated within an EU HORIZON 2020 project). It represents achievements in other transport modes with potential implications for Public Transport towards safety and security improvements, as well as economic efficiency. The FANCI system competes with other mood detection APIs, such as the American start-up Emotient Inc., which leverages artificial intelligence technology to sense people's emotions. FANCI promotes an innovative and cost-effective approach to assess the interactions between driver and vehicle in real-life scenarios. The project plans to carry out user studies with drivers to test authentication/user profiling, interaction with the car's infotainment display, selecting music depending on the driver's mood, dimming infotainment display, live eye tracking and live mood detection.
Anyone interested in purchasing the FANCI system should consider the following actions: feasibility study to set specifications, highlighting objectives and criteria of success, cost-benefit analysis, training plan and reporting structure for the results.

Recommendations for design/ implementation

- Identify system specification for local needs, infrastructure requirements, costs and training needs
- Visit the sites where the system is in operation
- Consult with the manufacturers, operators and authorities
- Before adopting the system, lay down an implementation plan, covering all tasks from testing to full implementation
- Test the reliability and accuracy of the system on a limited number of vehicles

3. Use of autonomous road vehicles in Public Transport

Building on the combination of new technologies, driverless vehicles have made significant progress over the last years (also known as self-driving or autonomous vehicles), and are becoming increasingly popular among mobility products. Considered as pure science fiction during the 20th century, driverless/autonomous vehicles have the potential to rapidly and disruptively change the way people understand mobility and organise their travels. The biggest companies worldwide are currently investing huge capitals in developing and advancing self-driving technology. A forerunner example of autonomous driving applied in Public Transport is the short connection between the metro station Kralingse Zoom and the business park Rivium in Rotterdam (NE). The 1800m line was developed in 1999 for the experimental use of autonomous road vehicles, and is currently operated by the public transport company Connexxion. In low-demand time periods, hey run on-demand, operating like a horizontal elevator. An enlargement of the system is projected for 2018 with on-street running to a nearby water hub (to be build). A pioneer example comes from the city of Trikala in Greece, where a driverless bus was launched in real road conditions of the city in 2015. Guided by GPS, this driverless bus could avoid pedestrians, impatient drivers, and bicyclists in its 2.4 km route. In 2017, a trial of a self-driving shuttle service in the London borough of Greenwich was implemented. Although, it was a limited trial, it is expected that this kind of driverless shuttles will become part of the public transport system.

Recommendations for design/implementation

- Can accommodate moderate up to medium passenger flows with large, unpredictable peaks
- Connexxion's system requires a separate roadway
- Long testing time may be needed (years)
- It requires a combination of infrastructure and vehicle development
- Connexxion's system is suitable for new development areas like business parks, airports, university campuses, and small city quarters

4. Fully equipped Public Transport: making travel time exploitable time for leisure, work, etc.

A strong incentive for commuting by Public Transport is the productive use of time that it offers. With the proliferation of mobile devices, an increasing number of passengers can take advantage of the time spent on the bus/train to get some work done, read the news, etc. To this end, having free access to high-speed data without usage limitations and free power supply for charging and using electronic devices can encourage people to use public transport instead of their personal vehicles. Wi-Fi access and free power supply can be a key factor in getting more commuters off the roads. Also, it is likely to pay off in the long term: installing Wi-Fi connections can prove particularly successful in attracting younger generations, who are used to an intensive use of the Internet through their mobile devices. Using free Wi-Fi, PTOs can incorporate new business models that involve, for instance, advertisers paying for broadcasting marketing messages to passengers by using the wireless service. In the UK, the journey to work has improved for millions of commuters across the country since the free Wi-Fi service "SuperConnected" was installed on buses and trams. In San Francisco, the crowdsourced shuttle company "MagicBus", which offers a home pickup service to commuters and drops them off at work, has installed free on board Wi-Fi in all its vehicles.

Recommendations for design/implementation

- Prefer 4G wireless networks that support faster (up to 10 times) wireless bandwidth services. This is an easy way to improve the service while cutting costs.
- Consider carefully the cost of installing and operating the Wi-Fi service, and make sure to choose a reliable provider
- Buses are easier to connect than trains: they travel more slowly and are more likely run through areas with higher cell phone service coverage

5. Bus Lane with Intermittent Priority

Sophisticated and smart techniques of giving traffic priority to Public Transport can significantly improve efficiency and passengers' satisfaction. A good example of this concept is the Bus Lane with Intermittent Priority (BLIMP) system, an innovative transit lane with preferential treatment based on the concept of dynamic lane assignment. BLIMP is essentially a dynamic bus lane that turns into an exclusive lane for buses when it detects a bus passing through a sensor located in front of the road section. Drivers are informed through markings on the road and dynamic signs. BLIMP can be activated per road section, allowing road users to use the entire road capacity and only moving them out of the lane when a bus enters a road section. Thereby, the bus/tram is allowed to pass the other traffic. The BLIMP system can be applied to roads with non-separated bus or tram lanes and limited road capacity. Although it is not as effective as an exclusive bus lane, the system still has significant advantages compared to regular shared bus and car lanes, both in terms of travel times and service reliability. In cities where space is limited, BLIMP helps maximise the use of road capacity. The concept has already been implemented in two locations, each with different objectives and parameters.

Recommendations for design/implementation

- Educational campaigns and intuitive road design by utilizing recognizable component and procedures are helpful for a successful BLIMP
- The sensors placed under the road, the markings on the road and the signs above the lane are essential parts of the system
- Benefits can result from both a left and right BLIMP lane, but in order to eliminate friction a right BLIMP lane is preferred
- Several aspects should still be evaluated, such as traffic volumes, bus volumes, and corridor length

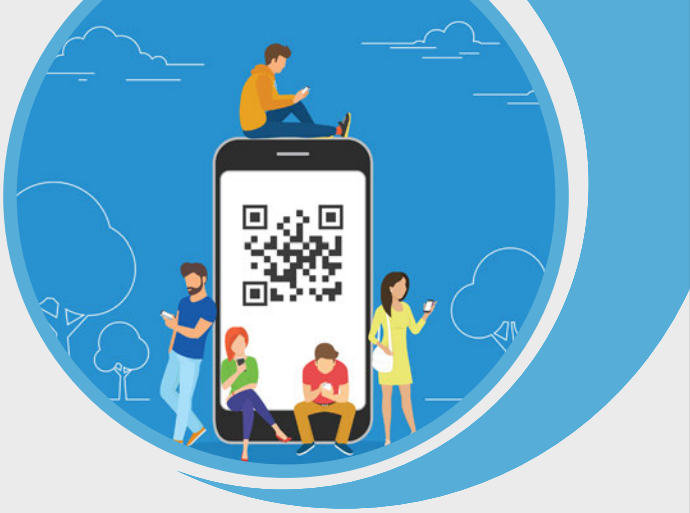
6. New creative uses of Hubs

Public Transport Hubs could act as a new meeting point, since many people pass through them on a regular basis. With adequate investments, they could become an attractive location for people to exchange information and ideas. The added value of sharing is at the core of the society 3.0. This philosophy was picked by Seats2meet, a platform launched in 2007 to create physical and virtual environments to connect and match people with similar business-related needs and interests. More specifically, the organisation creates and leases online tools inspired by the society 3.0 philosophy. These tools were created to act as a virtual layer for any physical location with possibilities for people to sit, work and share knowledge. The tools work as an online booking platform for exchanging of social capital (their knowledge and abilities) or money and question making (asking for help of people around you). It matches people based on their interests and field of expertise (facilitating serendipity). In that way, Seats2meet creates a network of relevant locations with a diversity of co-workers, who have their individual expertise, but can support each other on their way to be the best version of 'themselves for themselves'.

Recommendations for design/implementation

- Investment by a commercial organisation and not by PTO or PTA is recommended
- Resources provision, procedures, supervisions, quality/outcomes control, research/development, etc. should preferably be made by the commercial organisation
- Development areas, transit locations (like central stations, airports, Public Transport hubs), meeting spaces with free facilities are the most suitable places for Seats2meet

7. QR-Shopping at Public Transport Stations



Quick Response (QR) stores are a marketing innovation applied in several businesses that can be applied in Public Transport to the high numbers of passengers in cities. Korea's Tesco Homeplus is an example of a cross-sectoral innovation between retail, technology and Public Transport. Tesco managed to penetrate a niche customer market in South Korea. Studies show that South Korean Tesco's customers value multichannel options (online, mobile, etc.) and convenience much more than price. Hence, the attractiveness of virtual stores was highly based on their image as quick, tech-savvy and mobile solutions. Building on these considerations, Homeplus virtual stores focused on a customer experience, based on an easy-to-use technology, on-time delivery and quality products. These three services are offered by using the facilities of the South Korean Public Transport, which is considered to among the most reliable, fast and affordable in Asia. The case proves how technology and cross-sectoral "breeding" of innovations can easily disrupt existing traditional markets and create new ones. Tesco's innovation is part of a series of highly disruptive global trends that are emerging worldwide with the aim to promote economically efficient services that allow customers to save time in their busy working life.

Recommendations for design/implementation

- The potential market and the legal restrictions that could hamper the implementation of the service should be proficiently identified and managed
- Carry out on-site visits to see concepts in real implementation scenarios and report the operators' views
- A feasibility study and a cost benefit analysis would provide insights on the possible usage of this service and the return on investment
- A clearly-defined marketing strategy is required

8. Paperless payment of travel

Paperless solutions (also known as electronic ticketing) cover a wide range of implementations with the common objective to improve service accessibility. The general idea is to improve customer accessibility to Public Transport services in terms of more friendly interactions for ticket validation, decrease of boarding time and improved availability for ticket purchasing. In addition, the use of an electronic ticketing system enables PTOs and PTAs to collect data and perform statistical analysis on passengers' flows. Although paperless solutions vary substantially in terms of state of maturity, the purchase of tickets via smartphone has been adopted by a large number of applications. NFC (Near-Field Communication) have recently been introduced in some full-scale applications and pilot actions in larger cities: it allows users to pay the service directly with the smartphone and validate their purchase. Be-In/Be-Out is a prototype solution that enables the automatic calculation tariffs, detecting the downloaded applications or smart boarding cards downloaded on the smartphone. It also supports post-payment. Bank cards have been considered for Public Transport payment, being a native interoperable tool targeted for flexible demand and business customers. Electronic payment systems often comprise an opportunity to introduce more sophisticated and flexible pricing (fare structure).

Recommendations for design/implementation

- PTOs and PTAs should keep the property of security keys and encrypting algorithms. If not, technological changes may require new investments for system upgrading
- Standardised solutions should be followed in order to reduce maintenance costs, to ensure the scaling up and sustainability of the system
- For cities where e-ticketing is implemented from scratch, smart card implementation is a good starting point
- Strong marketing initiatives are required

9. Data Mining

The setup of new data mining procedures and tools can contribute in gaining cross-related knowledge from data produced by ITS systems (fleet monitoring, e-ticketing, APC – Automatic Passengers Counting). The results of this processing could provide answers to some questions, such as “What is the best location to install a shelter?, How can a selling network be improved?, Which lines/services should be considered for enforcing ticket inspections?”. Data mining solutions can contribute to co-developing new markets that will support the stakeholders’ operations and increase the Public Transport’s customer base, economic efficiency and safety, improve public health and life standards. It can be based on the collection of Big Data or the adoption of targeted data centres.
Data coming from different ITS systems are collected and cross-related to: (i) improve service planning, (ii) improve knowledge about service operation conditions and optimize procurements for service control, (iii) provide added-value services to end-users. Data provided by the feedback of users can be considered as another source to collect data. A data collection plan is required in order to identify the type and format of the data required. Any data-driven service is built upon reliable and consistent data.

Recommendations for design/implementation

- Set the objectives of the data mining analysis: identify what kind of data will be gathered and which needs will be addressed
- Set up appropriate procedures to check the reliability of the data
- Establish control procedures to assure data quality
- Consider any possible legal restriction

10. Passengers counting

Systems that count passengers in vehicles are fast developing and new solutions are emerging. For example, passengers can be counted by using Wi-Fi or Bluetooth. Collected data could help operators to improve their services and optimise the use of resources, based on the passengers’ key needs. Passengers counting in a crowded environment is not an easy task. It relies on technology-based solutions, which in turn require Public Transport stakeholders to deploy a considerable range of techniques. Traditional systems based on infrared and video cameras are expensive, and are not fully reliable. Alternative “estimation techniques” can now be considered instead. Generally passenger counting systems rely on wireless devices to collect data and use a web framework to collate and analyse them. Applications with prediction algorithms and visualisations have been developed as the technology progressed. Smartphones, associated with a network, send signals to connect to an access point with a better signal strength. Then, the use of 3G/4G Wi-Fi access points as sensors to detect nearby smartphones enables the collection of smartphone data as real-time public data and sends them to a cloud-based system. Low-cost computing technologies for building devices have become increasingly common over the last years.

Recommendations for design/implementation

- Evaluate regularly the estimation range offered by the emerging solutions, as well as their precision and reliability
- Plan how data provided (estimated passengers number on the vehicles) could be used for stakeholders’ purposes
- Test a product on a limited number of vehicles, then expand its implementation across the network
- Assess feedback and monitor

11. Passengers (re)distribution

Research shows that passengers' distribution in trains and at platforms directly influences the station dwell time and the minimum sustainable headway between trains. By measuring the occupation of the different carriages in a train, PTOs can make (real-time) estimations of the occupation level in a carriage. This information can be sent (through an app or graphical display) to passengers that are waiting at the next station(s). This allows people to stand at the right place on the platform (1st or 2nd class, in front or at the back) when the train arrives. Passengers can then move accordingly and will be better spread across the train. Passengers that have a seat and sit in a less crowded carriage are more likely to have an enjoyable journey and feel better about the service. In 2013, the NS (Dutch National Railways) launched a new passenger counting system. Passengers were given real-time occupancy per compartment in a display and the NS got accurate information on how their trains were being used. There are cheaper methods to influence passengers' distribution, like platform design and crowdsourcing, which is currently being tested in Finland and Belgium. Passengers can see how busy their train is on an application and users can send feedback if the information is (not) correct.

Recommendations for design/implementation

- Implementation costs and time can be avoided by purchasing new carriages that are equipped with sensors measuring the occupancy level
- Platform design interventions, like the positions of the exits/entrances, placement of seats and the division of a platform in different parts can improve passenger distribution significantly
- Cheaper methods to improve passenger distribution (like crowdsourcing and apps) can be very valuable and easier to implement
- Users should be involved in the evaluation of a (new) passenger distribution system

12. Internet of Things

The Internet of Things (IoT) is the process whereby technological objects (e.g. devices) transmit information over the Internet. IoT applications in Public Transport concentrate around vehicle dynamic monitoring, fleet management and value-added services, providing an unprecedented opportunity for improving passenger experience, increasing service reliability and security and reducing operational costs. IoT technologies can connect nearly anything with an electronic subsystem to the existing Internet infrastructure. Common technologies used for IoT applications include among others GPS, data analytics and cloud computing. PTOs already use some of these technologies, collecting on a daily basis vast amounts of data about their transport systems. Such information comes, among others, from vehicles, terminals, ticketing systems, and social media. IoT offers new insights into transmitting, processing and combining these data in order to enable a more effective decision-making and produce actionable results. Data can be used to provide more efficient services, engage Public Transport users, address specific user groups' needs and provide them with fine-grained and contextual information. The expected benefits from IoT applications in transport are multifaceted, ranging from the enhancement of passenger experience to the enhancement of service reliability and security and the reduction of fuel consumption and operational costs.

Recommendations for design/implementation

- PTAs and PTOs can act as initiators, managers and main funders of IoT applications
- Adequate incentives should be foreseen to push users towards using the system and sharing their data
- Extensive informative and training activities are required
- Serious issues of technological feasibility and maturity may rise when legacy infrastructure is involved
- Serious legal and institutional issues regarding data collection and privacy should be addressed
- PTAs and PTOs may incur significant costs to implement large-scale infrastructure developments

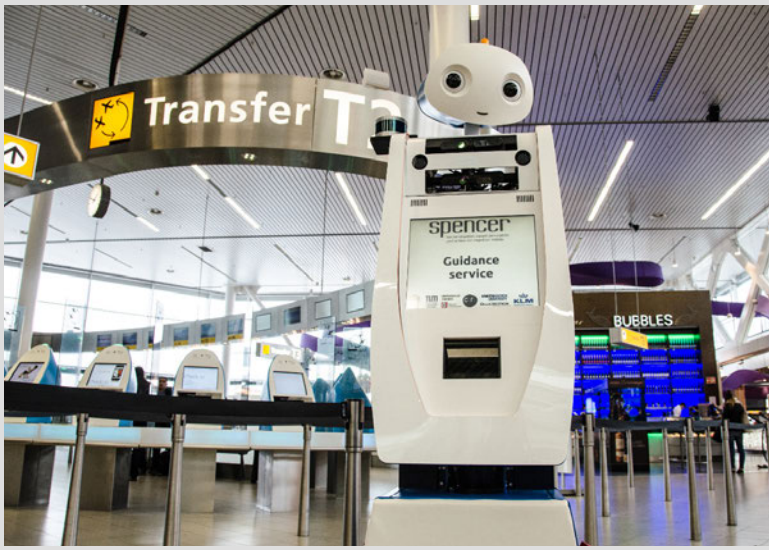
13. Innovative ‘light’ system for fleet monitoring and provision of user information

Vehicle monitoring and management is an essential element of any PTO operation insofar as its supports the efficiency of the Public Transport systems, thus contributing to passengers’ satisfaction. For monitoring and guaranteeing the quality and therefore the level of service of the Public Transport services, the PTO usually operates an ICT system, indicated as Automatic Vehicle Monitoring system (AVM). Celso is the winning breakthrough Automatic Vehicle Monitoring system, adding to the standard AVM new functionalities (service monitoring, regulation, users’ information). It enables an efficient assessment of bus service performances compared to scheduling (service validation), at remarkably lower prices than any other competitor in the AVM market.
The revolutionary Celso idea is based on two elements: (i) a simple application with an easy-to-use driver interface and light technologies, such as smartphones and tablets, collecting service data during bus operations; (ii) an innovative data mining tool to validate Public Transport services. Its performance surpasses competing AVM products in providing a validated set of data which can be exploited by Public Transport stakeholders to improve Public Transport services and overall mobility.

Recommendations for design/implementation

• PTOs/PTAs should define the objectives and targets of Celso implementation (i.e. real-time service control, users’ information, service validation) and the operational scenarios (i.e. Celso implemented as a system or accessed as a service)
• The clear definition of the specifications for the import of scheduled timetable is recommended

14. Improving easy transfer and wayfinding by effective signage, indoor-navigation and robots



Improving wayfinding is very important for any Public Transport user. It is particularly crucial for new and unexperienced users and everyone that is not familiar with a city and its system, especially in larger urban areas (where orientation is needed in general). It is a prerequisite in order to reduce access barriers for new customers. There is a wide range of cases where improvements can be made. Wayfinding is best when it is present only where users need the necessary information to take decisions (where to go, where they are, etc.). A simple signage that is easy to understand, commonly used and constructive for the customer is hard to be implemented, as it requires many stakeholders to work together. On the other hand, any change requires big budgets, because it is related to infrastructure and needs to be done throughout the whole network and in all vehicles following similar quality standards in order to be reliable. On a more elaborated level, the vast availability of smartphones and mobile internet gives a wide set of opportunities for navigation on the surface. Indoor and underground navigation is still limited, but in reach and already piloted. For example at Schiphol airport a robot called ‘Spencer’ assists KLM passengers to travel though different gates.

Recommendations for design/implementation

• Indoor-Routing: Smartphone design should orientate on existing routing and timetable online services and apps already developed from the Public Transport provider
• Wayfinding robots and assisting systems should provide existing (online) information and be able to connect to existing services
• Supporting actions for pilot ITS-related measures should involve a service provider and surveys for users’ feedback

15. Public Transport Seats

Public Transport Seats is an application that helps commuters identify free seats in any Public Transport mode. It is particularly useful during peak time, due to the fact that it helps avoiding the undesired consequences of travelling standing on a crowded bus/metro/tram, thus increasing the quality of the time spent on board. Public Transport Seats helps passengers to find out which parts of a vehicle are less crowded and therefore more likely to have available seats. In most cases, seats in Public Transport modes cannot be reserved, so during rush hour people are often inclined to enter the vehicle in the middle, while there is probably more room at the back or at the front. This application will attempt to solve this problem by using sensors mounted in the seats to identify where exactly there is a free space. If a PTA or a PTO decides to introduce an application of this kind, it should first ensure that the vehicles are equipped with specialized sensors; the network of sensors should be built and ready for use before the launch of the application. A widely used application worldwide is Moovit, which helps its users to find the fastest and least crowded route by combining the use of official transit data and the reports of the users (e.g. recommendations on which vehicles/routes to avoid).

Recommendations for design/implementation

- Public Transport Seats applications should be designed carefully and many options regarding the type of sensors should be investigated
- A 'promotion period' by the PTA or PTO is desirable for the implementation of the solution

16. Ridesourcing: letting vehicles with drivers for short-time

A ridesourcing platform or a 'transportation network company' connects potential passengers with drivers who provide the travel on their own non-commercial vehicles and for profit. All parties can connect to the service via website and mobile apps (Lyft, Uber, etc.). This business concept raises many concerns related to the protection of individual's data, the overriding of regulations for conventional taxi industry, the working conditions of the drivers, and the safety and security standards. Ridesourcing could replace some private automobile use, but since it can also induce travel, the impacts on overall kilometres travelled are uncertain. At the same time, ridesourcing sometimes attracts passengers, especially non-car owners, from Public Transport. It is estimated that the business concept of ridesourcing will be gradually become more and more transferable and will be spread all over the developed world. This emerging mobility scheme can also be seen as a potential supplementary means of transport for low demand areas and time periods, where and when there is not any Public Transport service provided. In this sense, it can be the backbone of the transport system, namely the Public Transport, or even replace it whenever needed. Of course, this kind of services may also act competitively against the Public Transport by attracting some passengers from it.

Recommendations for design/implementation

- Many concerns may arise related to the protection of personal data, the overriding of existing regulations for conventional taxi industry, the safety and security standards that users enjoy.
- Various factors may favour the expansion of ridesourcing, such as: the existing size of car market cultural aspects; spatial urban development; advancements in security protection; the market penetration of smartphones and ICT; the introduction of relevant regulatory frameworks, etc.

17. Changing starting and end times of certain city services to balance demand

In order to reduce the pressure on the Public Transport system in peak hours, starting/opening and end time of certain activities (e.g. working hours, school lessons, operation of market stores, public offices opening, etc.) could change. This would allow to use less vehicles in peak hours and redistribute the overcapacity throughout the day. It could also be combined with a re-organisation of the operations and practices of certain bodies, reducing the need of people to travel (e.g. the introduction of tele-working for a number of days per month could lead to the reduction of businesses' energy costs). Flexibility in working hours cannot be adopted in any kind of job and in all cases, as there are also personal reasons that may discourage people from accepting flexible schedules. The mutual agreement of both the employee and the employer is necessary for the successful implementation of the concept. The solution aims to contribute to the reduction of traffic congestion in peak periods, the reduction of travel time and an overall increase of travel satisfaction. There are no cases of this solution being implemented as a stand-alone solution to tackle congestion.

Recommendations for design/implementation

- Close cooperation between the main traffic generators (e.g. malls, Universities, public administration buildings, business parks) and the PTA/PTO is required from the very beginning
- The parallel reorganisation of PT timetables could enhance the effectiveness of the solution
- The cost can be considered as rather low since it is related to an organisational change
- Administration and management responsibilities are expected to increase
- Monetary motives could encourage flexibility in working or school schedules

18. Use of new social media for re-design end-users services

Social media can be leveraged by PTAs and PTOs to communicate with passengers, improve customer service, market their services and collect useful information. For instance, surveys delivered through social media regarding Public Transport operation and reliability are an easy way to gather users' evaluations on Public Transport services. These surveys' results can support PTAs and PTOs in re-designing their services in order to cover users' needs in the best possible way. Indicative popular social media channels are: Twitter, Facebook, forums, WhatsApp, Youtube, Snapchat, LinkedIn. In addition, social media can be used for monitoring, marketing and branding, for sales promotion, and also as a helpdesk for users.
When exploring the use of social media, cybersecurity plays a crucial role. Governments may be able to address this by creating guidelines on what kind of personal information should be shared on social media or not. Insofar as it can help build a more transparent communication with the user base, social media should receive support from the central management of a PTA or PTO. However, this is likely to cause controversy, as in most cases people tend to communicate with the Public Transport bodies to make complains.

Recommendations for design/implementation

- Employees' access, account management, content, acceptable use, Internet security guidelines, and legal issues should be carefully considered
- Proper employees' and passengers' behaviour in social media (e.g. restrictions on offensive language) should be encouraged
- Clear objectives and strategies on the usage of social media should be set
- Ongoing maintenance and monitoring are required

19. Driving monitoring and training tool

There are various systems for monitoring driver performance through software linked to vehicle CAN (Controller Area Network) bus system. The braking, deceleration, acceleration G-Forces can be recorded along with fuel consumption. The driver's suitable behaviour and performance can help reduce energy consumption as well as decrease environmental impacts of the vehicle's operation. Driving instructors can be used as a benchmarking in order to provide "best practice example" for any vehicle. Information downloaded from the vehicle will report the way each driver is performing against a benchmarking standard. Drivers who fail in this process, but still stay within acceptable standards of performance, could be retrained in order to provide more consistent levels of performance by enhancing passenger comfort, reducing wear and tear on vehicles and reducing fuel costs. Bus operators and vehicle manufacturers should consider the possibility of adding this type of system as a requirement for all buses during the design phase. This will require vehicle manufacturers to work with PTOs and trade unions in order to ensure that system requirements meet the needs of all stakeholders.

Recommendations for design/implementation

- Cooperation should be established between Public Transport stakeholders, vehicle manufacturers, bus operators and employees' trade unions
- Benchmarking standards and performance standard reporting are required
- A procedure should be foreseen to impose penalties on drivers who fail to abide by the required standards

20. Rewarding (PTMiles)

Public Transport users are the biggest captive customer population group in any city. Rewarding loyal passengers can be an effective way of incentivizing them and keeping them satisfied. For example, OVMiles (PTMiles) is an initiative of RET, the PTO of Rotterdam and its region. Together with 38 partners in the Rotterdam area, they offer travellers the opportunity to get substantial discounts and extras for free by using their Public Transport smart cards. OVMiles are earned when the user travels by Public Transport and checks in and out within the RET service area. Once miles are redeemed through the website, the ordered coupon will be linked to the Public Transport smart card and can be used at a participating partner. Additionally, participating partners can check if their customers used Public Transport to get there and reward them with extra perks. Such a loyalty program is expected to motivate frequent and less frequent travellers to make more trips by Public Transport.
The OVMiles initiative was launched by the PTO itself. It is important that PTOs and PTAs offer more than just the basic transport service, and innovations such as this may prove successful in attracting more Public Transport customers in other regions. However, to achieve optimal results, it is important that the PTO overseeing the implementation of this innovation has reached a level of maturity where it can adopt a more customer-oriented approach.

Recommendations for design/implementation

- Create enthusiasm and gather acquisition power from at least 20 launching partners
- Boost participation and engagement with interim partner meetings to share knowledge, experiences
- Enable external parties to share knowledge about loyalty programs and building the loyalty platform
- Choose an external party for developing the web shop platform and handling the issues related to privacy and certified card reader processes.
- Engage in continuous advertising campaigns

21. Increasing flexibility in tariff and ticketing

This concept proposes a flexible tariff during the day, based on the user's profile (to be implemented in combination with smart card). An example could be the shared use of seasonal subscriptions, combi-tickets, "pay-per-use" tariffs (e-purse), or even travel packages similar to the "flat" schemes adopted in telecommunications. Can Public Transport operators provide more attractive, flexible ticketing and tariff products? Other sectors, including among others telecommunications providers and Multi Media (pay to view TV, Spotify etc.), have sold their products on a 'pay as you go' or monthly basis, depending on their customers' specific preferences. Traditional multiple-trip (return, weekly, and monthly) travel cards are often regarded as expensive, although they are actually cheaper than paying trip by trip. As a matter of fact, travellers may only want to travel occasionally using different operators' services. Off-peak fares are available on rail and air services. Flexible tariffs and ticketing initiatives aim to making Public Transport more attractive to users. The promotion of new products requires a well-defined marketing plan, and the different types of tickets should be clearly specified, giving a comprehensive overview of the available options in terms of format (paper, smartcard, smartphone app, etc.), time coverage (off-peak, weekends, etc.), and target group (elderly, disabled, unemployed, students, families, etc.).

Recommendations for design/implementation

• A feasibility study should be the first priority, followed by a cost benefit analysis
• Indicative questions to be answered include: How long will it take to introduce this innovation? Is the PT system technologically mature? Is there any political support for policy changes? Who pays and how much? Who will manage the process?
• Flexible fares that have worked in other sectors rely on online booking allowing users to decide when, where and how much they are willing to pay

22. Companies taking part in financing better Public Transport connections to their sites

Innovative funding and financing tools can be used not only for the creation of new transport infrastructure, but also for the operation of urban public transport services. The existence of Public Transport is highly beneficial to the economic activity, as it provides customers, employers and employees access to businesses. The bearing of the operation cost by all beneficiaries (including private companies) either on a compulsory or a voluntary basis is a novel way to sustain a PT service with low demand, or overcome the problem of limited public funding sources. For example, in the Netherlands, twelve companies have come together and formed a foundation, with the aim of compensating the Operator of a bus line that serves their business locations in case the bus line is struggling to attract enough travellers by itself. This measure allows to distribute the risk of setting up the service, which does not solely rely on the Operator. The bus line, which started out with sufficient frequency, attracted over 100 daily travellers after about one month of being in operation. In general, such a Public Transport line should satisfy the users from the very beginning, and avoid bad experiences that might prevent passengers from using the line again.

Recommendations for design/implementation

• Support the companies to effectively organise into foundations, as they probably lack similar experiences
• Consult key stakeholders and convince them to support financially a Public Transport service explaining and documenting the benefits that the service would bring them

23. Travel Bonus

Public Transport companies in South Holland and Zeeland worked together with other provinces and the Metropolitan region Rotterdam – The Hague to introduce a new travel product: Travel Bonus. With Travel Bonus, travellers can purchase one product to travel with multiple transport companies (Arriva, Connexxion, HTM, HTMbuzz, RET and Veolia), and pay their travel costs afterwards. Additionally, when passengers spend more than € 75 per month for travelling by Public Transport, they receive a €10 discount. This new travel product was requested by the Dutch Government in order to develop more alternatives to regular smart cards and subscriptions. In the area of South Holland and Zeeland, travellers have to use multiple transport modes, managed by different PTOs on a daily basis. Rather than paying a fixed amount per month, payments depend on the travelled kilometres. Less travels mean lower costs, while travelling more leads to a bonus. Travel bonus can also be combined with an anonymous Public Transport smartcard, providing an even more convenient solution to travellers. In any case, large political support in the beginning and strong cooperation between stakeholders and transport companies are required.

Recommendations for design/implementation

• A practical organisation of the process is necessary, taking into account the operational procedure and the adaption of the operational workflow
• PTOs should implement the solution, whereas PTAs have to ensure a good degree of cooperation among them. PTAs should also support PTOs in involving the right stakeholders

24. Crowdfunding

Crowdfunding is the practice of funding a project by raising contributions from citizens/users. Being mostly web-based, crowdfunding has already spread in most world countries. It requires a platform where people can upload their work/idea and receive funding in order to realise it. Sandawe is a clear example of a new fund-raising channel based on public engagement: “crowdfunding”. The Belgian platform facilitates fundraising for comic designers by providing a collaborative crowdfunding platform. For each project, Sandawe calculates the budget needed to support the book launch. Then, the project is presented and users decide whether or not to fund it. In exchange for their contribution, users have a share in the profits along with Sandawe and the project presenter, by receiving 60% of net gains until they recover their investment and 40% after that point, until 5 years after publication. They also receive exclusive items (for example collectables) and enjoy moral benefits from contributing to the realization of the project that they liked. As public engagement in fundraising activities to help entrepreneurs or organisations with their projects are becoming increasingly popular, more actions should be taken to change the cultural attitude towards crowdfunding. The adoption of such crowdsourced funding models could be explored in Public Transport, especially considering that Public Transport services are already funded by public money.

Recommendations for design/implementation

• Bear in mind that crowdfunding is suitable for both early stage innovations, supporting their market uptake, and short/medium-term and well-focused projects resulting in tangible (visible) and easily verifiable results
• Clearly determine meaningful projects for people to invest on them
• Build a straightforward, easy-to-use platform and provide accessibility for people with special needs
• Improve public engagement through a strategic use of social media, create a video explaining the project and run relevant awareness campaigns

25. City marketing from a Public Transport perspective

This concept promotes the combination of city marketing and Public Transport by addressing the transport needs of city visitors. Some types of the combinations could be (i) package deal tickets for tourists, (ii) development of a free app for booking both attractions' visits and Public Transport travels, (iii) introduction of group and family cards, (iv) establishment of special rates, etc.
The MRDH (Metropolitan Region of Rotterdam-Den Haag), together with the province of South Holland and the Public Transport Companies, have developed a disposable OV-chip card specifically for tourists.
The Tourist Day Ticket (TdT) gives right to 24-hour unlimited travels all over South Holland at the price of € 13.50, which includes bus, tram, metro and waterbus. Significant destinations/ touristic attractions are all easily accessible with one card. The ticket meets the wish of the Lower House to facilitate travel for foreign tourists by Public Transport. The TdT is available for purchase at any vendor in Rotterdam, The Hague Airport, as well as in hotels and tourist offices in South Holland, thus providing tourists with an easily available and accessible Public Transport solution. However, combi-ticket for using the public transport systems and entering in touristic attractions (museums, exhibitions etc.) Is not (yet) available. The launch of combi-ticket will be feasible after the introduction of barcode scanners at metro stations.

Recommendations for design/implementation

- The design should also include future extension to services/operators that are not directly involved in the first launch phase
- Commercial agreements among Operators are necessary
- PTAs should act as coordinators, but a strong cooperation among stakeholders is also required
- A simplification of fare structure and tariff scheme is recommended
- Wider promotional activities can be useful to make tourists and local citizens familiar with this initiative/ opportunity

26. Individualised mobility marketing

An individualised mobility marketing campaign is a novel way of attracting new passengers. Its main aim is to inform and motivate people to think about their daily trips in order to change their mobility habits and switch to a more sustainable way/mode of transport. For this reason, public opinion surveys could be implemented to identify the mobility needs and habits of citizens. Trainings and promotional material could be prepared and mobility info shops could be established in order to offer information on sustainable mobility. Such a campaign was implemented in 2015 in Langadas, Greece, in order to increase the number of passengers on buses in the peri-urban area and promote local bus lines. Active mobility consultancy was provided to citizens via face-to-face interactive contacts. Based on the initial feedback from the campaign's participants, individualised information material on local Public Transport and soft modes of mobility was designed, produced and distributed. Active mobility consultancy has proven to be an efficient way to increase awareness and encourage people to use Public Transport more frequently. Another individualised mobility marketing campaign was implemented in Ljubljana in May 2011. The campaign aimed to inform, prepare and convince citizens to change their way of thinking on how to use specific forms of transport in the city.

Recommendations for design/implementation

- Focus the production of training material on relevant stakeholder groups
- Focus the production of attractive information material on the citizens based on the campaign's scope
- Organise training workshops for the stakeholders who will play a role in implementing the campaign
- Face-to-face interaction with citizens is strongly recommended, compared to information provision by posts or other forms of communication
- Small-scale surveys could be included in order to assess/evaluate the success rate of campaign

27. Assistance for Special User Groups

The complexity of the Public Transport network can be a significant barrier for people with different kinds of disabilities in their attempt to achieve independence. The 'Assistance for Special User Groups' schemes support vulnerable people to overcome barriers by empowering them with tools that facilitate their inclusion. Public systems can offer training to specialists or volunteers in order to make them able to accompany an individual unfamiliar with Public Transport or a particular route. The Netherlands has implemented the OV4U scheme, which helps pupils to become familiar with Public Transport and prepares them to make more independent transport choices. In the US, a country-wide free of charge Transit Ambassador Programme has been put in place. The Ambassador rides around the city with the travellers until they feel comfortable enough to travel alone. However, it should be noted a "travel buddy" alone cannot be really useful without an adequate infrastructure and a coherent bundle of services, policies and practices aimed at "opening" Public Transport to the whole user base. For instance, building social norms around helping other people on Public Transport could enhance the confidence of vulnerable transport users. Travellers who volunteer to help others could be rewarded with brightly-coloured name badges. The long-term goal is to generate a culture where it is acceptable to ask for help, and acceptable to offer it.

Recommendations for design/implementation

- The stakeholders involved should take into account that, if they choose to include volunteers in the scheme, in addition to specialists, extensive background checks should be performed on these persons before allowing them to take part in the programme
- An ad hoc marketing strategy should be designed to inform and motivate people to take part in the programme
- Participants in the programme should be asked to provide feedback on a regular basis to ensure the smooth running of activities

28. Mobility as a Service (MaaS)

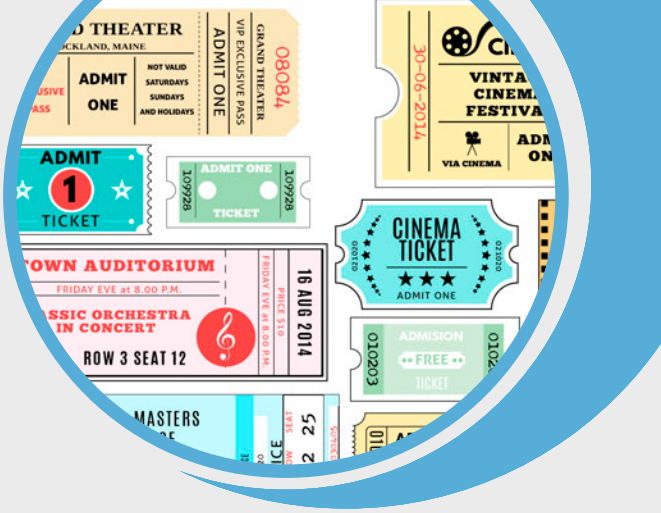
Mobility as a Service (MaaS) offers a full door-to-door mobility service. In MaaS, a MaaS operator buys services from mobility operators. Customers book and pay their travels from this operator and can choose from several multimodal options for their travels, depending on travel time, travel costs and comfort. Travel information is integrated in every step of the process, so that alternative options can be chosen not only during the booking phase, but also during the travel itself. Several MaaS operators started to set up pilots. One of them is Ubigo in Sweden: each month, participants purchased prepaid credits and spent them to use different mobility services. UbiGo also provided additional services, such as a bonus system for eco-friendly transport choices and guaranteed travel (when Public Transport was delayed 20 minutes or more, participants could order a taxi paid for by UbiGo). When Public Transport decision-makers offer good Public Transport and are willing to participate in the MaaS system at an early stage, MaaS can represent a considerable opportunity to Public Transport rather than a threat, and it could attract a wide pool of customers. Governments can assist by addressing the regulatory aspects around MaaS. For example, local governments could designate parking spaces for car-sharing and PTAs could manage agreements with PTOs on open data.

Recommendations for design/implementation

- A MaaS operator should work with open standards to make it easier for mobility operators to be included
- Mobility operators should have the opportunity to stay independent and distinguish themselves from competitors
- A PTO should not become a MaaS operator, as it could repel other mobility operators, because they could think that there would be unfair competition
- A PTA should not become a MaaS operator, because MaaS is mainly focused on those cases where a profitable business model can be set up

29. “Combi ticket” - Integrating Public Transport use in entrance tickets of events and venues

The benefits of integrating Public Transport use in entrance tickets to events are manifold. In highly integrated Public Transport systems, this type of tickets does not generate extra costs. The Combi-tickets scheme could be used for events taking place in non-peak times. . “Combi-tickets” are currently being planned in Frankfurt, starting with venues, where the municipality can directly intervene or hold an exlusive ownership (e.g. stadium, opera, fairground, etc.). Generally, “combi-tickets” are part of an innovative fare management and include a (limited) Public Transport flat rate option for specified users. The “combi-tickets” scheme does not require technological efforts besides an add-on logo as imprint on entrance tickets or a QR Code for online versions/printouts. “Combi-tickets” are low priced due to the large quantities of sales and are therefore very attractive, especially for all those who prefer to use Public Transport instead of their own car. Implementation is achieved in two steps: venues owned by municipalities can be easily integrated by political decision-making, while privately owned venues can be integrated in a second step, with the need of financial and marketing incentives.



Recommendations for design/implementation

• A powerful Public Transport network with good access/links to the venues is needed
• Savings have to be passed directly to the users in order to make the venues’ integration more effective
• Ideally, the whole area that attracts the visitors should be covered to offer an attractive fare. It is therefore preferable to establish co-operations among as many stakeholders active in the area as possible. Additionally, the fare’s scope should include at least the closest station for visitors coming from outside the region.

30. Shared Mobility Agency

The Agency is based on a single coordination centre enabling the planning and management of different mobility services, including new shared mobility services integrated with conventional Public Transport. The Agency also allows the coordination of different actors involved in the transport chain, providing the main functionalities related to integrated tariff schemes and payment, user information flows, clearing of resources and revenues. The Agency can guarantee and facilitate: planning/control of service extension in terms of vehicles and services’ operators; efficiency and transparency of service management; back-office workflows (booking, software planning, and communication of the next trip to the vehicle). The architecture is based on available advanced ICT, such as clouds, open database, distributed web-services, software resources sharing techniques, Business-to-Business (B2B) and Business-to-Consumer (B2C) services. The Agency manages the entire service chain – from customer booking/payment to service planning, monitoring and control – operating as a unique entity, through a dedicated Management Centre based on an advanced cloud architecture, a large open data base, distributed web services, software resources sharing techniques, and B2B, B2C and B2A services. The operation of the Agency is based on the setup of a suitable regulatory framework and on a strong cooperation between Authorities and different Mobility Operators.

Recommendations for design/implementation

• A key recommendation is to accurately design the role of flexible services and shared services as last-mile/ feeder services to the conventional Public Transport
• The range of flexible services should be specified against different areas/target groups/roles
• The allocation of resources, the operation procedures and the communication flow between the Agency and the Operator are key success elements
• A clear identity has a key role in supporting marketing perspectives and communication strategies

31. Involvement of end users in the service assessment

This innovation puts forward new strategies and solutions to get direct contact and feedback from end users. As the design of any product or service is usually based on satisfying the needs of the customers, the key challenge for Public Transport is to meet the mobility demands of its user base, especially of the most vulnerable traveller groups (e.g. people with disabilities). Since demographics change radically from one area to another, it is impossible to apply a one-size-fits-all solution. Thanks to the wide range of smart technologies and social media, however, passengers and potential passengers are now able to effectively communicate among themselves and with the transport providers. A suitable structure is required in order to allow the general public to communicate their views to PTAs and PTOs. It is essential that no one is excluded due to limited access to smart technologies. Such an inclusive process, however, will require significant investments in terms of time and resources. Can crowdsourcing be used for PTAs and PTOs to promote policies and ideas and get feedback? Could social media be used to allow passengers to “rate” the performance of each trip covering reliability, comfort, time, cleanliness, noise, price etc.? Who would be responsible for such an approach? All these are issues that have to be addressed in any attempt of systematically involving end users in the service assessment.

Recommendations for design/implementation

- PTOs and PTAs would have to agree on a structure for identifying representatives among members of the users’ group, and should work together on a communication strategy to engage them
- Adopting an open transparent approach involving stakeholders in the design of services requires trust from all parties
- PTOs PTAs will need to provide a person to be responsible for the process and act as a contact person
- If social media is to be used, it is important that someone takes up the responsibility of responding to the issues raised by users on a regular basis and reporting back these issues to users’ group, PTAs and PTOs

32. Crowdsourcing

Crowdsourcing is the practice of engaging the public in the deployment of a service, encouraging them to report problems, provide information and possibly suggest solutions possible improvements. Based on the type of platform, people can be involved in different ways in their social-local community by addressing problems, discussing alternative solutions, and providing real-time useful information to other users of the platform. The crowdsourcing can be used: to get “real-time” information about the service operation, which could help PTOs optimise their service planning and quality control; to register the travellers information in order to better understand the demand; to assess the level of user satisfaction about the Public Transport performances or some supporting services; to assess the level of acceptance of future Public Transport initiatives. When the user decides to report a problem or make a suggestion for services’ improvement, he/she can also decide whether he/she wants to provide his/her location data to the Operator or not. It should be mentioned, that the users must be aware that such data will not be used for tracking them or their travel behaviour. The implementation can deal with different options, ranging from dedicated platforms to on-line questionnaires linked to Google docs, while access through social media account could be a possible choice. Data mining tools can be linked in order to extract knowledge from the data collected, cross-relating them with other information coming from ITS, staff notifications, etc.

Recommendations for design/implementation

- Preventing users from using the crowdsourcing tool in a fraudulent way must be a target
- The crowdsourcing tool must be easy to use
- Legal support should be used when managing privacy issues
- It is key to engage in a promotional campaign
- Incentives (in terms of prizes, free tickets, rewarding, etc.) can encourage the recruitment of the users

33. Gamification

Gamification is a type of innovation that can be described as the application of game elements to non-game contexts. Gamification takes the characteristics that people like about games, adding them to everyday actions in order to make them more interesting. These game elements leverage people's love for competition and reward, and can encourage them towards certain actions or behaviours. An example of gamification is the web-based ''Eco-Driving advice'' service that supports eco-driving using CARWINGS (launched by Nissan, 2007). This service calculates the average fuel consumption based on vehicle information sent to CARWINGS from the customer's car and displays monthly fuel efficiency rankings on their website. Through this service users can enjoy seeing how well they do as eco-drivers, while being encouraged to pursue fuel-efficient habits. The concept of gamification has received attention as a promising trend in improving creativity and innovation. The main outcome of gamification is the engagement of the customer/user, which is a key factor that allows users to have an important role in the service by increasing their activity and social interaction. All the above lead to the conclusion that gamification is likely to be successful in attracting more Public Transport customers at limited costs. Gamification can be a powerful tool for motivating change in citizens' behaviour towards Public Transport.

Recommendations for design/implementation

- Gamification design should increase user involvement
- When designing a gamification application for Public Transport, the peculiarities of each area should be taken into account
- It could be useful to incorporate mechanisms that record which information has been shared with whom and where, in order to reduce potential concerns about privacy issues
- Emotional factors such as fun or personal engagement have been proven to have more influential power than rational factors like health benefits or environmental reasons

34. Cycling Allowance Scheme

Cycling allowance scheme is a type of innovation that provides financial incentives to motivate people to cycle to work. It is part of an increasingly popular scheme for commuters across Europe. Those who choose to commute to work by bicycle, are being rewarded with a reimbursement for every kilometer they cycle. Such an initiative was launched in France in 2014, in the form of a trial scheme. For a six-month period, 20 companies with about 10,000 employees offered tax-free payments of 0,25€/km to employees to commute to and from work by bicycle. Although the results of this trial period have not been ideal, showing that 419 people agreed to cycle to work, while the number of employees eligible to participate was 8200, the scheme did attract more users towards cycling and it might be able to attract more in the future. Behind the idea of this innovation lies a straightforward financial incentive scheme aimed to decrease environmental pollution and car reliance. Financial incentives are widely known to be efficient in many cases and these schemes are definitely noteworthy. The degree of transferability of this scheme to the Public Transport sector is quite high, but it is subject to whether the costs can be sustained by employers and whether this specific financial incentive will work for different target groups. The cycling allowance schemes' experience has shown that merely paying people to cycle to work is unlikely to cause a significant shift in their commuting behaviour.

Recommendations for design/implementation

- In order to be fully effective, such schemes should be accompanied by a progressive elimination of parking spaces or the application of strict parking management measures
- Commuting habits are usually fixed and automatic, but there are moments in life when they become vulnerable to change, e.g. when one changes job environment. Such interventions could have a wider impact if they addressed these time periods, treating them as "windows of opportunity"

35. Use of local ‘ambassadors’ to guide Public Transport users

The practice of using of “ambassadors” in the entire service provision spectrum and specifically in Public Transport has become increasingly popular in recent years. First, a number of ambassadors have to be recruited. Afterwards, they are debriefed on the specific features of a service and (sometimes) trained on the proper use of it. Finally, they are commissioned with spreading out the good practice to their peers. This kind of paradigms are already in use in groups of pupils, young people, older people, etc. “Ambassadors” usually work for free or at very low cost. Sometimes they are compensated for their travel or given bonuses, such as free Public Transport tickets. There are also Mombassadors, i.e. mothers who live in cities and are recruited to assist by visiting families with children and planning their itineraries. The added value of this service results from the fact that mombassadors are parents who have special knowledge as residents. Given its little cost, this innovation is very likely to be successful in attracting more Public Transport customers at limited extra costs in any European city.
The initiator and designer of this kind of solution is usually a public authority (public initiative) or a business (private initiative), which, in most cases, is also in charge of its implementation. However, the critical factor for the success of this innovation is people’s willingness to become “ambassadors”.

Recommendations for design/implementation

• Future “ambassadors” training will be defined upon demand, e.g. if a new concept is introduced in the Public Transport system (e.g. e-ticket)
• It is recommended that ambassadors have the same age of their focus group
• The solution can be implemented relatively easily, as it does not involve exceedingly novel technological resources or legal regulations and can be implemented at a very low cost
• Marketing holds a particularly important role in this kind of initiatives

7. Exploit collective intelligence: a catalyst power for innovation generation

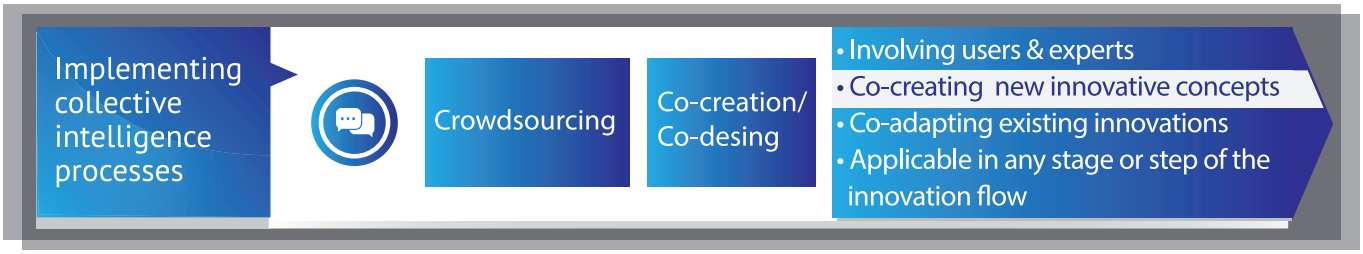
Collective Intelligence can be used in various stages of implementing a strategy that promotes innovation within organisations (see the 'Innovation flow' graph), crossing horizontally all vertical separated phases. It may include the exploitation of participatory approaches and the use of the resources available among crowds. In CIPTEC, collective intelligence processes were mainly used in an integrated way for the generation of new innovations, addressing underserved segments and needs of both suppliers and users.

'A group, in the right circumstances, can be smarter than its smartest member'

James Surowiecki,
The Wisdom of Crowds, 2005

If you are interested in tackling underserved needs by introducing new solutions for Public Transport in your city, you may consider putting forth a collective intelligence project to crowdsource and co-produce novel approaches. **Use the citizens' collective intelligence and make Public Transport more innovative, increasing its attractiveness and market share!**
When users are involved in the design or development of a good/service, its end value is enhanced, as they can tailor the product/service according to their needs. Through the adoption of collective intelligence processes, the ability of an organisation to provide personalised products/services and better customisation to its users is considerably increased.

Two main processes that the term "collective intelligence" encompasses **in order to support innovation and increase attractiveness** of Public Transport, are **"crowdsourcing"** and **"co-creation".**
These two processes are applicable at any stage or step of the innovation flow. They can be used together or as stand-alone tools, and can help design new innovative concrete concepts/solutions or adapt the existing ones by using the **"knowledge of the crowd".**



Co-creation (co-design) is a participatory and collaborative process which is based on the creativity of a small group of two or more people. It can be applied to the production and creation of new innovative concepts and ideas. A co-creation workshop is primarily focused on action: participants from different backgrounds (e.g. experts, business core teams/ operators, representatives of passengers, etc.), collaborate, work together freely and contribute towards serving the objectives of the workshop.

Co-creation workshops are increasingly popular in many projects and organisations, as there are some benefits resulting from their application:

- ✓ *Customised products/services*
- ✓ *Higher customer satisfaction and loyalty*
- ✓ *Reduced costs*
- ✓ *Reduced risk of innovation efforts that do not meet customer needs*
- ✓ *Reduced time to market for innovations*
- ✓ *Increased sales and profits for organisations*
- ✓ *Continuous improvements of products/services*
- ✓ *Better decision-making*
- ✓ *More successful innovations*
- ✓ *Mobilising the innovation potential that people acquire*

Crowdsourcing **outsourcing** the work to the **crowd**

Crowdsourcing is rapidly gaining the interest of the business community as a method of collecting sources of different types (e.g. data, ideas, funding, etc.) from the crowd. Crowdsourcing for innovation can allow organisations to include the 'sentiment' of the crowd within their decision-making. The feedback received from the crowd provides an understanding of the opportunities and weaknesses of the submitted ideas, as well as a preliminary appreciation of the potential market reaction.

Well-established brands of different industry sectors (e.g. manufacturing, transport and warehousing, public administration, educational services, real estate, health care and social assistance, information and cultural industries) use crowdsourcing for inviting people to share their ideas/solutions: **Ford, Starbucks, McDonald's, Nivea, Colgate, Lufthansa Cargo, British Airways, NASA etc.**

Although the Public Transport sector usually influences a large and loyal community of people in any city and its services gain the interest of public, crowdsourcing has not been widely used so far by Public Transport Authorities (PTAs) and Public Transport Operators (PTOs).

There is no better time than now to use crowdsourcing to develop innovative concepts for Public Transport!

8. Crowdsource innovation!

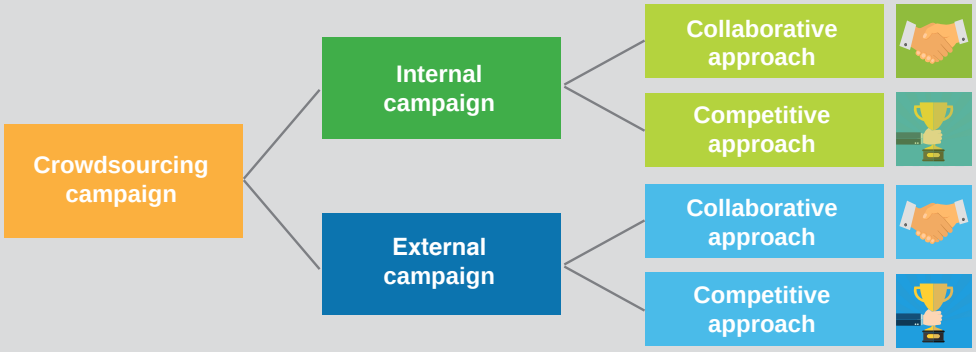
If you decide to crowdsource input, for example innovative ideas, from citizens (both users and non-users) on Public Transport, the implementation of a crowdsourcing campaign would might be right up your alley!

Apart from the already mentioned benefits, a crowdsourcing platform is a living and breathing Public Transport innovation marketplace, where new ideas can arise and the interested parties can inspire each other.

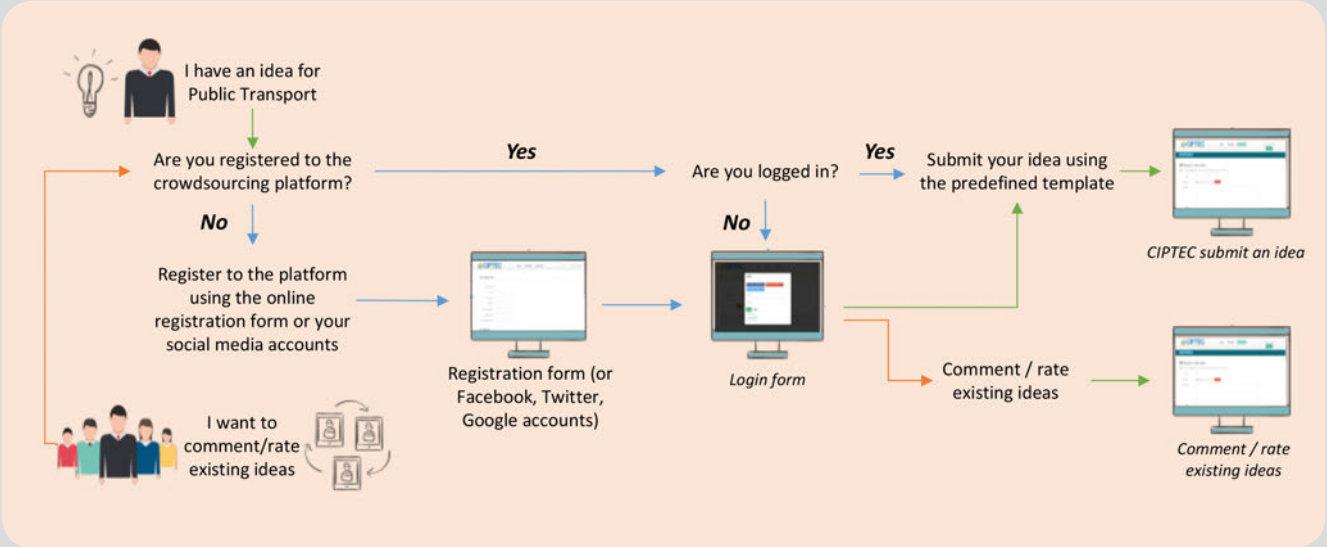
For a successful implementation of a crowdsourcing campaign, follow the following steps:

Step 1. Description of the campaign (challenge) - Identify the challenge that you want to address with the assistance of the crowd. This should be a meaningful, short, clear and easy-to-understand description.
Step 2. Definition of the campaign type and the rules of the campaign - Set out clear rules for users. Some useful questions that you should answer in advance are:

- Is the campaign addressed to PTA's/PTO's employees (internal campaign) or to its customers and public in general (external campaign)?
- What type of crowdsourcing campaign will it be (e.g. idea generation, product development, crowdfunding etc.)?
- Is this a competitive crowdsourcing initiative (contest version) that is used to gather new innovative ideas, or is it a collaborative crowdsourcing initiative that is partially used to allow reviews, ratings, etc. on the submitted ideas?
- What is the starting and the ending time of the campaign?
- How will the crowdsourcing input be evaluated? Will the evaluation and the selection of the winners be performed by an internal team of experts, or by the crowd itself through voting?
- Will there be any prize for the winning idea (in case of a competitive campaign), and what are the incentives for users to participate?



Step 3. Releasing the campaign online - Develop an appropriate digital platform and release it online. You can take inspiration from the CIPTEC crowdsourcing platform.



Step 4. Advertising the campaign - Promote your campaign by using both online (e.g. websites, social media, newsletters, search engine optimisation techniques) and offline (e.g. Newspapers, TV and Radio channels, brochures) advertising in order to gather as many contributors as possible.

Step 5. Gathering contributions - During this step, the campaign is running and the registered users can participate in the crowdsourcing initiative by contributing with content.

Step 6. Evaluation process and rewards - Update the platform with content about the evaluation process (e.g. how it works, who will participate in the experts' committee (if there is one) when the results will be announced, e.t.c.).

See CIPTEC crowdsourcing experience in the relevant CIPTEC Deliverables (D3.1, D3.2, D3.4, D3.5) or visit the website: http://youplan.ciptec.eu

Tips:

- The online platform should have a nice professional design and meet the defined requirements
- Find a "catchy" and clever name for the campaign that will be used for marketing purposes
- Create a video outlining all the relevant details: video clips convey a better idea of the challenge and capture users' attention more easily
- The rules for participation in the campaign should be clear and easily understandable by all
- If you are going to organise a contest based crowdsourcing initiative, you should think about providing incentives to the users
- Competitive and collaborative crowdsourcing campaign types are not necessarily mutually exclusive, so they could be combined
- The evaluation process could be based both on users' and experts' assessments
- Dedicated administration supporting users in any problem they may encounter is needed
- In order to ensure citizens' engagement, you should organise special events aimed at providing technical support to people of specific groups (e.g. the elderly) in submitting their ideas
- Allocate some funds for the real implementation of some of the ideas suggested by the crowd in order to build trust with the citizens of your city and boost participation
- Bear in mind that a great deal of time effort is needed for running such a crowdsourcing initiative (design, platform's development, promotion/advertising, administration, evaluation)

If you are interested in running a crowdsourcing campaign, contact CIPTEC and take advantage of the project's platform (http://crowdsourcing.ciptec.eu).

9. Co-create innovation!

If you decide to co-create/co-design innovative concepts and solutions with the assistance of your city's residents and/or experts in the Public Transport sector, the organisation of co-creation workshops is an appropriate approach.

- Each co-creation workshop consists of three indicative main phases (introduction, core co-creation and evaluation).
- Several methods can be applied to the implementation of each phase.
- Which method suits best in your needs and your workshop's objectives?

Some indicative examples are listed below:

Introduction Phase

Standard Personal Introduction

Ice-breaker activity in which the participants get to know each other.

Advice: Set predefined criteria to ensure that everyone gives and receives the same basic info.

Marshmallow Challenge

Participants (all together or split into teams) try to build the tallest free-standing structure out of 20 sticks of spaghetti and put a marshmallow on the top.

Advice: This is a challenging ice-breaker method, however give some minutes to the participants to introduce themselves after the implementation of the method.




Co-creation Phase

Brainstorming

Participants freely express their ideas creating an inventory.

Advice: Avoid more than one person talking at the same time and make sure that everyone expresses their opinion. An experienced moderator is crucial for this method.

Conceptual mapping

Participants visually demonstrate the brainstorming discussion. This method stimulates the generation of new ideas and allows the creative process to be written up and made available for all to view.

Advice: Make practice on conceptual mapping before using it in a workshop. Preconceived limitations must be set aside.


Co-creation Phase

Role playing

Participants play roles to facilitate the discussion on complex social issues in a non-threatening environment.

Advice: Role-plays work best when kept simple, and participants need few minutes to get into their roles. Participants volunteer and are never forced to play a role they are uncomfortable with.

World Café

Participants discuss a question or issue in small groups around café tables. At regular intervals, participants may move to a new table.

Advice: Select clear, thought-provoking and open-ended questions in order to engage participants and help them successfully produce cross-pollinated ideas. People should be reminded to record all the ideas, doodles and questions produced in the flipchart.

Evaluation Phase

Two dimension axis

Participants place the co-created concepts on a two-dimensional axis being assessed against two criteria that will represent their feasibility and potential. This makes it easier to identify the most promising ideas.

Advice: Keep the number of co-created concepts low, as the data processing is time-consuming. Use another evaluation method for limiting the number of co-creation concepts and then evaluate the top five of them by using this method.

Dot voting

Participants are allocated a number of stickers or dots, that are used to vote, prioritise and converge upon an agreed solution.

Advice: Allow appropriate time for participants to read all the ideas and evaluate them.

For more co-creating methods and for details about their appropriate use go through relevant CIPTEC Deliverables (D3.1, D3.2, D3.4, D3.5).

10. Evaluate the case, then take a decision!

It is widely assumed that Public Transport and mobility users have diverse preferences when it comes to choosing transportation and mobility solutions, a notion that also extends to innovations. This is **not an "easy-taken" decision,** as the actual introduction of innovative concepts into everyday operations and to the benefit of citizens has not been without challenge. Therefore, these selected innovative concepts should be further evaluated.

A couple of evaluation methods based on experts' and/or users' opinion exist. However, each organisation should recognise which one of them suits better its priorities and needs.

In various stages of the 'Innovation Flow' graph, you will be asked to take a decision, evaluate the examined case/situation or validate the information you have already gathered.

There are various structured, systematic and sophisticated methods and techniques to use that could help you minimise bias and subjectivity.

According to the particular phase you are working on, these methods could enable you to reach consensus, prioritise certain attributes, investigate users' preferences, gain insights on customers' behaviour, etc.

This way, you will be equipped with the necessary feedback to interpret correctly any case and take evidence-based decisions.

Below, you can find a list of some indicative evaluation and decision-taking supporting methods that have been used in the frame of the CIPTEC project.

Evaluation & decision taking supporting methods

Analytic Hierarchy Process

Conjoint Analysis

Lab & Field consumer experimentation

Delphi method

- The **Analytic Hierarchy Process (AHP)** is one of the most commonly Multi-Criteria Decision Analysis (MCDA) methods used in the transport research field for evaluation and prioritization purposes. Through pairwise comparisons, this method is avoiding bias of rating. Especially in the case of Public Transport, where Public Transport stakeholders cannot implement all the suggested innovative concepts at once but, should instead focus on the most important one, this method could prove very useful to decision-makers. In CIPTEC, by using this method, we reached an unbiased hierarchy of the selected innovative concepts and solutions that were assessed against certain predefined criteria.

- You could consider applying advanced marketing research methods to investigate users' preferences regarding certain attributes of a product/system/service that you would like to design and implement, or/and reveal hidden groups based on their preferences. **Conjoint Analysis** is the standard method for optimizing new products and services. In the case of innovative concepts, there is a need to support decision-makers with fresh knowledge as there is little evidence regarding their acceptability. Besides, this information is useful to customize new offers (according to the preferences), avoid costs (e.g. providing something without demand), and improve the appeal of the new services (to all or to certain target groups).

  The **Maximum Difference Scaling method (MaxDiff)** is a preferential analysis method and an effective tool for encompassing large numbers of attributes. In CIPTEC, MaxDiff was applied to narrow down an initial long list of innovative concepts and solutions. This concise list of innovative concepts/solutions was then used as an input for the Conjoint Analysis to highlight the most preferred innovations in Public Transport.

  By applying the **Choice-Based Conjoint (CBC)** method, you can investigate respondents' preferences and reveal potential hidden user groups (segments) based on pertinent preferences. In addition, by using the Conjoint Analysis simulation, you will be able to examine alternative scenarios regarding respondents' willingness to use Public Transport when particular attributes (e.g. innovative concepts) are suggested to be implemented either as stand-alone tools or in combination with each other.

- During an experiment, a cause is simulated and its effect is measured. You can use both **lab** (type of experimentation in a well-controlled environment) and **field** (type of experimentation in real world) **consumer experimentation** in order to investigate how a situation will be affected by some interventions. Both types of experimentation were used in CIPTEC in order to identify the possibilities and limitations of a cost-effective behavioural intervention to increase people's willingness to use Public Transport. In this case, the behavioural intervention was called **"social labelling".**

- The **Delphi Method** is a research forecasting method/technique that aims to reveal underlying trends by producing consensus among experts of a panel. In a typical Delphi exercise, each panellist expert is asked to judge assumptions made by other experts (in two or more cycles, depending on the resources), until a clear direction in terms of experts' opinions is reached. In CIPTEC, Delphi was applied with the aim of identifying the most crucial trends that could influence the Public Transport sector.

For more information regarding the application of these methods in CIPTEC, see relevant CIPTEC Deliverables D1.5, D3.5, D4.3.

11. Motivate citizens, exploit Social Labelling!

Social labelling is a technique to influence people's behaviour. It consists of making a statement about an individual's personality, with the aim of eliciting from the individual a behavioural response that is congruent with the statement.

Social labelling intervention is related with one of the main global trends identified in CIPTEC, in particular **"Sustainable lifestyle",** and it is also linked with the **'Social Entrepreneurship'** concept.
Social entrepreneurship is not only about providing services of higher social value through a more social business model. It aims to provoke a framework and systemic change. In this sense, it is related with social labelling as both of them intend to re-brand Public Transport in a new way highlighting, among others, sustainability, fairness and environmental friendliness.
Social labelling is an innovative and rather cheap way to shift travellers towards Public Transport. Regardless of the modal share's increase that it brings, it has inevitably a high rate of return.

By using relatively simple and low-cost interventions you could increase the usage of Public Transport!

The CIPTEC's consumer experimentation

In CIPTEC, we used social labelling as a tool to influence transport choices. We tested both in lab and field experiments whether labelling participants as environmentally concerned travellers ("green label") would encourage them to choose Public Transport over their own car.
The primary goal of the field experiment was to test whether a small and relatively cheap intervention could increase actual Public Transport use.
During the experiment, passengers on three lines (experimental) received plastic travel card holders with a message printed on them that labelled them as environmentally conscious individuals. At the same time, passengers on three other lines (control) received card holders that had no message on them.
We tested whether the message on the card holder did increase Public Transport use in the period after the intervention.

What we found?

- ✓ Social labelling can be used to increase Public Transport use.
- ✓ Social labelling with a 'green label' works to enhance attitude and willingness to pay for Public Transport.
- ✓ In a period of about one month, we observed an **increase of 0.83% in Public Transport** use on experimental bus lines compared to control bus lines! Considering that this increase was realised simply by giving passengers a title, you can understand how social labelling is a powerful and cost-efficient method!

12. Reveal hidden groups, understanding better your customers!

Understanding the differences between what users like but also the factors that shape these preferences among users is of paramount importance in understanding which innovations can work for specific segments of the population.

By using the **Conjoint Analysis method** you can explore what people really value in products and services, revealing the underlying drivers behind users' choices.

As the segmentation analysis reveals, there are homogenous groups with different priorities and therefore different needs and driving factors. These groups don't follow the dominant demographics patterns (e.g. age, gender), and remain hidden to the common analytics and mainstream approaches **(hidden groups).**

Mapping and appreciating these finer structures can open up the way to an improved customer-oriented service design, better tailored innovation strategies and roll-up to target these segments.

- ✓ In CIPTEC, Conjoint Analysis was used to analyse preferences concerning **eleven (11)** selected existing innovative concepts.
- ✓ Findings reinforce the underlying work hypothesis that EU users have different preferences when it comes to PT innovations.
- ✓ **Seven (7)** distinct groups/segments that demonstrate similar preferences with respect to their preferences in Public Transport innovations were identified.
- ✓ From a practical standpoint, both differences and similarities among the present 7 groups could be utilised by the participants in order to effectively place their services to the appropriate target groups.

In the following pages, we present the main attributes of the groups and the associated preferred innovations.

Group 1

- Urban dweller
- Weekly trips: Pedestrian or by private car
- PT only out of necessity
- 0-10% of monthly budget spent for mobility issues
- Ready to change mobility habits

Group 2

- Lives in urban or suburban area
- Weekly trips mostly by private car
- Not frequent PT user
- 0-10% of monthly budget spent for mobility issues
- Sensitive to price increase
- Not willing to change travel behaviour
- Most likely to never have had a traffic accident

Special pricing for commuters and loyal PT users

Assistance to special user groups

Group 3

- Urban dweller
- Weekly trips mostly on foot
- PT user mostly out of necessity
- 11-20% of monthly budget spent for mobility issues
- Moderately ready to change travel behaviour
- Most likely to never have had a traffic accident

Real-time information applications

Smart cards for all mobility needs

Group 4

- Urban dweller
- Weekly trips mostly by private car
- PT user mostly out of necessity
- 0-10% of monthly budget spent for mobility issues
- Not ready to change travel behaviour
- Never have had a traffic accident

Real-time travel information at PT stops

Group 5

- Urban dweller
- Weekly trips mostly on foot or by private car
- PT user mostly out of necessity
- 0-10% of monthly budget spent for mobility issues
- Ready to change travel behaviour
- Most likely to never have had a traffic accident

High efficiency bus system with exclusive lanes

Group 6

- Urban dweller
- Weekly trips mostly on foot
- PT user mostly out of necessity
- 0-10% of monthly budget spent for mobility issues
- Moderately ready to change travel behaviour
- Most likely to never have had a traffic accident

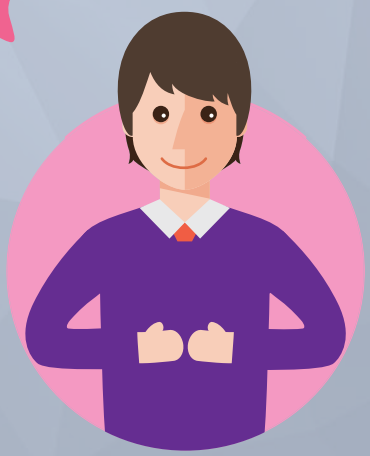
Integrated real-time GPS and other information for all transport modes

Group 7

- Urban dweller
- Weekly trips mostly on foot
- Not frequent PT users
- 0-10% of monthly budget spent for mobility issues
- Not ready to change travel behaviour
- Either never have had a traffic accident or one with only minor damages

Customized travel information for specific groups

Assistance to special user groups



13. What should you pay attention to when implementing innovations?

What Public Transport stakeholders should pay attention to when they decide to introduce one or more innovations in their city's Public Transport system?

By using the empirical evidence collected through the use of advanced marketing research methods, Public Transport stakeholders can invest their funds in innovative concepts and solutions that can really favour Public Transport share, not wasting valuable sources for useless applications. This way, they can decide which innovations should be offered and how much they should charge.

One key insight, derived from the Conjoint Analysis conducted in the frame of CIPTEC, is that introducing more than one innovation can have a significantly larger effect than introducing these innovations alone. While more evidence is necessary, this preliminary finding points to the fact that there is synergetic value (beyond mere adding of values) in combining certain innovations in a service. This finding also suggests that one-shot innovation introductions might be less impacteous in increasing choice share than a combination of two or more. However, according to our data, it should be noted that this effect does not appear to work for any combination – introducing the wrong innovations could result in marginal effects. Innovations should be strategically viewed, selected and rolled out in order to take advantage of the positive synergetic effects.

Investigate the implications that relate to the combined effect of the selected innovations on the increase in choice share with a parallel increase in current price ticket.

Tips based on the CIPTEC experience:

- ✓ The introduction of every single innovation even with a 1%-4% increase in current ticket price increases the choice share of Public Transport.
- ✓ Simulations also provided the conditions under which a larger increase in current ticket price would be accepted without a loss in Public Transport choice share (introduction of a specific number of innovations for a certain range of price increase).
- ✓ The introduction of combined sets of innovations has multiplier effects on the modal share of Public Transport, especially when these sets are relevant to the factors and the needs of the hidden groups.

Use these results in combination with the estimated cost of each innovation in order to decide which innovations should be offered and how much they should charge.

Tips based on the CIPTEC experience:

- ✓ The introduction of the "wrong" innovations could result in marginal effects, so innovations should be strategically selected and rolled out in order to take advantage of the synergetic and multiplier effects.

Challenge yourself to employ marketing research methods.

Tips based on the CIPTEC experience:

- ✓ Ideally, PTOs/PTAs should conduct a rolling Conjoint Analysis survey every 5 years or even more frequently in order to modify and diversify their services.

14. Don't do business as usual, think of social entrepreneurship!

Public Transport has significant social impact and comprises a precondition for the overcoming of social isolation.

How can a PTO/PTA organisation address key unmet social needs of the users' and potential users' of the Public Transport system? How can it tackle complex social challenges, such as climate change, lack of accessibility and transport poverty?

The consideration and adoption of Social Innovation and Social Entrepreneurship concepts in the Public Transport sector can contribute in addressing effectively social and economic challenges!

Although both concepts share the common high social impact and value they can produce, they are not identical. Apparently, a social innovation is not always provided by a social enterprise, while a social enterprise is not always offering innovative services.

Social innovations are new products, services or models that meet social needs, create social relationships and form new collaborations. They introduce innovative ways and processes that tackle social challenges *(European Commission a)*

A **social enterprise** is an operator in the social economy whose main objective is to have a social impact rather than make a profit for their owners or shareholders. It operates by providing goods and services for the market in an entrepreneurial and innovative fashion and uses its profits primarily to achieve social objectives. It is managed in an open and responsible manner and, in particular, involves employees, consumers and stakeholders affected by its commercial activities *(European Commission b).*

There are not many clear examples of 'social enterprises' in the field of passengers' transport, although there are various unsatisfied social needs for mobility.

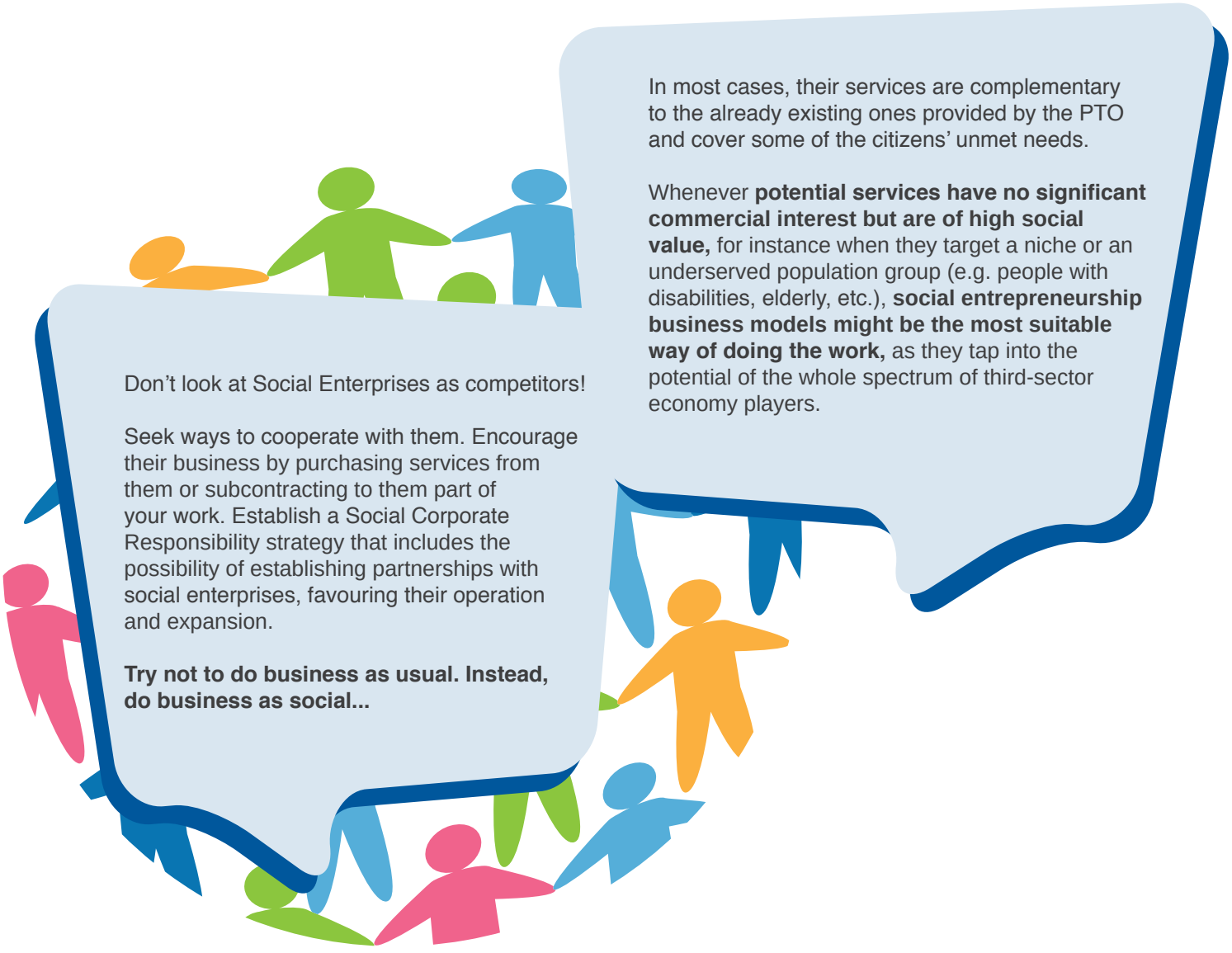
The most common example of Social Entrepreneurship in Public Transport services provision is the **Community Transport model,** mainly applied in UK. Some forms of Community Transport include for instance:

- ✓ Community car schemes, with volunteers driving their own cars
- ✓ Group travel services and door-to-door dial-a-ride services using minibuses
- ✓ Demand-responsive or fixed route transport services

For more information regarding the adoption of Social Innovation and Social Entrepreneurship concepts in the Public Transport sector, go through relevant CIPTEC Deliverables D6.1 and D6.2.

Apart from the core activity of a PTO, that is the circulation of the Public Transport vehicles, there are plenty of other supplementary and supporting services that are (or could be) provided by external parties and entities enhancing the PTOs operation. These services can be produced by social enterprises and can be linked, whenever possible, with innovations of social purpose, being incorporated in the modern digital and social economy.

A significant aspect of social entrepreneurship in Public Transport could be related to social change and travel behaviour change. Social entrepreneurship attempts to create wider changes in how the economic framework and system are formed. Influencing how people behave and think is of crucial importance, and may enable the re-branding of a business sector as a whole.



In most cases, their services are complementary to the already existing ones provided by the PTO and cover some of the citizens' unmet needs.

Whenever **potential services have no significant commercial interest but are of high social value,** for instance when they target a niche or an underserved population group (e.g. people with disabilities, elderly, etc.), **social entrepreneurship business models might be the most suitable way of doing the work,** as they tap into the potential of the whole spectrum of third-sector economy players.

Don't look at Social Enterprises as competitors!

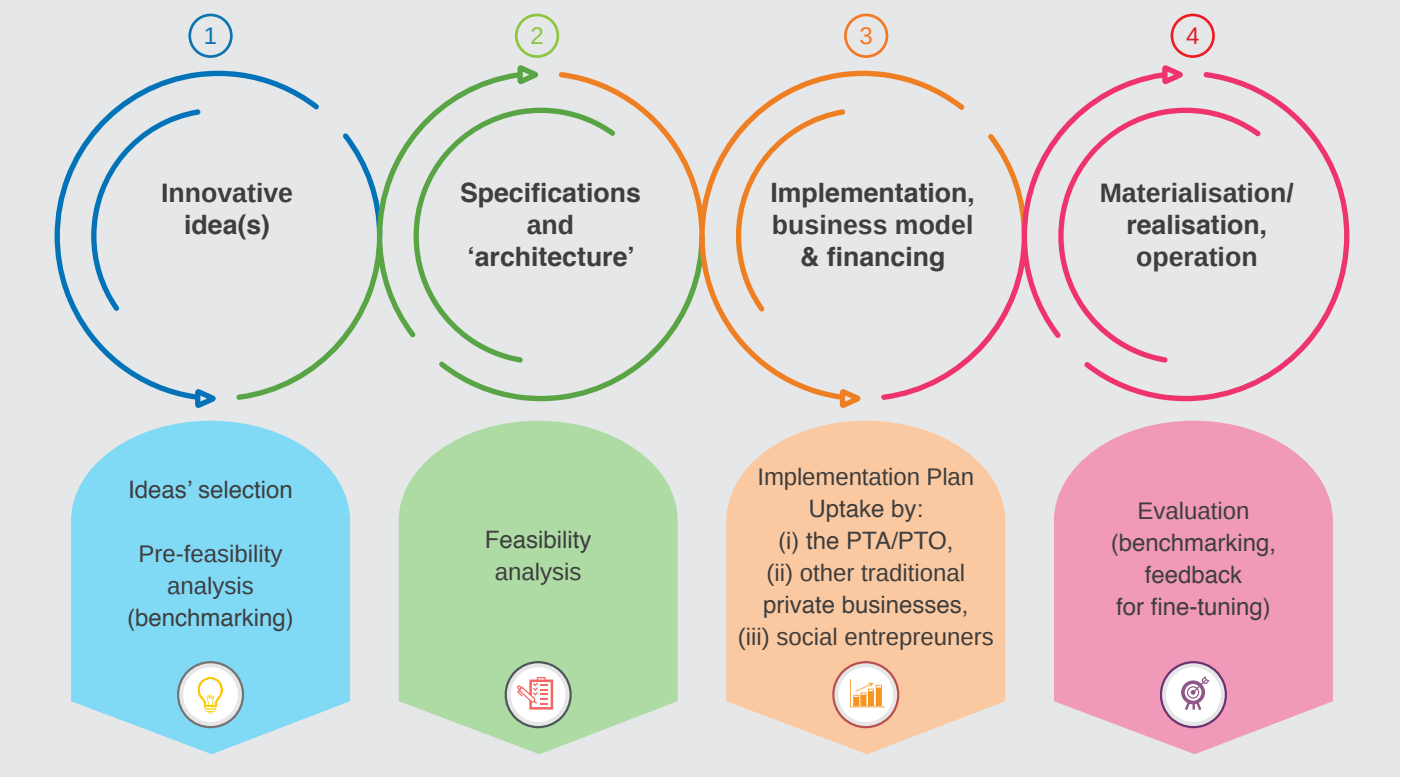
Seek ways to cooperate with them. Encourage their business by purchasing services from them or subcontracting to them part of your work. Establish a Social Corporate Responsibility strategy that includes the possibility of establishing partnerships with social enterprises, favouring their operation and expansion.

Try not to do business as usual. Instead, do business as social...

15. Towards the implementation of an innovative concept

The implementation of any innovation in Public Transport, which is characterised by various dynamic factors, requires an in-depth examination. In order to increase the success potential of any new innovative solution (service or technological system), you can adopt a structured process by following certain design/planning steps, identifying and specifying/tailoring any possible innovative concept according to the local needs of your case.

Design & planning steps towards the implementation of an innovative concept



The steps are associated with the activities defined in the proposed CIPTEC Innovation Flow, and can be outlined when drafting an Innovation Strategy Plan. The in-depth consideration of any innovation concept could consist of the following stages:

• Pre-feasibility study: at this stage, you can identify the gaps between the current Public Transport supply and mobility demand and try to understanding which key areas should be addressed for improving service quality. Local needs, requirements and performance required for the new innovative concept should be mapped. A benchmarking exercise, namely comparing objectives set with the results encountered in other similar reference contexts, could be very helpful.

• Feasibility study: at this stage, realistic requirements and objectives can be set, detailed technical, functional and operational specifications can be provided, and long-term impacts on the interested stakeholders can be better understood.

• Implementation Plan: at this stage, you may consider all investment and operational costs, as well as the supporting actions needed. This stage can also be integrated with the feasibility study.

• Evaluation: you can measure and assess the success, results and impact of the realization and operation, by using the indicators set in previous stages and considering other comparable experiences, e.g. in terms of context, institutional and technological/operational background, needs and objectives.

16. Enable the smooth implementation of an innovative concept

Whenever you introduce and implement innovative concepts in Public Transport, you shouldn't ignore the crucial role and impact of:

1. risks associated to the design phase
2. human factors, related to employees management, organisation's business culture and customers/ passengers perceptions
3. innovation related barriers
4. integration and synergies potential

Risks associated to the design phase

Some common risks that you may have to handle are:

- poor consideration of long-term impacts due to the lack of a related innovation strategy roadmap. The pre-feasibility analysis plays a key role in avoiding purely 'fashion-driven' solutions
- lack of benchmarking of current experiences, targeted to assess similar initiatives
- overconfidence in new technological solutions
- failure in identifying the target users groups and understanding their needs
- poor involvement of the associated staff during the feasibility and design phase.

Organisational structure, staff responsibilities and operational procedures

Appropriate organisational structure and operational procedures can contribute to the smooth and successful implementation of an innovative concept in Public Transport.

The introduction of innovative concepts, such as ITS or high-tech systems, does not magically result in the reduction of human resources required. It should be preceded by a broader analysis and revision of the whole organisation's structure, including staff interactions and responsibilities, as well as operational procedures. Therefore, when you are rethinking how the work is done internally, you may want to consider:

- re-shaping the organisational structure by adjusting skills, roles and positions
- fine-tuning the operational procedures by modifying activities and interaction between employees

The revision of operational procedures can be integrated as part of the feasibility study for any innovative measure/solution. The role of the key responsible staff is very important, as it can effectively understand and predict the impacts of an innovation implementation, and propose new useful ideas. Thus, try to involve it actively in the design, contracting and evaluation phase of a new implementation. Provision of life-long learning opportunities will ensure you that the employees have the required expertise to address the challenges of any evolution.

Innovation barriers

A key point is the identification of the potential barriers:

- *Behavioural change:* bear in mind that customers/passengers tend to evaluate both reasons for and against engaging in the adoption of an innovation. Individuals may resist to innovation in different ways, such as by rejecting it directly, postponing it or opposing it. In addition to barriers raising from the users' side, the employees' resistance or the 'lack of political will' (i.e. commitment' on the administration side) can also delay or undermine the implementation of an innovation.

- *Regulation, fragmentation & resources:* the Public Transport sector includes many 'players', and is widely affected by local regulations. The adoption of international standards is still limited and, overall, the resources allocated for research & innovation are lower than in other transport industries. These conditions slow down the speed of implementation of innovations. For example, the absence of an appropriate institutional framework for flexible (public) transport services may have prevented their expansion
and, ultimately, their large-scale applications.

- *Infrastructure:* there are many challenges associated with the infrastructure. Nowadays, new materials, advanced 'predictive' maintenance and infrastructure of IoT can result in solutions that are able to tackle congestion in numerous cities.

Integration and potential synergies

- 'Physical' and 'Virtual' Integration of Public Transport (both of fixed and flexible services) with other mobility services, in particular 'last mile services', such as bike sharing, ridesharing, taxi sharing, etc., is a key objective in cities.

- Synergies with other business sectors sectors could unambiguously boost innovation, as the knowledge and expertise derived from introducing and maintaining innovation in other sectors can be beneficially used for a more effective uptake of innovation in Public Transport.

17. Schedule next steps, develop a strategy plan on innovation!

Now you have reached the final step of the 'Innovation Flow'. You are ready to organise the introduction, promotion and implementation of innovation in your city's Public Transport system in a systematic way by developing an **Innovation Strategy Plan.**

This plan will be adjusted to the peculiarities and needs of your area, taking into account the specific setting, the characteristics of the Public Transport and mobility system, the level of innovation advancement of the area and organisation, the target groups, the organisation's potential and resources, etc.

Planning the implementation & management of innovation *(Innovation Strategy Plan)*

- Innovation mix selection
- Pre-feasibility & feasibility analysis
- Implementation plan, business models (e.g. social entrepreneurship)
- Realisation & evaluation

Please note!

• The plan should be in line with your organisation's available budget for introducing new innovations.
• The plan should follow a time frame with specific milestones based on your organisation's target and objectives.
• Estimate how much human effort and resources you will need in order to reach the targets set. Prepare a well-balanced allocation of work and engage employees in the realisation of the plan.
• In case of limited funding sources, examine the possibility of using alternative business models, such as the concept of social entrepreneurship, to provide new, novel services to your customers.
• Identify possible risks, barriers or resistances you may encounter when promoting innovation. Be particularly aware of the human risks and resistances coming from the inside (e.g. from your staff) or from the outside (e.g. from the passenger base). Think of ways and means to manage, overcome or mitigate these resistances.
• Changing mindsets and making them more adaptable to a modern and ever-changing environment is far from being an easy process, but it is an investment that is worth your commitment, as it can produce tangible results.
• Innovating is the only way for you to go forward to the future.

18. What could your Innovation Strategy Plan include?

When you are preparing an Innovation Strategy Plan of your PTA/PTO, you may consider the following aspects:

1

• Overview of the PTA/PTO and its service region

• Overall target of the Innovation Strategy Plan and priority objectives

What do you aspire to achieve through your innovation plan? (e.g. address the needs of specific target groups, increase attractiveness of our services, increase environmental-friendliness, uptake of specific modes of transport, etc.)

• Selection of appropriate innovations/solutions

What are the innovative concepts and solutions coming from CIPTEC Toolbox or your collective innovation activities that could address the plan's objectives?

- Initial list of solutions/innovations
- Pre-feasibility analysis and selection of solutions(s) for the plan

Conclude on your selected innovative service, product, process, after having considered and assessed the suitability of the innovations under examination. For instance, you could define specific indicators against which you will determine the best solution(s) for your case, e.g.: (i) compliance with priority objectives; (ii) benchmarking of solutions; (iii) market limitations; (iv) first draft assessment of investment & operational costs; (v) time of implementation required; or (vi) any other aspect that is important for your case. Then, you could perform a simple multi-criteria rating exercise.

2

• Feasibility analysis for the selected solution(s)

The Feasibility Study should clearly identify the different implementation steps for the launch of the measure/ solution in order to facilitate the monitoring and management of the implementation plan within time and budget constraints: (i) define the real objectives to be achieved; (ii) identify relevant actors and their responsibilities; (iii) define the specifications of the solution; (iv) evaluate the impacts of the solution on the organisation and operation; (v) define performance indicators and the expected value.

3

• Operational tasks for the implementation of the innovation

How are you going to adapt your operational and organisational processes to effectively manage the innovation implementation?

- Operational and organizational management procedures
- Change management
- Skills and competences
- Resource planning/allocation

• Budget-related issues

• Implementation plan

Define specific tasks, time frame and milestones (including pilots, if required); develop a Gantt chart; draft your Business Model Canvas; consider investment and operational cost impacts; consider the terms & conditions for the purchasing of the innovative service/system; identify possible co-financing sources.

• Risk assessment

Identify potential risks and mitigation actions.

For further information on the steps suggested above to reach a full Innovation Strategy Plan, you may consult the full CIPTEC Toolbox report (D5.1) and the example Innovation Plans (D6.3) available at: **www.ciptec.eu** and **www.toolbox.ciptec.eu**

19. Key References

CIPTEC deliverables & publications

D1.1: Report on major market trends, the effect of societal trends on market and their influence on public transport
D1.2: Report on analysis of customers' groups and users' needs per customer group
D1.3: Report on PT Authorities and Operators' mapping/typology and needs
D1.5: Implementation of workshops and personal interviews with experts
D2.1: Guidelines for field research design and relevant material on existing innovative practices
D2.2: Portfolio of public transport services and "products" targeted to the traditional and new customer base, incorporating field research results
D2.3: Portfolio of existing innovative supply from other transport systems or/and business sectors, incorporating field research results
D2.4: Workshop on existing innovative supply
D3.1: Collective intelligence conceptual framework and guidelines
D3.3: Plan for co-creation/co-design workshops
D3.4: Summary reports for collective intelligence initiatives (crowdsourcing platform, co-creation/co-design workshops)
D3.5: Evaluation report for the Collective intelligence process's output
D4.3: Field experiments report
D5.1: "Toolbox for Public Transport Innovation" Guide (full version report)
D6.1: Workshops' preparation and design
D6.2: Workshops' outcome report: social innovation in PT and the overcoming of barriers
D6.3: "Model" Strategy reports of PT providers
D6.4: Policy recommendations

CIPTEC Scientific Publications available at: http://ciptec.eu/scientific-publications/

Main external sources

- European Commission a, Social Innovation, retrieved from: http://ec.europa.eu/growth/industry/innovation/policy/social_en, on April 02, 2018
- European Commission b, Social enterprises, retrieved from: http://ec.europa.eu/growth/sectors/social-economy/enterprises_en, on April 02, 2018
- Shuroveski, J. (2005), The Wisdom of Crowds, New York, United States, Anchor Books

Photographs

- Photograph for Innovation 3 (page 24) derived from CityMobil2 project/FP7 'Cities demonstrating automated road passenger transport' (http://www.citymobil2.eu)
- Photograph for Innovation 14 (page 29) derived from SPENCER project/FP7 'Social situation-aware perception and action for cognitive robots' (http://www.spencer.eu)
- All the other photographs used for this dissemination publication were either derived from: https://www.freepik.com/ or purchased from: https://www.shutterstock.com

The content of this publication is mainly derived from the CIPTEC project's deliverables. All external sources used for this content, are referenced in details in the respective CIPTEC deliverables.

Imprint & credits

Supervision:
prof. Aristotelis Naniopoulos, CIPTEC Coordinator (AUTh, Greece)
Elaboration:
prof. Aristotelis Naniopoulos, Evangelos Genitsaris (AUTh, Greece)
Text editing:
Evangelos Genitsaris, Afroditi Stamelou (AUTh, Greece)
Graphic design:
Maggie Papacharalampous (AUTh, Greece)
Flow charts:
Evangelos Genitsaris (AUTh, Greece), Ilias Trochidis (Tero, Greece)
Proofreading:
Simone De Ioanna (White Research, Belgium)
Leader of Work Package 5:
Saverio Gini (MemEx, Italy)
Scope:
This publication comprises an integrated booklet dissemination report that aggregates the project's results, building mainly on the Toolbox report (D5.1) and the CIPTEC booklet (Sep. 2017).
Acknowledgment:
This publication was made possible, in the frame of WP5, thanks to the research project's outcomes and the input derived from all CIPTEC deliverables (reports), prepared by the CIPTEC partners. Especially, the CIPTEC Toolbox report for Public Transport Innovation (D5.1, responsible partner: MemEx, Italy) was used as the primary reference document for this publication. Some deliverables' content was edited properly for clarity and length management.
Photos:
Photos that are the property of certain organisations are referenced. The rest photos were downloaded from: https://www.freepik.com and https://www.shutterstock.com under the conditions applicable to each case.

This publication was printed in Thessaloniki, Greece.

April 2018

The CIPTEC Consortium

- Aristotle University of Thessaloniki- Transport Systems Research Group, Greece
- KU Leuven - The Research Centre for Marketing and Consumer Science, Belgium
- Mobycon Concordis Groep, Research Consultancy, The Netherlands
- Tero Ltd., Research Consultancy, Greece
- MemEx, Research Consultancy, Italy
- White Research, Research Consultancy, Belgium
- Ortelio Ltd., Research Consultancy, United Kingdom
- Metropolitan Region Rotterdam The Hague, Public Transport Authority, The Netherlands
- TIEMME, Public Transport Operator, Tuscany, Italy
- Local Public Transport Authority of the City of Frankfurt am Main, Germany
- European Passengers' Federation, Belgium
- European Metropolitan Transport Authorities, France

For more information, please contact
the Project Coordinator:
Prof. Aristotelis Naniopoulos
Transport Systems Research Group (www.tsrg.gr)
Aristotle University of Thessaloniki,
Faculty of Engineering,
"Ktirio Edron", 6th fl. P.C. 54124, Thessaloniki, Greece
Tel: +30 2310 995796
e-mail: naniopou@civil.auth.gr

www.ciptec.eu

auth@ciptec.eu
@ciptec
www.facebook.com/ciptec

CIPTEC

COLLECTIVE INNOVATION FOR PUBLIC TRANSPORT IN EUROPEAN CITIES

Funded by the Horizon 2020 research and innovation programme of the European Union (No 636412)

2020 CiViTAS
Cleaner and better transport in cities