Transfer of intelligent transport systems (ITS) innovations to the market

6th ECITL, Zaragoza, 23.10.2013, Susanne Kellberger

- Fraunhofer and Fraunhofer CML
- The project T-TRANS
  - General Information
  - Research results
    - 3.1 Development of an Intelligent Transport System ontology - linking applications and technologies across different transport modes
    - 4.1 Success and failure factors of past innovations

Agenda

- Founded in 1949
- Largest organization for applied research in Europe
- Contract research of direct utility to private and public enterprise and of wide benefit to society
- 1,9 billion Euro research budget
  - 2/3 is derived from contracts with industry and from publicly financed research
  - 1/3 is contributed by German federal and state governments in the form of institutional funding
- 80+ research institutions
- 22 000 employees (predominantly scientists and engineers)

Fraunhofer-Gesellschaft

Fraunhofer
CML

- General Information
  - Founded 2010 in Hamburg
  - Located at the campus of TU HH
  - Applied research in maritime logistics
- Competences in:
  - Port and terminal planning
  - Assessment and optimization of maritime logistics processes
  - Maritime forecasts, studies and market analysis

Fraunhofer Center for Maritime Logistics and Services CML

- Fraunhofer and Fraunhofer CML
- The project T-TRANS
  - General Information
  - Research results
    - 3.1 Development of an Intelligent Transport System ontology - linking applications and technologies across different transport modes
    - 4.1 Success and failure factors of past innovations

Agenda

- Problem: ITS innovations often do not even enter the market in Europe.
  - How are the innovation chains?
  - How can the market deployment be facilitated?
- Duration: 27 months (01.09.2012 - 30.11.2014)
- Total budget: 1.7 Mio € (EC funding: 1.5 Mio €)
- Coordinator: UAB (ES)
- Partners: LGI (FR), ATOS (ES), Fraunhofer CML (DE), SERNAUTO (ES), UNITS (IT), INTELSPACE (GR), KEMA (NL), TTI (LV)

Project data and partnership

- ***Phase 1***: Compilation of information and analysis of innovation chains
- ***Phase 2***: Strategies for technology commercialization and identification of good practices to promote innovation transfer to the market
- ***Phase 3***: Establishment of an Innovation Network for ITS (pilot regions Central Macedonia, Galicia, Latvia)

Project structure

- Analysis of the innovation chain in transport and ITS, along four predefined case studies:
  - ***CS 1 Smart grid****: connection, charging and energy storage* (Intelligent control systems for network management for EVs)
  - ***CS 2 Revenue management*** *technologies for freight transport* (Transport prices reflect the demand like for passenger flight tickets)
  - ***CS 3 Revolution in intermodal transport units****: Intelligent intermodality* (The intelligent container)
  - ***CS 4 Rail network****: technological system wide approach* (Increasing the rail network capacity)

Phase 1:
Analysis of innovation chains

- Fraunhofer and Fraunhofer CML
- The project T-TRANS
  - General Information
  - Research results
    - 3.1 Development of an Intelligent Transport System ontology - linking applications and technologies across different transport modes
    - 4.1 Success and failure factors of past innovations

Agenda

- Change in ITS applications + evolution of ICT = make it necessary to have an overview of the whole range of ITS
- From an **application point of view** the technological combinations are most likely to be neglected
- From a **technological point of view** the multifaceted possible fields of applications are not considered sufficiently.

→ An ontology in the ITS area is proposed to highlight the relationship among all concepts

Problem description

- Review of commonly and occasionally used ITS areas and subareas
- Scientific literature
- Practical sources

- ITS areas
- ITS subareas

Sources

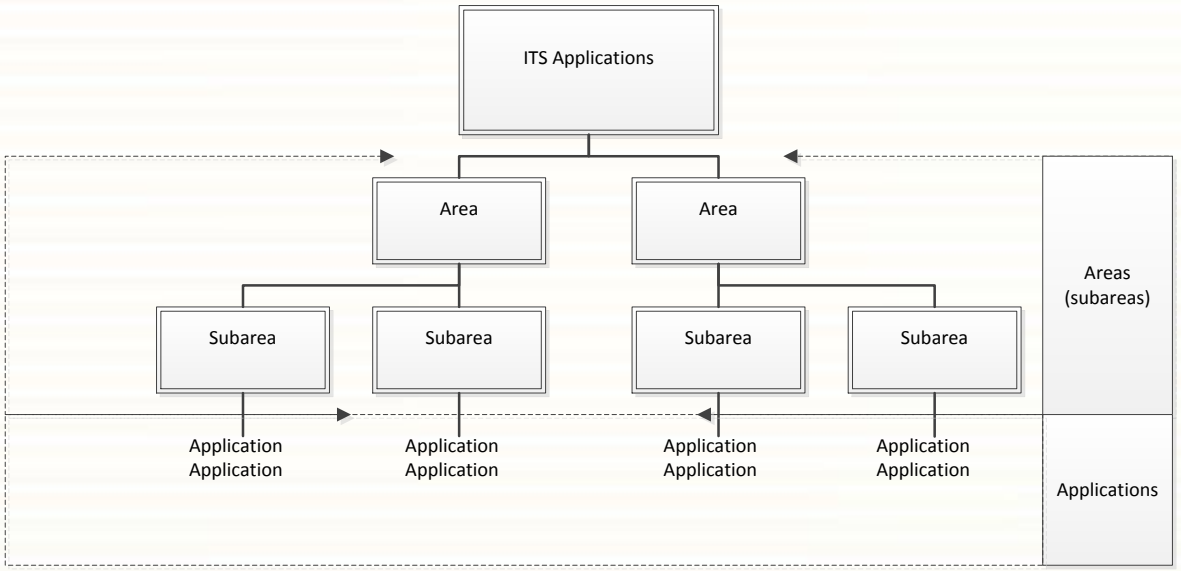
ITS (sub)ares

ITS area	ITS subarea	Diebold (1995)	Wootton et al. (1995)	Kanninen (1996)	Weiland and Purser (1999)	Nelson (2000)	Appel et al. (2002)	Samper et al. (2006)	HIDO (2007)	RITA (2009)	European Commission (2012)	Aparicio et al. (2012)
Information Services		x	x	x	x	x	x	x	x	x	x	x
	Public Transport Information		x	x	x	x	x			x		x
	Individual Traveller Information	x	x	x	x	x	x	x	x	x	x	x
Security, Safety and Control		x	x	x	x	x	x		x	x	x	x
	Drivers Assistance			x		x	x		x	x		
	Emergency Management		x			x				x		
	Collision Management		x	x					x	x		
	Safety & Security				x				x	x	x	x
	Control	x	x	x	x	x	x		x	x		
Freight and Logistics			x			x	x			x	x	x
	Transhipment									x		
	Storage									x		
	Transport		x			x				x		x
Booking, Payment and Pricing			x			x	x		x	x	x	x
	Electronic Payment		x			x	x		x	x	x	x
	Pricing									x	x	
	Booking						x					
Traffic Management		x	x	x	x	x	x		x	x	x	x
	Fleet Management		x			x	x			x		
	Operations & Maintenance		x							x		
	Demand Management		x			x				x		

Literatur Review

- **(ITS) area:** ITS applications are classified into different ITS areas (example: ‘information services’)
- **(ITS) subarea:** In between applications and areas some subareas pool applications (example: ‘public transport information’ or ‘individual traveler information’)

ITS concepts and classification: (Sub) Areas

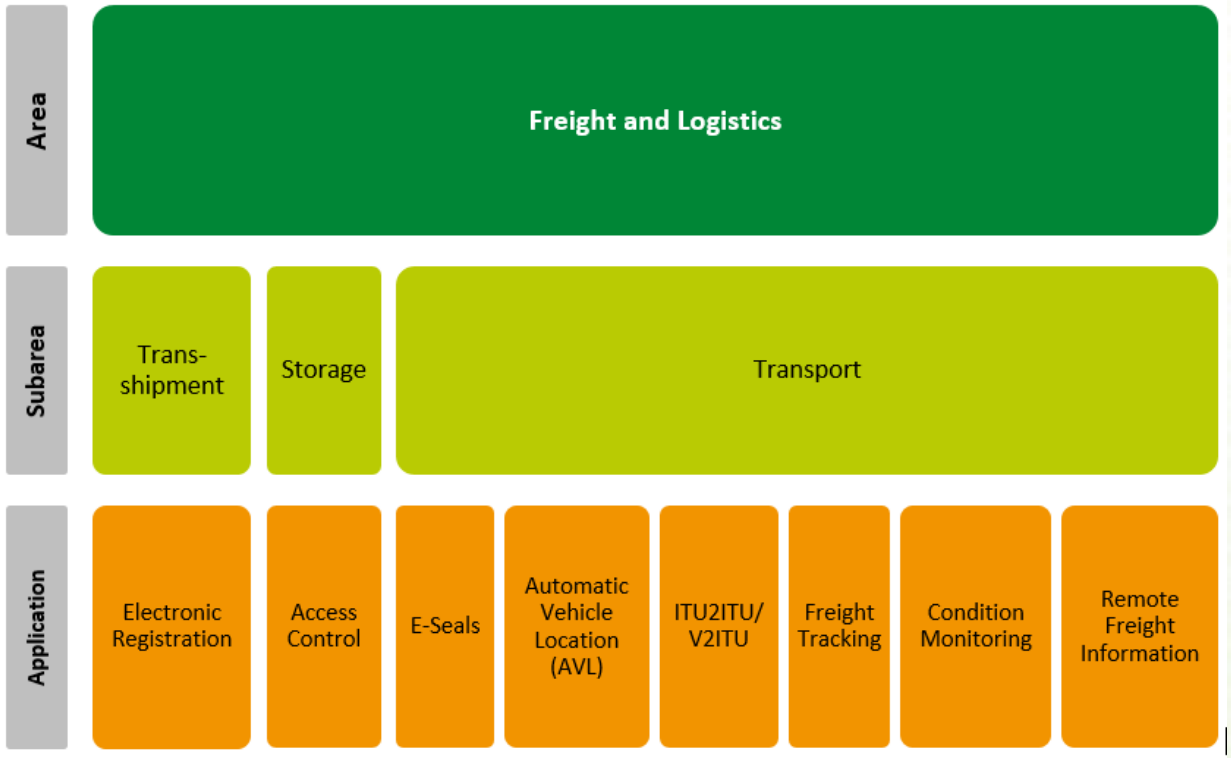


- **(ITS) application:** The combination of technologies to fulfil user requirements related to a transport mode on a certain market is a so-called *application* (example 'freight tracking')

ITS concepts and classification: Applications

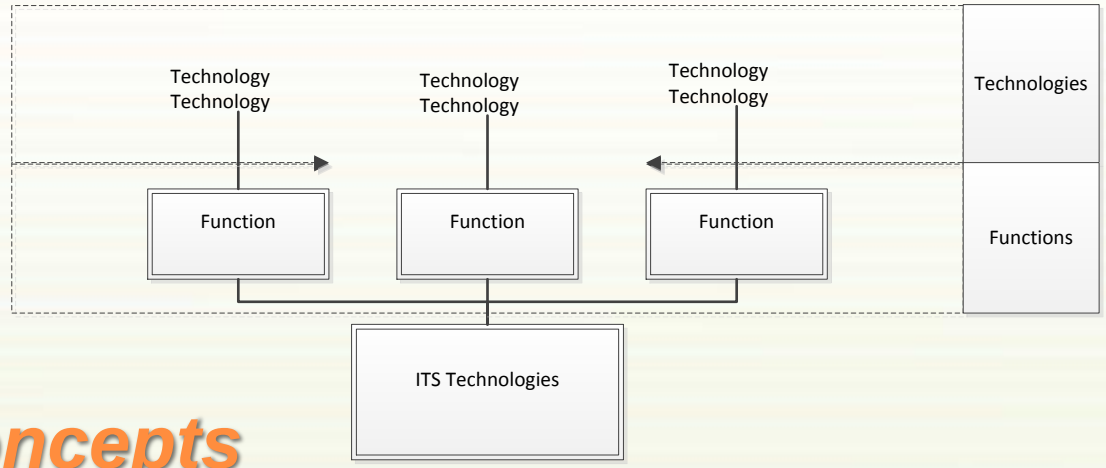
ITS Ontology

- An ontology enriches, with respect to a “simple” classification, the information available on these items (van Rees (2003)).
- An ontology is a specification of a conceptualization (Gruber (1993))
- Here exemplarily CS 3 applications:

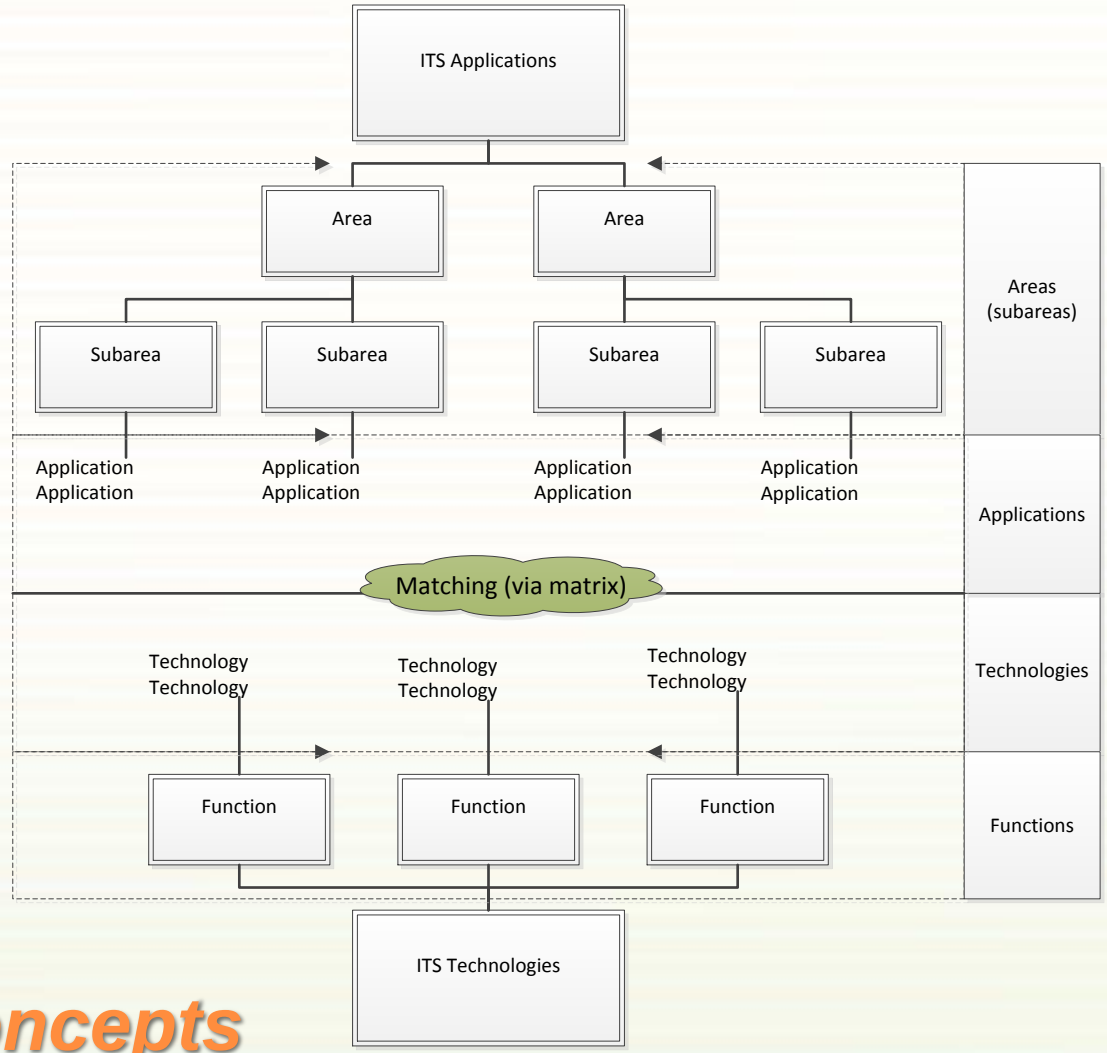


ITS Ontology

- **(ITS) technology:** These are technologies that can be applied in the context of transport and that are predominantly information and communication technologies (example: ‘digital camera’)
- **(Technology) functions:** certain technologies are classified by their functions. (example: ‘Sensors’ or ‘Identification technologies’.



ITS concepts and classification: Technologies and functions



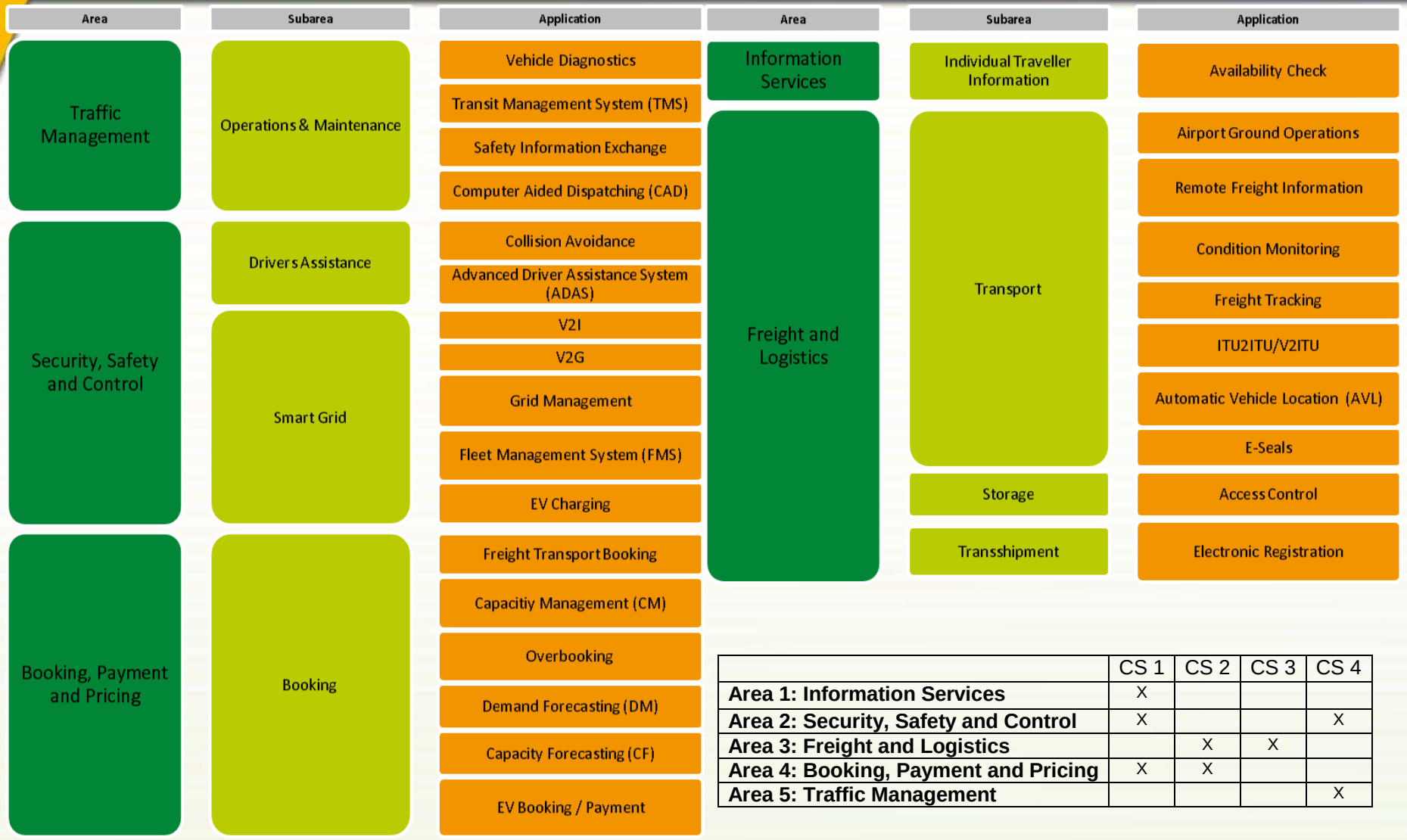
ITS concepts and classification: ITS ontology (basic)

Extract of the ITS Ontology in T-TRANS:

- All of applications that are applied by T-TRANS case studies are combined with the used technologies
- The technologies have been aggregated to their functions here.
- The numbers in the cells represent the case study number

Functions / ITS Applications	Communication technologies	Hardware infrastructure	Software infrastructure	Algorithms	Positioning technologies	Sensors (monitoring and detectin	Identification technologies	Energy related technologies
Access Control	3	3			3	3	3	
Advanced Driver Assistance System	4	4			4	4		
Airport Ground Operations	2	2			2		2	
Automatic Vehicle Location (AVL)					3,4	4		
Availability Check	1	1	1	1	1			
Capacity Forecasting (CF)		2	2	2				
Capacity Management (CM)		2	2	2				
Collision Avoidance	4	4	4		4	4		
Compueter-Aided Dispatch	4	4	4		4	4		
Condition Monitoring	3				3	3		3
Demand Forecasting (DF)		2	2	2				
E-Seals	3		3		3	3	3	
Electronic Registration	3						3	
EV Booking / Payment		1		1			1	
EV Charging		1		1				1
Fleet Management System (FMS)	1	1	1		1		1	
Freight Tracking	2	2	2,3	2	2,3			3

Extract of the ITS Ontology in T-TRANS (Application-Function-Matrix)

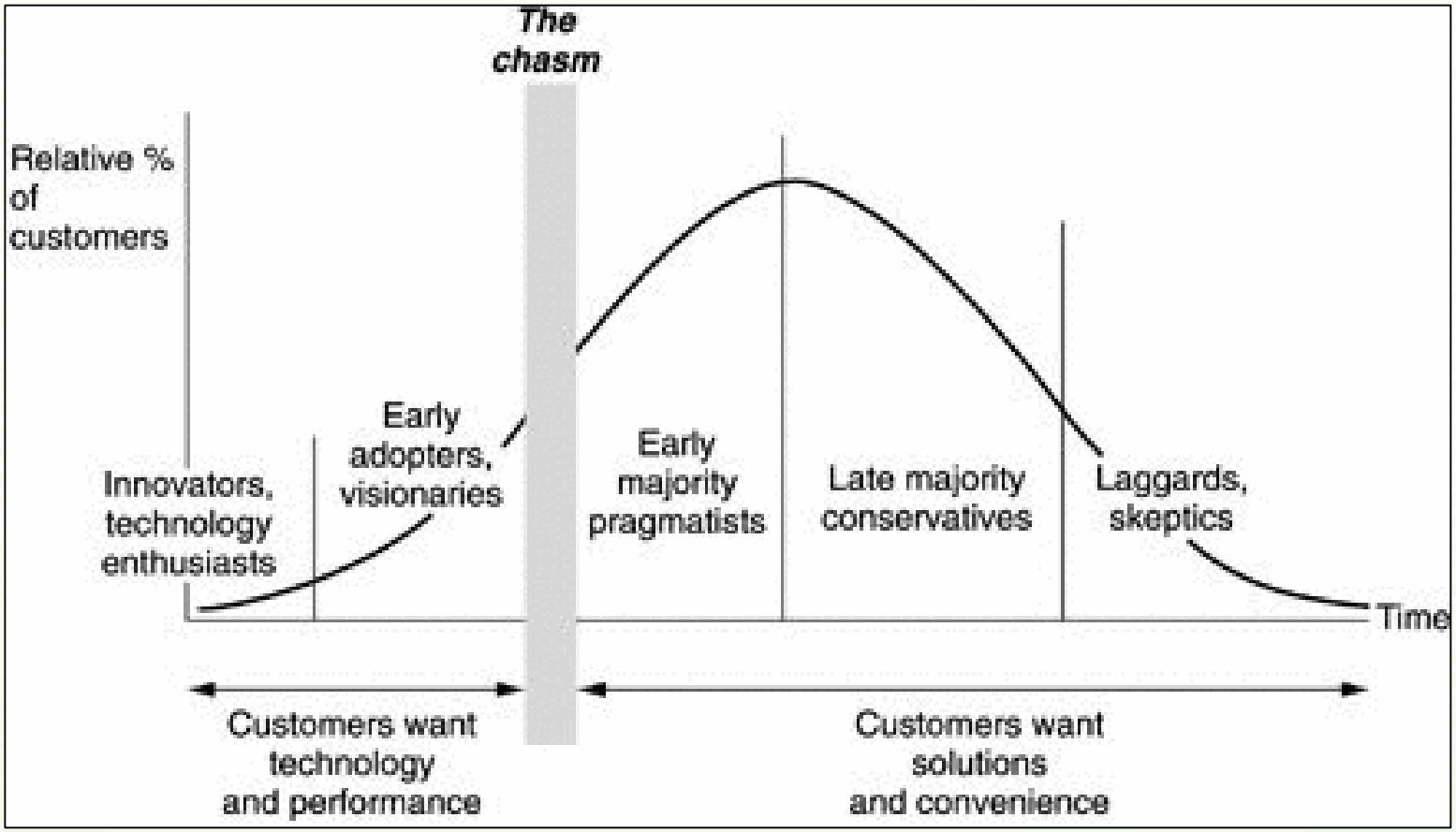


	CS 1	CS 2	CS 3	CS 4
Area 1: Information Services	X			
Area 2: Security, Safety and Control	X			X
Area 3: Freight and Logistics		X	X	
Area 4: Booking, Payment and Pricing	X	X		
Area 5: Traffic Management				X

T-TRANS ITS Ontology

- Fraunhofer and Fraunhofer CML
- The project T-TRANS
  - General Information
  - Research results
    - 3.1 Development of an Intelligent Transport System ontology - linking applications and technologies across different transport modes
    - 4.1 Success and failure factors of past innovations

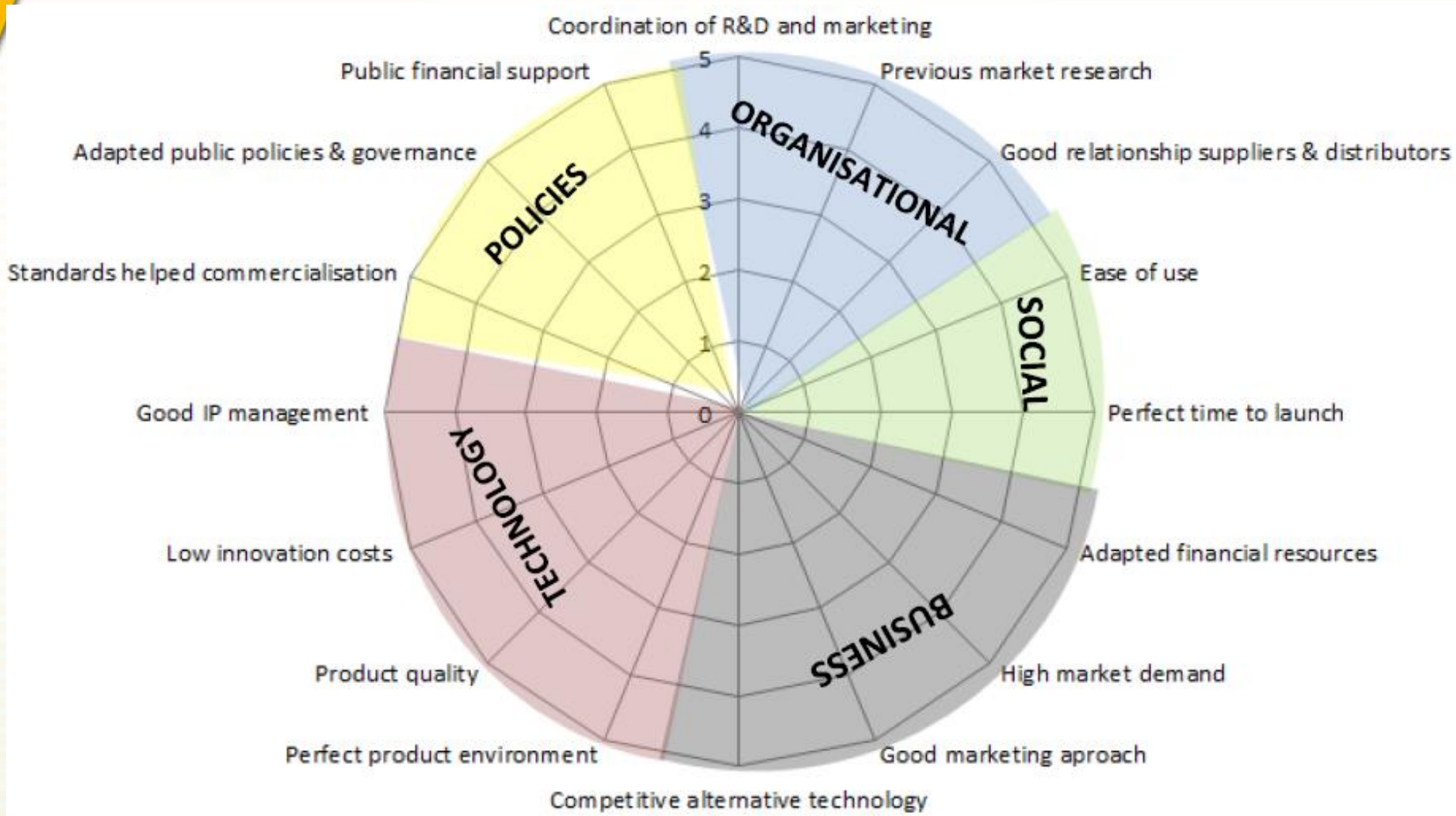
Agenda



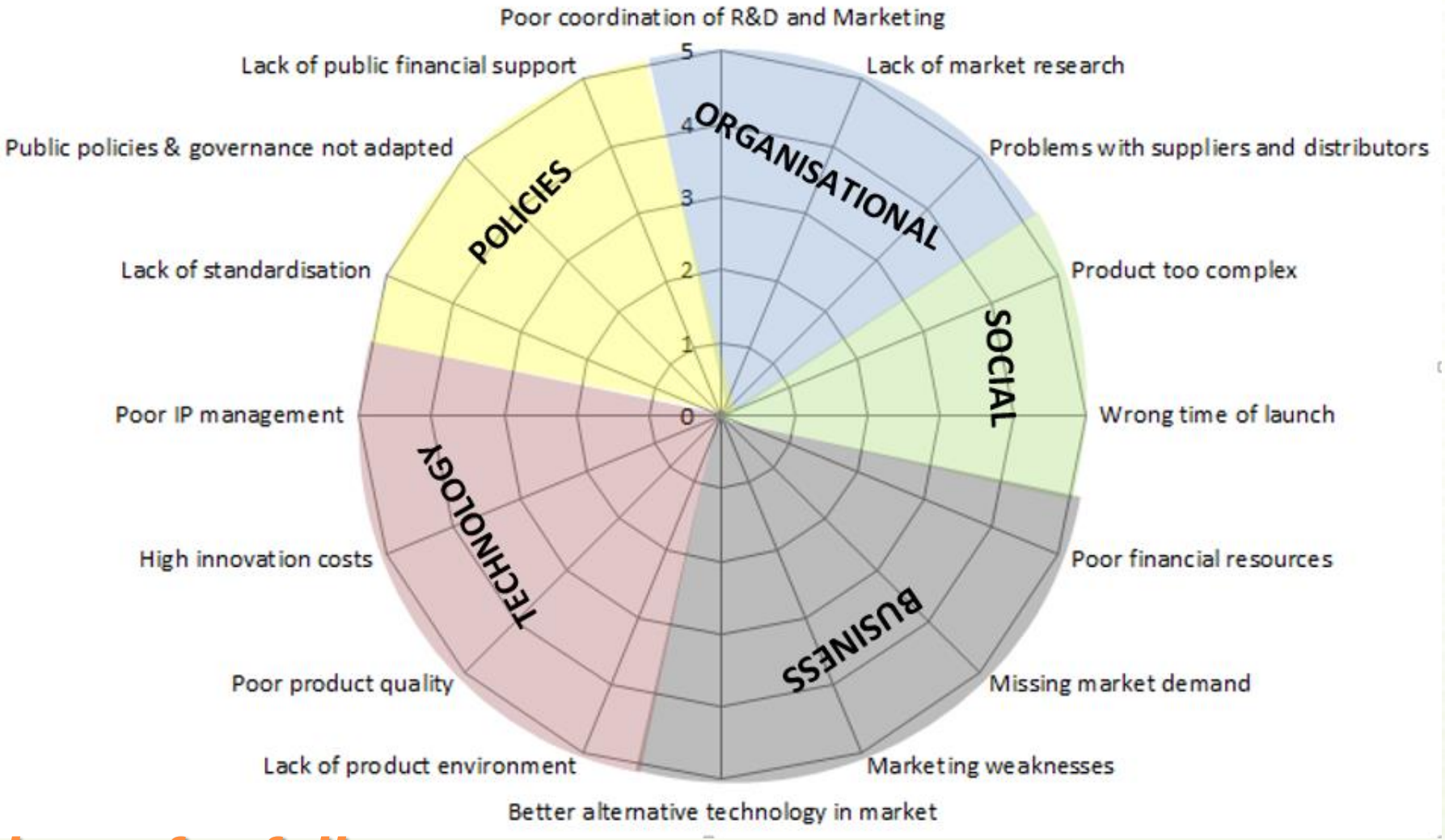
How to overcome the chasm?

- **Organisational success:** Good coordination between suppliers, partners and public government or even with its internal departments.
- **Social success:** The innovation covers the current needs of the society.
- **Business success:** Business planning, technical marketing strategy and communication strategy are harmonised with one another.
- **Technological success:** The new product technically works.
- **Policy and Normative success:** Public entities have set the a normative environment into the market to adopt the innovation.

5 Types of success



Drivers for success



Drivers for failure

	Success	Failure
Transport	Public bicycle sharing system	Segway
	Automatic Vehicle Location	Maglev
	Geographic Information Systems	Electric cars in the beginning of the 20th century
		Cargolifter
ICT	Personal Computer	Minitel
	Cloud computing	MiniDisc
	Identification cards	Video 2000
	Voice over Internet Protocol	Satellite telephones
	Microchips	HD-DVD
	Barcode	Microsoft Zune
	Smart meter	

Past innovations

Drivers for success (Transport + ICT)

Drivers for failure (Transport + ICT)

Top 5 ITS	Factors	
Rank	Success	Failure
1.	Perfect product environment	Better alternative product
2.	Public financial support	Marketing weaknesses
3.	Ease of use	The lack of product environment
4.	Good marketing approach	The lack of market research
5.	Standards	Problems with suppliers and distributors

Ranking of top five factors for success and failure (transport + ICT = ITS)

1. Increase public investment in R&D.
2. Reform policies to increase research and innovation efficiency.
3. Increase autonomy of universities.
4. Create a sound level of competition.
5. Support the internationalisation of research.
6. Create an innovation-friendly business environment.
7. Develop financial incentives.

Recommendations to public authorities

1. Create partnerships between universities and companies.
2. Fail often, fail early, fail cheap.
3. Incorporate the user in the process as soon as possible.

Recommendations to innovators

Acknowledgement

This project is funded by the European Union Seventh Framework Programme (FP7/2007-2013).

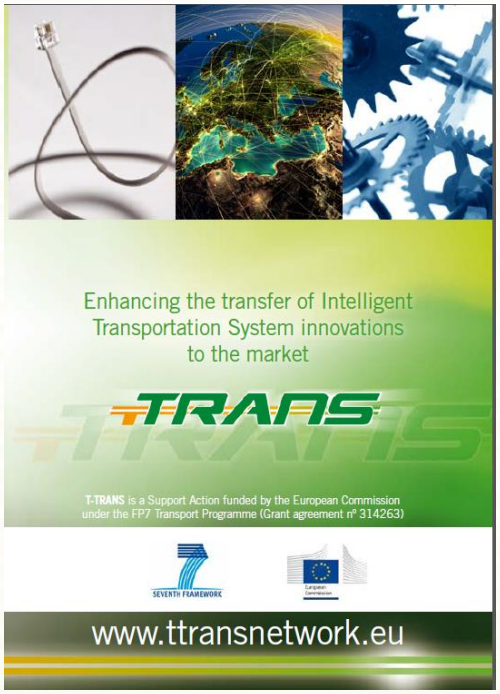
Grant Agreement nº 314263.

Sources and references I

- Aparicio, P. C., Christidis P., Ciuffo, B., Dilara, P., Giannopoulos, G., Lonza, L., McKinnon, A., Miola, A., Nelldal, B. L., Ntziachristos, L., popa, M., Schmitt, D., Thiel, C. (2012) Scientific Assessment of Strategic Transport Technologies, European Commission, Joint Research Centre, Institute for Energy and Transport, Luxembourg.
- Appel, K., Dörge, L., Storkitt, A., Aakre, A., Muskaug, R. (2002) Road Transport Informatics Terminology, NVF (Nordic Road Association), [Online], Available: http://www.nvf-its.org/terminology/download/index.htm, [Accessed: 27th August 2013].
- Diebold, J. (1995) Transportation Infostructures: The Development of Intelligent Transportation Systems, ABC-CLIO, Santa Barbara.
- European Commission (2012) Intelligent transport systems, [Online], Available: http://ec.europa.eu/transport/themes/its/index_en.htm, [Accessed: 15th March 2013].
- Gruber, T. R. (1993) A translation approach to portable ontology specifications, Appeared in Knowledge Acquisition, 5(2):199-220, 1993, [Online], Available: http://tomgruber.org/writing/ontolingua-kaj-1993.pdf, [Accessed: 9th April 2013].
- HIDO Highway Industry Development Organization (2007) ITS Handbook Japan 2006-2007, The Ministry of Land, Infrastructure, Transport and Tourism Japan, 5-18.
- Kanninen, B. J. (1996) Intelligent Transportation Systems: An Economic and Environmental Policy Assessment, Transportation Research Part A: Policy and Practice 30 (1) 1-10.

Sources and references II

- Nelson, D. C. (ed.) (2000) Intelligent Transportation Primer, Institute of Transportation Engineers, Washington DC.
- RITA (2009) Applications Overview, [Online], Available: http://www.itsoverview.its.dot.gov/, [Accessed: 8th April 2013].
- Samper, J. J., Tomás V. R., Martinez, J. J., van den Berg, L. (2006) An Ontological Infrastructure for Traveller Information Systems, Proceedings of the IEE ITSC 2006: 2006 IEEE Intelligent Transportation Systems Conference, Toronto.
- Wootton, J. R., García-Ortiz, A., Amin, S. M. (1995) Intelligent Transportation Systems: A Global Perspective, Mathematical and Computer Modeling 22 (4-7) 259-268.
- van Rees, R. (2003) Clarity in the Usage of the Terms Ontology, Taxonomy and Classification. In Proceedings of the 20th CIB W78 Conference on Information Technology in Construction (pp. 432-439). Waiheke Island, Auckland, New Zealand. p.434, [Online], Available: http://reinout.vanrees.org/_downloads/2003_cib.pdf [Accessed: 8th April 2013].
- Weiland, R. J., Purser, L. B. (1999): Intelligent Transportation Systems, [Online], Available: http://onlinepubs.trb.org/onlinepubs/millennium/00058.pdf [Accessed: 29th August 2013].
- T-TRANS (2012) Enhancing the transfer of Intelligent Transportation System innovations to the market (T-TRANS), [Online], Available: http://www.ttransnetwork.eu/ttrans/ [Accessed: 29th August 2013].



www.ttransnetwork.eu

Dissemination and set-up of the innovation network

Contact:
Dipl.-Ing. Susanne Kellberger
Fraunhofer Center for Maritime Logistics and Services CML
Schwarzenbergstraße 95 D, 21073 Hamburg, Germany
Telefon +49 40 42878-6116
susanne.kellberger@cml.fraunhofer.de
www.cml.fraunhofer.de

SEVENTH FRAMEWORK PROGRAMME

TRANS

Thank you for your attention!

Do you have any questions?