Intelligent Infrastructure: The Future of ITS

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ITS

Real change in our lives,
as a result of the 4th Industrial Revolution

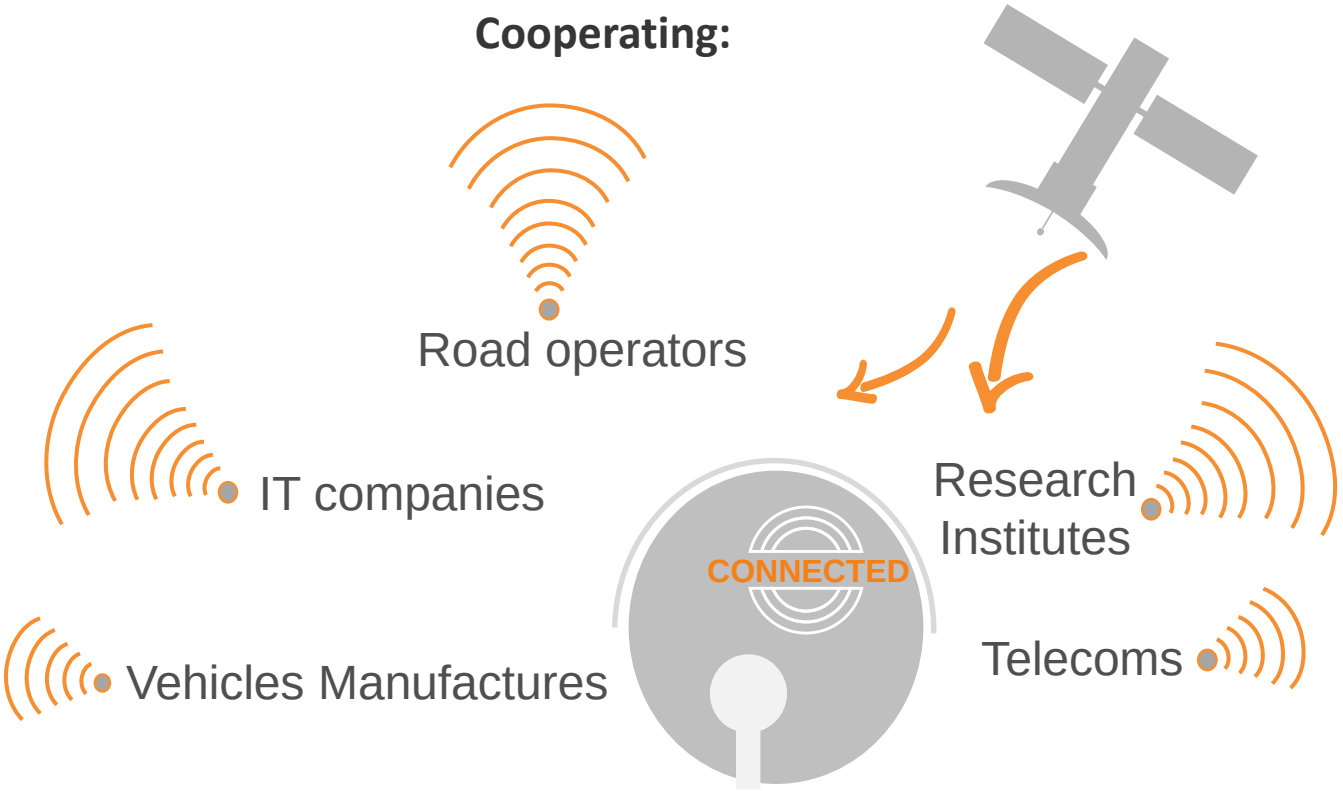
It's not just a matter of autonomous cars

It is a matter of cooperation between cars
(autonomous and conventional),
road infrastructure and drivers

Road Infrastructure & vehicles!

Drivers interact harmoniously, communicate with each other, improving traffic on the roads

Cooperating:



Vision

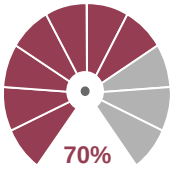
A not-so-distant future where road infrastructure will support, possibly control and ensure the smooth and effective coexistence of all types of cars (automatic and conventional)

Targets:

- ✓ Enhanced Traffic Efficiency 40%

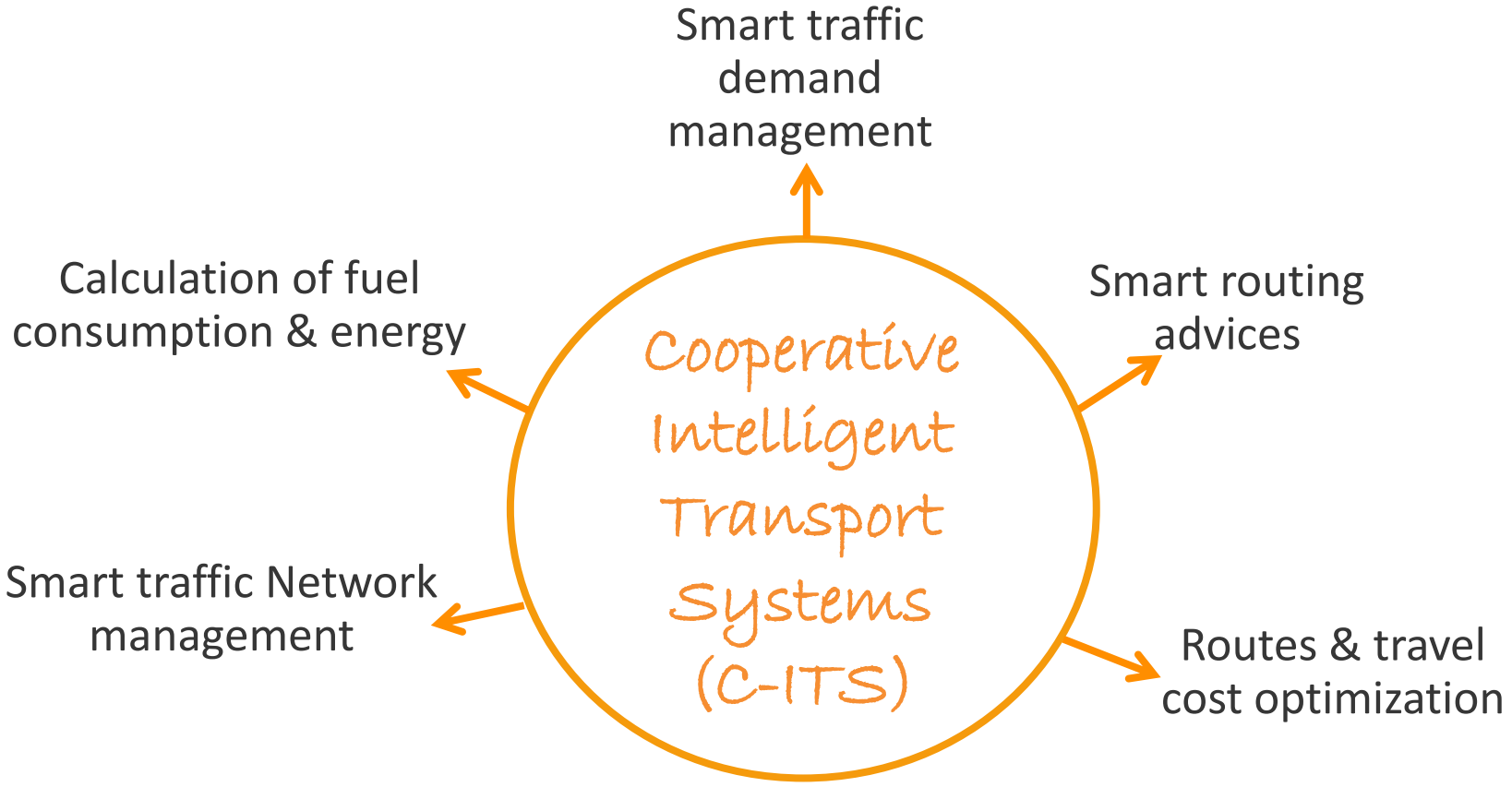
- ✓ Increased Safety 50%

- ✓ Increased User Acceptance 70%

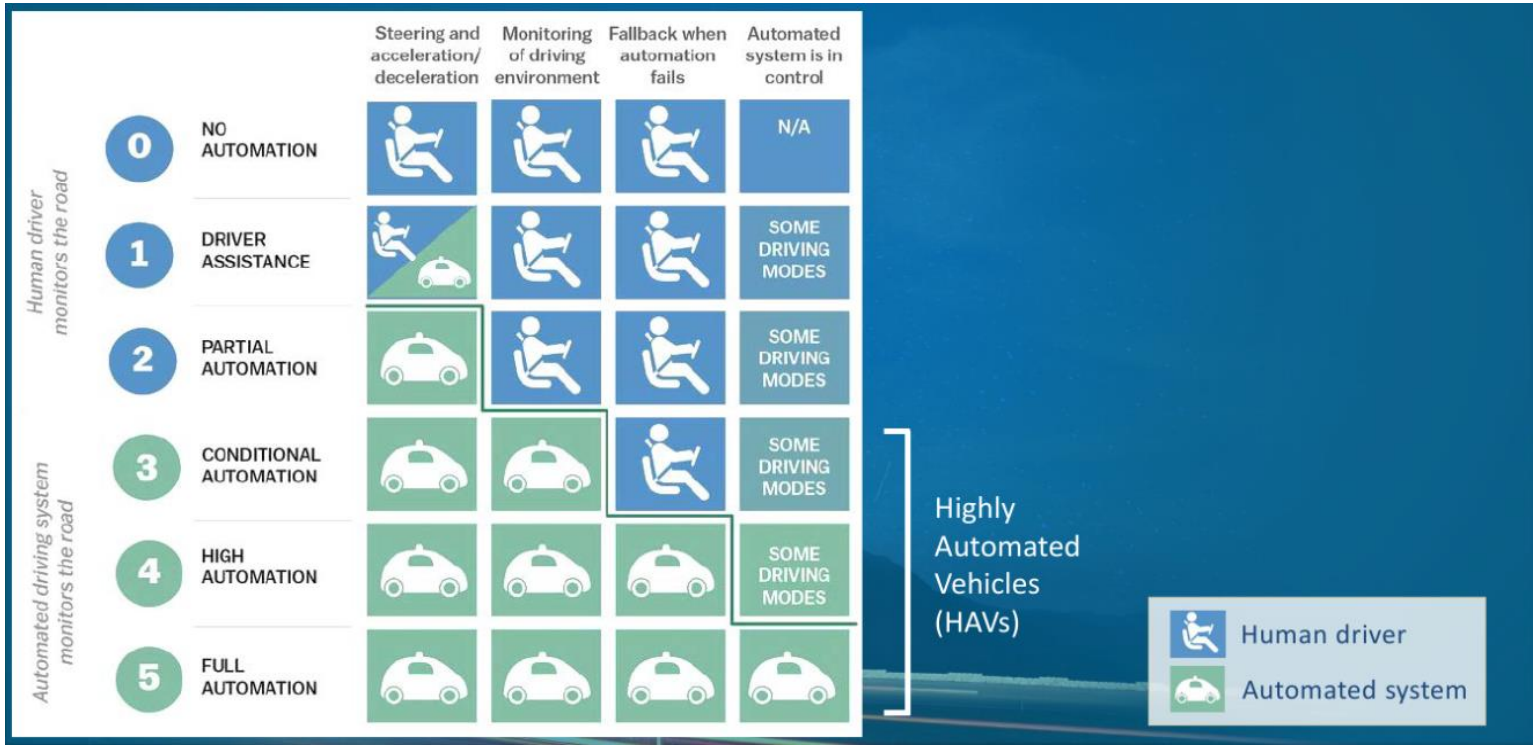


By increase in autonomous rate penetration by 30%

C-ITS


Smart traffic demand management
Calculation of fuel consumption & energy
Smart routing advices
Cooperative Intelligent Transport Systems (C-ITS)
Smart traffic Network management
Routes & travel cost optimization

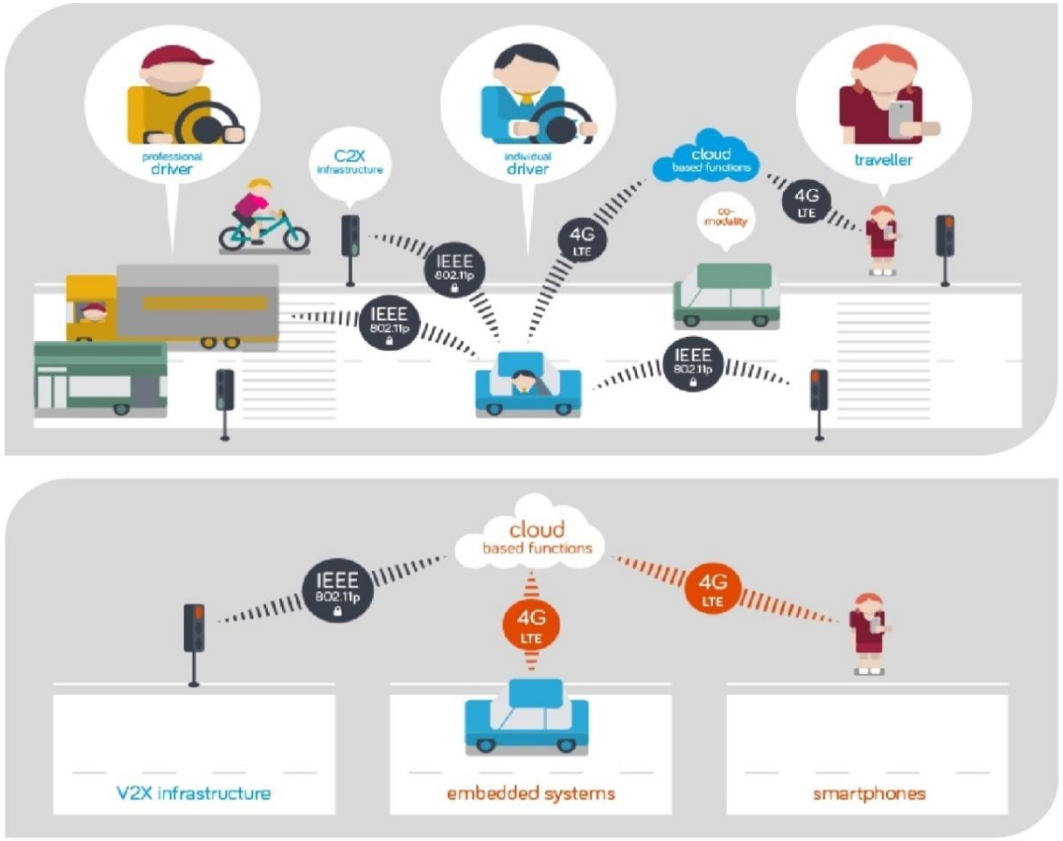
Five levels of driving automation



Benefits - Innovations (I2V - Infrastructure to Vehicle)

- Green Traffic Light Optimum Speed → GLOSA (Birmingham Drivers) Get Smart Speed Guides on Birmingham
- Travel times improved by 7%
- At the same time, traffic flow improved and fuel consumption decreased
- Early warning on car and mobile screens for dangerous signs on the road
- Early warning of works on the roads
- Weather warnings
- Smart directions for optimal routes and parking
- Accident warnings
- Traffic congestion warnings

Benefits - Innovations
(I2V - Infrastructure to Vehicle)



Cars, road/technology infrastructures and smart devices work together to prevent and control traffic

Benefits – Innovations (I2V - Infrastructure to Vehicle)

- Cooperative design and implementation of intelligent priorities and optimization of MMM traffic
- Using the cars themselves to collect traffic data, instead of traditional sensors
- **Categorization, standardization** of road infrastructure according to the automated functions they support
- Traffic optimization, increased security, increased user acceptance
- Well designed and at a lower cost for road maintenance
- Automatic car alert that impending collision and possible brake trigger
- Reducing traffic congestion will have huge social benefits for work, education, quality of life

Benefits – Innovations (I2V - Infrastructure to Vehicle)

- New Entrepreneurial Opportunities: Internet of Mobility will enable integrated service packages now provided separately by different “players” (car manufacturers, IT companies, road network management companies, telecommunications companies, insurance companies), providing multiple services by a company or even the synergy of many companies in providing service packages
- **Pay-As you go toll** → Automated toll payment
- **Pay as you go insurance** → Smart insurance charges depending on driving behavior

All on the vehicle display

and smartphones/tablets applications

Benefits (V2V - Vehicle to Vehicle)

V2V Future → communication

- Hazardous Location Notice
- Warning for a slow moving vehicle or a stationary vehicle
- Traffic jam warning
- Warning of nearby hospital, police, fire or other emergency vehicle that wants to pass
- Motorbike warning

Cars that talk to each other

ISAD Levels
Infrastructure Support Automated Driving Levels
INFRAMIX Approach

Level / Name	Digital infrastructure	Physical infrastructure	Operational infrastructure
A / Cooperative driving	HD maps (cloud based dig. maps incl. accurate position of signs, dynamic update of lane topology, location of emergency stop zones)	Elements to ensure continuous connectivity (enabling V2X) along the segment (e.g. RSUs)	Dynamic Guidance for Individual & group of vehicles: speed, gap, lane advice
		High precision meteorological stations; in-pavement sensors to detect moisture, temperature, strain	Detailed weather info
		+ level B	+ level B
B/ Cooperative perception	HD maps (cloud based dig. maps incl. accurate position of signs, dynamic update of lane topology, location of emergency stop zones)	Elements to ensure continuous connectivity (enabling V2X) along the segment (e.g. RSUs)	Microscopic traffic situation
		+level C	Data exchange with cloud services
			+ level C
C / Dynamic Digital information	HD maps (incl. accurate position of signs, dynamic update of lane topology)	Dense location referencing points	Automated update of digital infrastructure
		+ level D	Automated data processing
			+ level D

Level / Name	Digital infrastructure	Physical infrastructure	Operational infrastructure
D / Static digital information	Digital map with static road signs (incl. accurate position of signs)	VMS	Handling information related to: Warnings
		+ level E	Incidents
			Weather
E / Conventional infrastructure	-	Vehicle-recognizable road traffic signs; colours, position	-
		Signs with speed limits, road curvature and inclination	
		Good lane markings in both sides	
		Lane width based on standards	
		Working zone signalization	
		Video cameras for real-time vehicle detection	

Challenges

- Services, especially in the beginning, should be designed in such a way as to avoid a “bad” first image that would make it difficult for users to be widely accepted
- The coexistence of conventional and automatic cars of all categories, especially the first
- TMC personalized driving instructions depending on driving style
- Complex decision making, such as creating a platoon of vehicles
- Lack of data in real-time traffic
- Cyber security / GDPR issues
- Conflict or “alleged” conflict of interest between stakeholders: e.g. road and car manager

Challenges

Questions

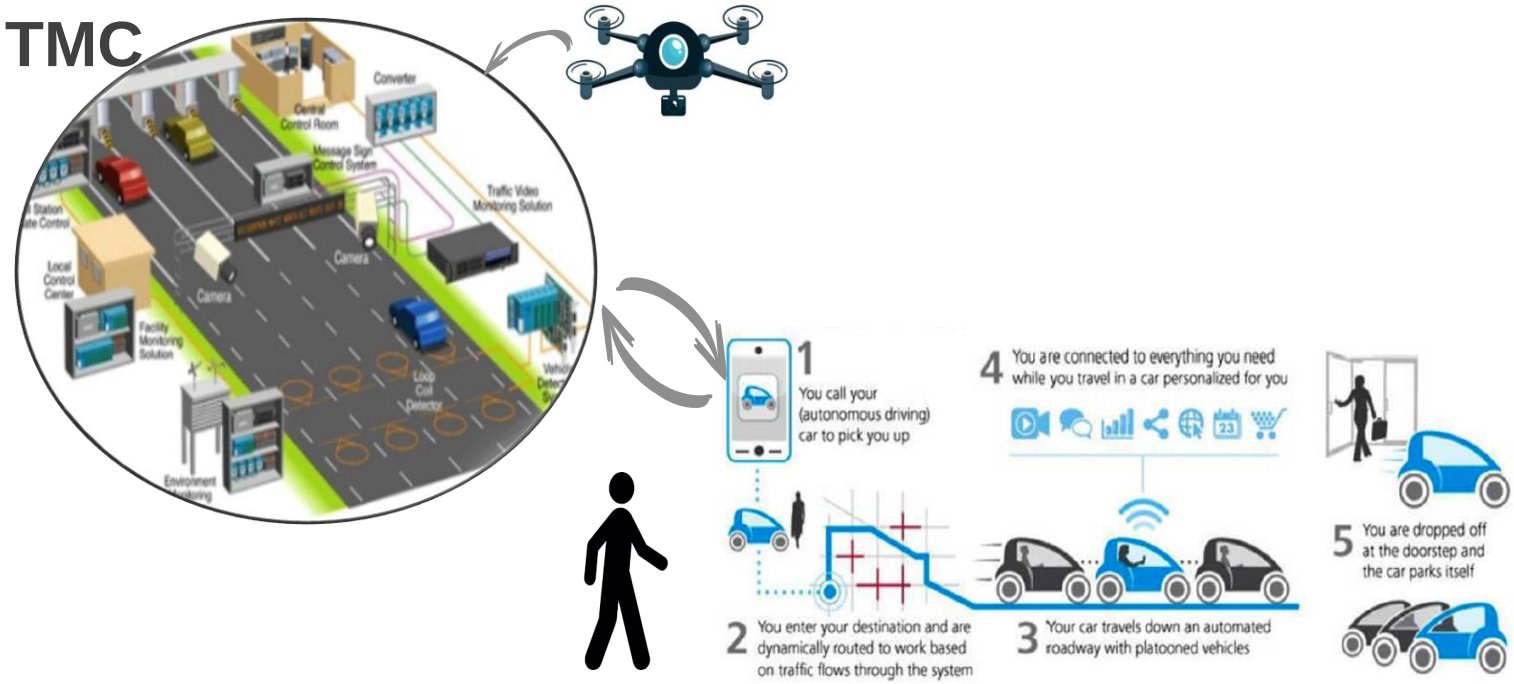
In the event of an accident, who will be responsible, the car manufacturer, the road manager (TMC), the driver or possibly a third party service provider?

Can there be **harmonization of legislation** between states or not?

Will the definition of a **Governance Model** be global or local?

Mobility as a service

Internet of Mobility



C-ITS → **Mobility as a pure service**

Mobility as a service

Internet of Mobility

A key feature is the Ubiquitous Connectivity: V2V, V2I, Transmission and User Communication.

In this context, the European C-Roads Project is already introducing the concept of Roaming Vehicles. In the future a Greek car that will be driven e.g. on a French or German highway will enjoy the same package of innovative services as in Greece.

Cars that talk to each other

The future has begun
A new world opens up in front of us

My car is shopping and parking by itself

Important opportunities of MaaS – what benefits can we gain from it?

- Moving from independent elements to an interdependent ecosystem. The combination of currently independent Transport elements (Electric vehicles, connected and autonomous vehicles, Road Infrastructure) and the cooperation with other sectors like energy and fleet services will bring convenient, safe and economic mobility, with less impact to health and the environment, building the smart societies
- Different Business Models, New Partnerships, New Services: peer-to-peer logistics platforms and shipment sharing, drone delivery, innovations in last-mile deliveries
- Governments also have an opportunity to take a leadership position for domestic industries

Important opportunities of MaaS – what benefits can we gain from it?

- Open mobility to excluded people such as handicapped, young or older travellers
- Mobility is critical to support future's community hubs and economic activity
- The current vehicle-centric ecosystem will move to human-centric
- Mobility as a Service alternative to ownership: Instead of vehicle ownership, Service-based transport will be adopted like-new car subscription services, private hire car providers or car-sharing schemes
- The decrease in the total cost of ownership (TCO). Customer connectivity, account-based payments, intelligent routing algorithms

Important opportunities of MaaS – what benefits can we gain from it?

- Facing climate change by global carbon emissions reduction
- Customers can travel on different modes of transport (from different service providers) by using one payment platform: MaaS Global company has developed a product called Whim with a monthly subscription. Customers can plan individual journeys via different means of transport
- It could increase productivity, bring a new travel experience, change the roles of future employees. By this way, economic growth, social inclusion, space optimisation, environmental benefit, and social wellbeing are more than ever possible

Important opportunities of MaaS – what benefits can we gain from it?

- Internet of Mobility:

  Computers on wheels:

  Data – the key element of future mobility is often referred to as the future oil, increasing the safety, convenience and enjoyment of journeys, while ubiquity can enhance in-vehicle entertainment, commerce, job opportunities and even health

Next step to take to enable sustainable MaaS and to Smart Societies

- Social awareness and education
- New governance models for devoting resources to small-scale pilot projects, to test new applications and provide potential platforms for future growth
- Develop cross-sector partnerships and alliances
- Deploy a new mobility business model by using pilots like a Mobility aggregator platform, or develop a leading-edge technology e.g. new technology battery
- Alignment of financial, business and operating models

Internet of Mobility

- Less time lost in traffic congestion
- More time for creative activities, education, entertainment, social life
- More profitable time by automating shopping, connecting to your job and making payments while driving
- Better traffic management with smart priorities and smart vehicle tips

Therefore

BETTER QUALITY OF LIFE

ITS & Market Opportunities

From the above it is obvious that opportunities arise for:

- Synergies of different sectors (freeway managers, car manufacturers, IT companies, content providers, insurance companies, etc.)
- New services based on Data Fusion and Artificial Intelligence (driving and analytics applications, traffic optimization, personalized driving instructions, personalized ads)
- New completed packages (“players” that will offer “all in one” packages)
- New start-up companies

ITS & Market Opportunities

The consultancy is **necessary** for the implementation of all of these, as well as for:

- Providing specialized knowledge
- The availability of human and technological resources
- Motivate synergies
- Encouraging private and public sector cooperation
- Linking to European and global research