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# SCIENTIFIC RESEARCH METHODOLOGIES AND TECHNIQUES

## Unit 12: ROADMAPPING AND FUTURE PLANNING (I)

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PhD PROGRAM IN ELECTRICAL AND COMPUTER ENGINEERING

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## 1. *FUTURES* RESEARCH



## What is it?

**Futures research** - the science, art and practice of postulating possible, probable, and preferable futures.

It includes analyzing the sources, patterns, and causes of change and stability in the attempt to develop foresight and to map possible futures

### Some methods:

- Delphi method
- Trends identification and analysis
- Scenario development
- Roadmapping
- ...

### A good information source:



**The Millennium Project**

World Federation of UN Associations

[www.unmillenniumproject.org](http://www.unmillenniumproject.org)

See also: [www.ifla.org/IV/ifla61/61-weid.htm](http://www.ifla.org/IV/ifla61/61-weid.htm)



## The aim

Long-term notions  
of the good society

**Desirable futures**

**Probable futures**  
Likely temporal  
development  
of societal problems

**Possible futures**

Unrealized but realistic  
possibilities of problem  
solutions



# “Futures research” methodologies

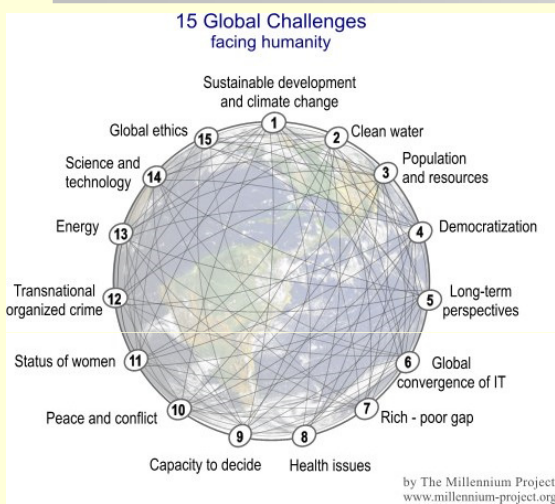
1. Introduction to the Futures Research
- 1.5 Evaluation and organization of Methods
2. Environmental Scanning
3. The Delphi Method
4. Real-Time Delphi
5. The Futures Wheel
6. The Futures Polygon
7. Trend Impact Analysis
8. Cross-Impact Analysis
9. Wild Cards
10. Structural Analysis
11. The Systems Perspectives
12. Decision Modeling
13. Substitution Analysis
14. Statistical Modeling
15. Technology Sequence
16. Morphological Analysis
17. Relevance Trees
18. Scenarios
19. Interactive Scenarios (software)
20. Robust Decision making
21. Participatory Methods
22. Simulation and Games
23. Genius Forecasting and Intuition
24. Visioning for Strategic Planning
25. Normative Forecasting
26. TRIZ
27. S&T Road Mapping
28. Field Anomaly Relaxation (FAR)
29. Text Mining for Technology Foresight
30. Agent Modeling (demo software)
31. Prediction Markets
32. Forecasting By Artificial Neural Networks
33. State of the Future Index
34. SOFI Software System
35. Multiple Perspective Concept
36. A Toolbox for Scenario Planning
37. Heuristics Modeling
38. Personal Futures
39. Causal Layered Analysis
40. Linking Methods
41. Integration, Comparisons, and Frontiers

[Glenn, 2008]

[www.clingendael.nl/cscp/events/20081216/20081216\\_presentatie\\_glenn.ppt](http://www.clingendael.nl/cscp/events/20081216/20081216_presentatie_glenn.ppt)



# “Futures research” examples



[www.iff.org/system/files/deliverable/SR1293\\_IFTF2010TYF\\_MapoftheDecade\\_1.pdf](http://www.iff.org/system/files/deliverable/SR1293_IFTF2010TYF_MapoftheDecade_1.pdf)



## Delphi method

“The Delphi Method is based on a **structured process** for collecting and distilling knowledge from a **group of experts** by means of a series of questionnaires interspersed with controlled opinion feedback “

“The Delphi method is a systematic interactive forecasting method for obtaining forecasts from a panel of independent experts “

“*A means of eliciting and combining expert judgments while avoiding the pitfalls of conference room confrontations.*” [Glenn, 2008]

Software example:  
<http://armstrong.wharton.upenn.edu/delphi2/>

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Administrator log in  
Expert log in

**Delphi**  
forecastingprinciples.com

Authorization:

- Administrator log in
- Expert log in

Related useful links and texts:

- Forecasting website
- >>> What's New <<<

Welcome to the Delphi Decision Aid!

Delphi is a data-gathering tool to aid in the anonymous survey of expert judgments, obtained in a series of rounds, ultimately for forecasting purposes. This can have (but is not limited to) the following applications:

- New product forecasts
- Personnel selection
- Estimating the effect of a change in a marketing program
- Predicting outcomes in conflict situations

Delphi is designed only for use with questions that yield either rankings or quantitative estimates.

This site helps you to:

- Select experts
- Develop questions and scales
- Obtain responses from the experts
- Summarize a report after each round

It also allows access to relevant literature including, in some cases, full-text articles.

If you wish to administer a session, please [create a new administrator account](#).

**Program development**

This Delphi program was developed by J. Scott Armstrong and was funded in part by the [International Institute of Forecasters](#).

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## Delphi method ...

1. Formation of a team to undertake and monitor a Delphi.
2. Selection of one or more panels to participate in the exercise.  
*Customarily, the panelists are experts in the area to be investigated.*
3. Development of the first round Delphi questionnaire
4. Testing the questionnaire for proper wording (e.g., ambiguities, vagueness)
5. Transmission of the first questionnaires to the panelists
6. Analysis of the first round responses
7. Preparation of the second round questionnaires (and possible testing)
8. Transmission of the second round questionnaires to the panelists
9. Analysis of the second round responses  
*(Steps 7 to 9 are reiterated as long as desired or necessary to achieve stability in the results.)*
10. Preparation of a report by the analysis team to present the conclusions of the exercise

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## Trends and drivers

	2007	Short term	2008	2009	Medium term	2011	2012	Long term	2015	
Trends & Drivers	Social:	1. Education & Skills (Technical)	4. Public Opinion & Sector Perception	3. Education (Leadership & Entrepreneurship)	MRSA	20. Safety	17. Demographics / Aging Population	Attracting Talent to UK		
	Technological:	7. Speed Time to Market	15. Cross-Industry Knowledge Transfer	18. Product Innovation	9. Increased use of Vaccines (due to Economic Drivers)	11. Productivity → Integration of R&D & Process Development	10. Personalised Medicine	19. Synthetic Biology		
	Environmental:		Environmental Legislation		Growth of BioFuels (Spin-off Markets / Technologies)		Sustainability	Reduce waste in disposables		
	Economic:	Weak \$	6. Lack of Critical Mass of Bio Sector in UK	16. Demand for Lower Manufactured Cost of Goods	2. Funding & Fiscal Environment	14. IP & Patents	13. Manufacturing Location → Low Cost Economies	12. New Business Models / Scale Reduction	Globalisation of R&D	Global Growth Opportunity
	Political & Legal:	8. Need for Improved Regulation			5. R&D & Approvals Costs to Market					

© L. M. Camarinha-Matos, 2009-2012 [www.bioprocessuk-website.org/documents/bioProcessUKroadmapreportMBDRAFTforwebsite.pdf](http://www.bioprocessuk-website.org/documents/bioProcessUKroadmapreportMBDRAFTforwebsite.pdf)

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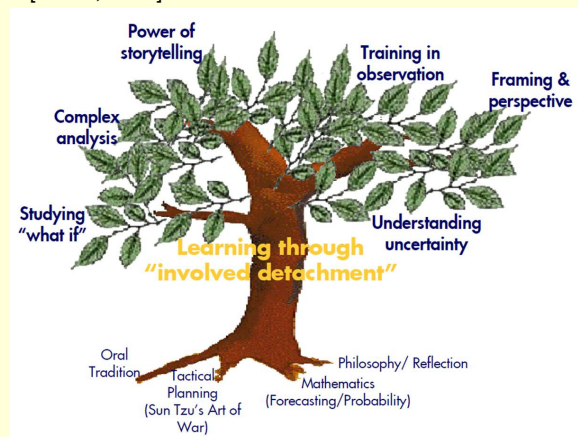
## Scenarios planning

A **scenario** is a story with plausible cause and effect links that connects a future condition with the present, while illustrating key decisions, events, and consequences throughout the narrative.

**Scenario planning** is a method for learning about the future by understanding the nature and impact of the most uncertain and important driving forces affecting our world. [www.well.com/~mb/scenario\\_planning/](http://www.well.com/~mb/scenario_planning/)

Scenarios resemble a set of stories, written or spoken, built around carefully constructed plots.

[Glenn, 2008]



Roots of scenario thinking [Davis, 2002]

### Scenarios: An explorer's guide

[www-static.shell.com/static/aboutshell/downloads/our\\_strategy/shell\\_global\\_scenarios/scenario\\_explorersguide.pdf](http://www-static.shell.com/static/aboutshell/downloads/our_strategy/shell_global_scenarios/scenario_explorersguide.pdf)

### Scenarios as a Tool for the 21st Century

[www.casin.ch/web/bulletinboard/geddavisscenariosastool2002.pdf](http://www.casin.ch/web/bulletinboard/geddavisscenariosastool2002.pdf)

© L. M. Camarinha-Matos, 2009-2012

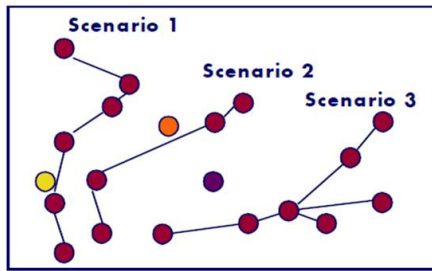
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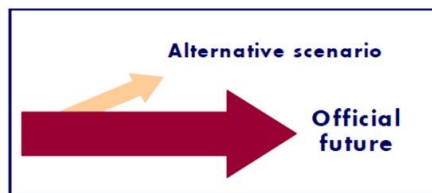
## Types of scenarios

emerge from discussion and exploration of drivers and trends

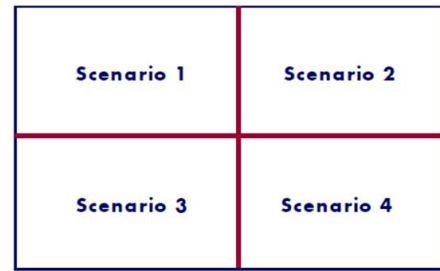
choose two or more of those drivers to structure scenario worlds



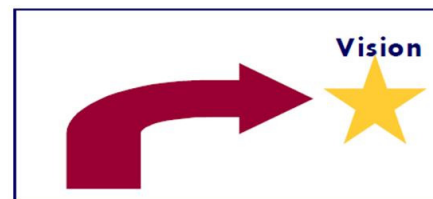
**Inductive**



**Incremental**



**Deductive**



**Normative**

similar to the official future - the one written in our strategic plans - but different enough to move the organisation in a different direction

the futures that we believe 'should' happen

[Davis, 2002]

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## Scenario building

**Basic steps in a scenario planning exercise are:**

**Stage 1:** determine a focal issue or critical decision to 'anchor' the process

**Stage 2:** identify and analyze the internal and external driving forces after the decision

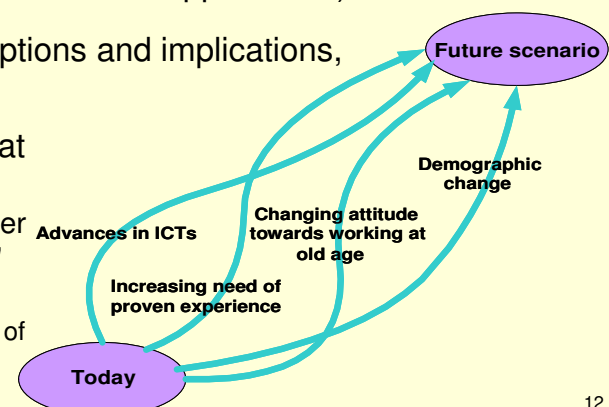
(these drivers are usually categorized into 'predetermined elements', those which we have a good idea about how they will play out over time - for example, demographics, and 'critical uncertainties', those which we have no real understanding of how they will develop into the future)

**Stage 3:** build scenarios (using inductive or deductive approaches)

**Stage 4:** identify robust potential strategic options and implications, and determine strategic options

**Stage 5:** identify drivers and other issues that need to be monitored over time (these are often called 'early warning signals' - to see whether something identified in a scenario is 'coming true' or is less likely to happen).

This last step is often neglected, but it is critical in terms of embedding strategic thinking in the organization.



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## Scenario example

### A scenario in active ageing

José is apprehensive today. In fact he has been worried lately. Everything was different two years ago when he and his friend had this idea for an innovative low consumption air conditioning device and started their FreshAir company. The two engineers soon developed the new equipment thanks to their dedication and enthusiasm. But now they are facing difficulties. They don't know much about marketing or internationalization, although they understand the need to target a global market. Unfortunately they spent all their resources in the start-up phase and now cannot afford to get assistance from one of those big consultancy companies ... Either something happens or may have to close and fire their employees soon...

Three weeks later ...

José and his colleague are having a meeting with Carlos and Ana, two members of the local branch of the Regional Development Agency (RDA). After some initial contacts, Carlos and Ana spent some time in the company making an analysis of its problems and today they are presenting their conclusions. The diagnosis seems logical to José. It is clear that FreshAir needs some coaching and specialized guidance in two crucial areas – focused marketing and internationalization.

But they cannot afford the high costs of such specialized assistance. RDA, an organization funded by the local government and that aims to promote local businesses, made the analysis for free. Unfortunately they do not have the expertise to help in the next phase ...

Guessing the worries passing through José's mind, Ana told them that there is a potential solution. Then she mentioned the ActiveSeniors association ...

Pedro is a retired professional, member of ActiveSeniors. Based on his specific expertise and experience in marketing, he was invited to join a team involving 2 other members of ActiveSeniors with competencies in internationalization and air conditioning. Together with Carlos and Ana from RdA, this team started a temporary collaborative network with people from FreshAir. After 3 months the first results are starting to show up. The ActiveSeniors team not only provided technical assistance and guidance, but also helped FreshAir establish some contacts with a new market in India. Now the business prospects for the young company started to seem brighter...

Pedro is quite satisfied for having this opportunity to work on a topic where his experience was a real added value. He very much appreciated the diagnosis and preparatory work done by RDA, which allowed him and his senior colleagues to focus on the core issues. Working in a team was a great experience. The small payment Pedro received is also great to complement his pension and give him some better living conditions. FreshAir and RDA could mobilize some resources to pay a small fee to the 3 members of ActiveSeniors, a value much lower than the typical consultancy prices that could never be afforded by FreshAir.

Carlos and Ana got a special recognition from their boss at RDA for being successful in helping a local company and thus creating better economic prospects for the region.

José and his friend re-gained their enthusiasm and they really appreciated the value of this collaboration endeavor with RDA and ActiveSeniors. They certainly plan to keep the contact and look forward to using again this amazing pool of expertise and experience available at ActiveSeniors.

[ePAL project, 2008]



## 2. ROADMAPPING CONCEPT



# Roadmapping concept

"A **'roadmap'** is an extended look at the future of a chosen field of inquiry composed from the collective knowledge and imagination of the brightest drivers of change in that field."

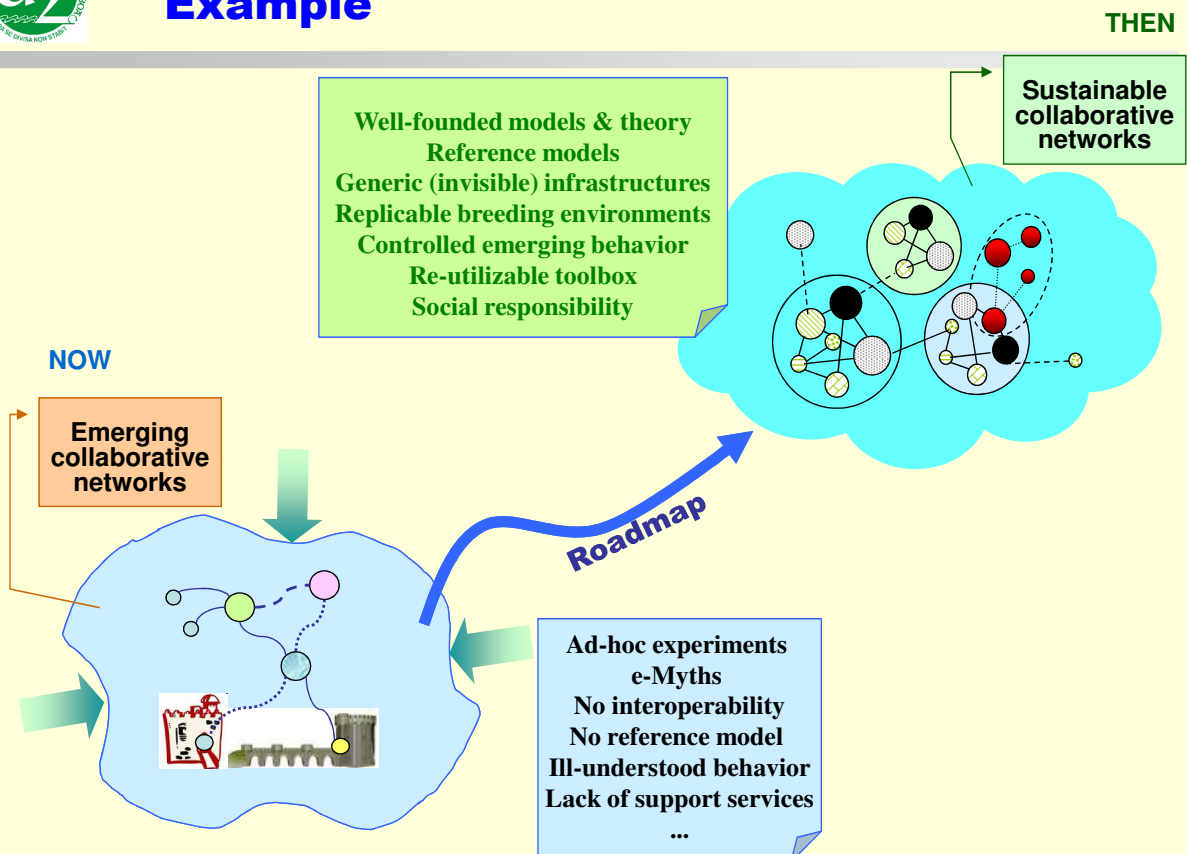
[Galvin 2002]

“**Roadmapping** is a popular metaphor for planning and portraying the use of scientific and technological resources, elements and their structural relationships over a period of time. The process of roadmapping identifies, evaluates and selects strategic alternatives that can be used to achieve desired objectives, and the resulting roadmaps summarise and communicate the results of key business decisions”.

[Vähäniitty, et al. 2004]



# Example







## Types of roadmaps



- Science and research roadmaps
- Cross-industry roadmaps
- Industry roadmaps
- Technology roadmaps
- Product roadmaps
- Product-technology roadmaps
- Project and issue roadmaps



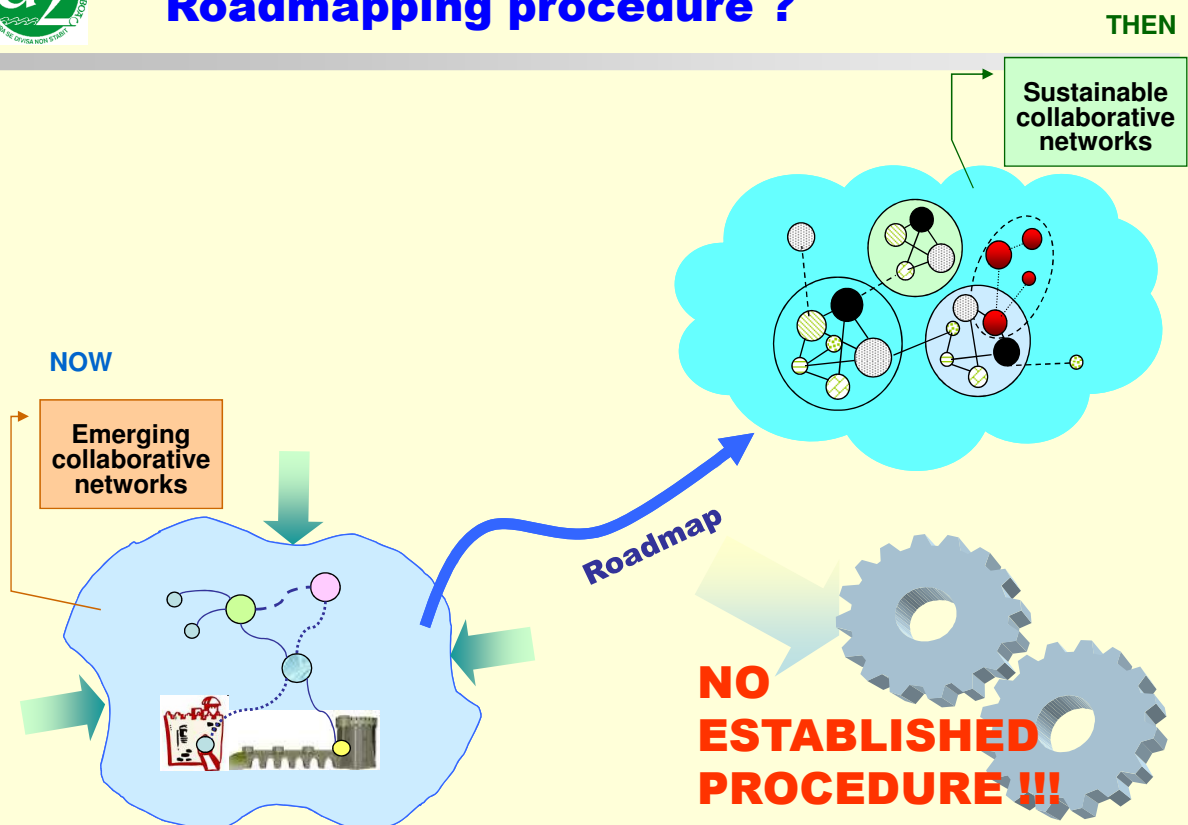
## Types of roadmaps ...

### Roadmapping Topics

	Definition and Strategy "Know-why"	Direction "Know-what"	Technology "Know-how"	Action Plan "To-do"
<b>Science and Technology Roadmaps</b>	<ul style="list-style-type: none"> <li>• Scope of the Field</li> <li>• Technology Applications</li> </ul>	<ul style="list-style-type: none"> <li>• Technical Challenges</li> <li>• Architecture</li> <li>• Trends, Discontinuities, and Objectives</li> </ul>	<ul style="list-style-type: none"> <li>• Technology Elements and Evolution</li> <li>• Competitive Technologies and Costs</li> </ul>	<ul style="list-style-type: none"> <li>• Action Programs</li> <li>• Technology Investment</li> <li>• IP and Standards</li> <li>• Risk Roadmap</li> </ul>
<b>Industry and Government Roadmaps</b>	<ul style="list-style-type: none"> <li>• Industry Structure and Position</li> <li>• Customer Drivers</li> <li>• Industry Direction</li> </ul>	<ul style="list-style-type: none"> <li>• Technical Challenges</li> <li>• Architecture</li> <li>• Trends and Disruptions</li> <li>• Learning and Targets</li> </ul>	<ul style="list-style-type: none"> <li>• Technology Elements and Evolution</li> <li>• Technology Alternatives</li> <li>• Future Costs</li> </ul>	<ul style="list-style-type: none"> <li>• Action Programs</li> <li>• Technology Investment</li> <li>• IP and Standards</li> <li>• Risk Roadmap</li> </ul>
<b>Product – Technology and Platform Roadmaps</b>	<ul style="list-style-type: none"> <li>• Market Structure and Size</li> <li>• Customer Drivers</li> <li>• Competitive Strategy</li> </ul>	<ul style="list-style-type: none"> <li>• Product Roadmap</li> <li>• Architecture</li> <li>• Product Drivers and Targets</li> <li>• Feature evolution</li> </ul>	<ul style="list-style-type: none"> <li>• Technology Elements and Evolution</li> <li>• Competitive Position</li> <li>• Target Costing</li> </ul>	<ul style="list-style-type: none"> <li>• Action Programs</li> <li>• Technology Investment</li> <li>• IP and Standards</li> <li>• Risk Roadmap</li> </ul>

### 3. ROADMAPPING METHODOLOGY

### Roadmapping procedure ?

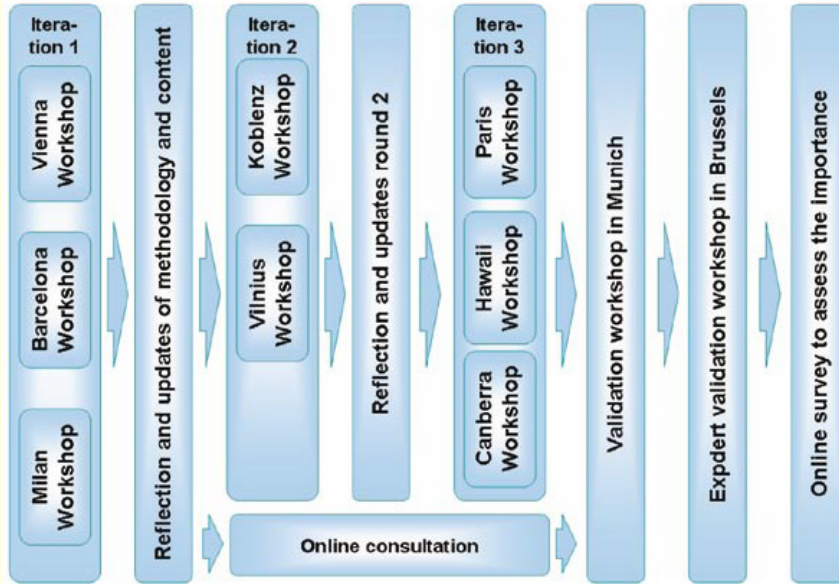




# Roadmapping procedure ?

One frequent approach: Organizing activities around a series of workshops

Example: eGovRTD2020 roadmapping workshops



### Difficulties:

Without a preliminary study, initial workshops can be quite inefficient

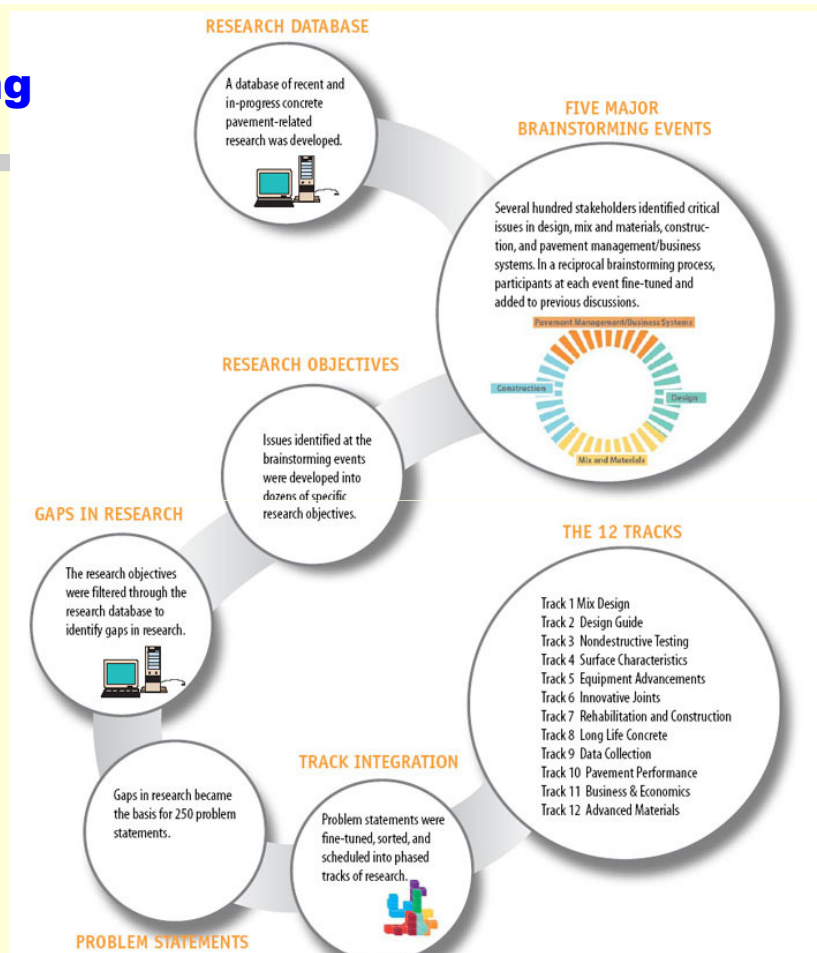
Some participants may mislead the discussions

<http://www.uni-koblenz.de/FB4/Contrib/EGOVRTD2020/FinalBook.pdf>



# Roadmapping procedure ?

An example in Concrete Pavement Road Map





# VOmap project

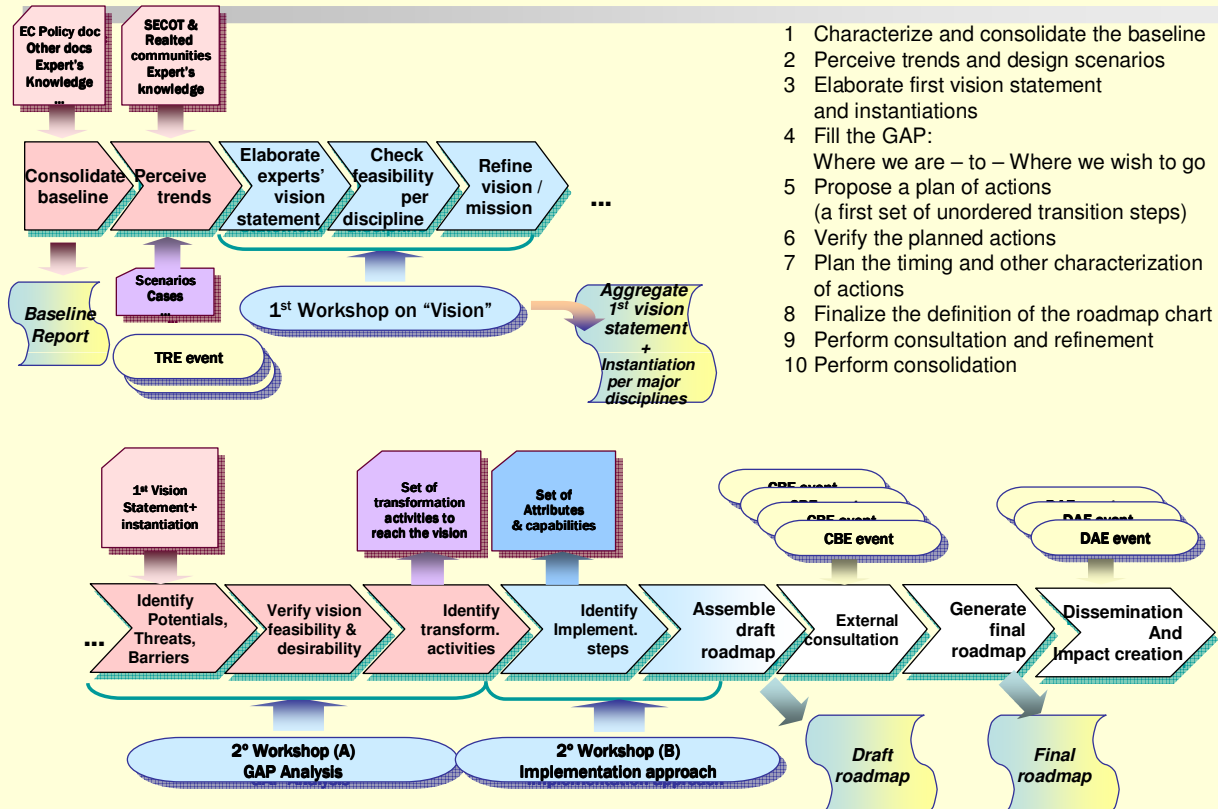
VOmap aimed at identifying and characterizing the

- ➔ key research challenges
- ➔ required constituency
- ➔ implementation model

for a comprehensive initiative to affirm the European leadership on dynamic collaborative virtual organizations



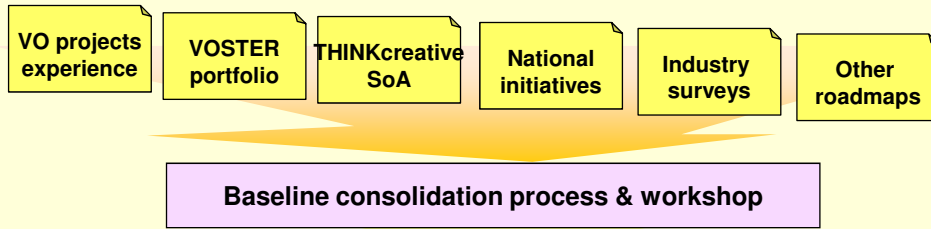
## 10-step procedure



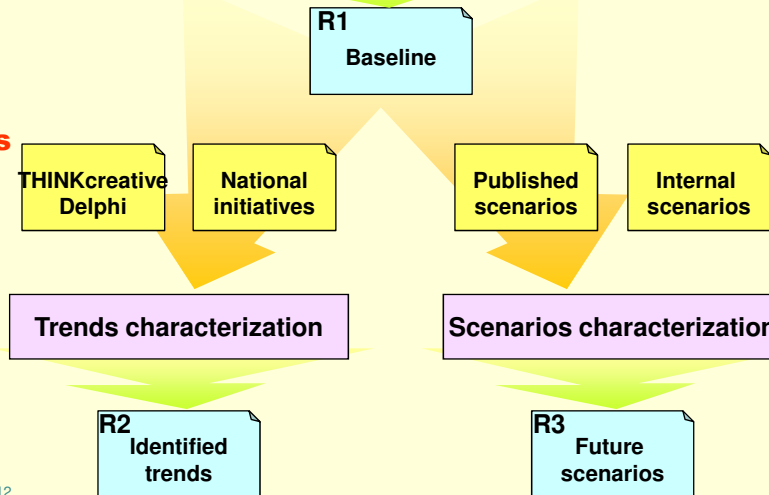


# VOmap roadmapping procedure

## 1 Characterize and consolidate baseline

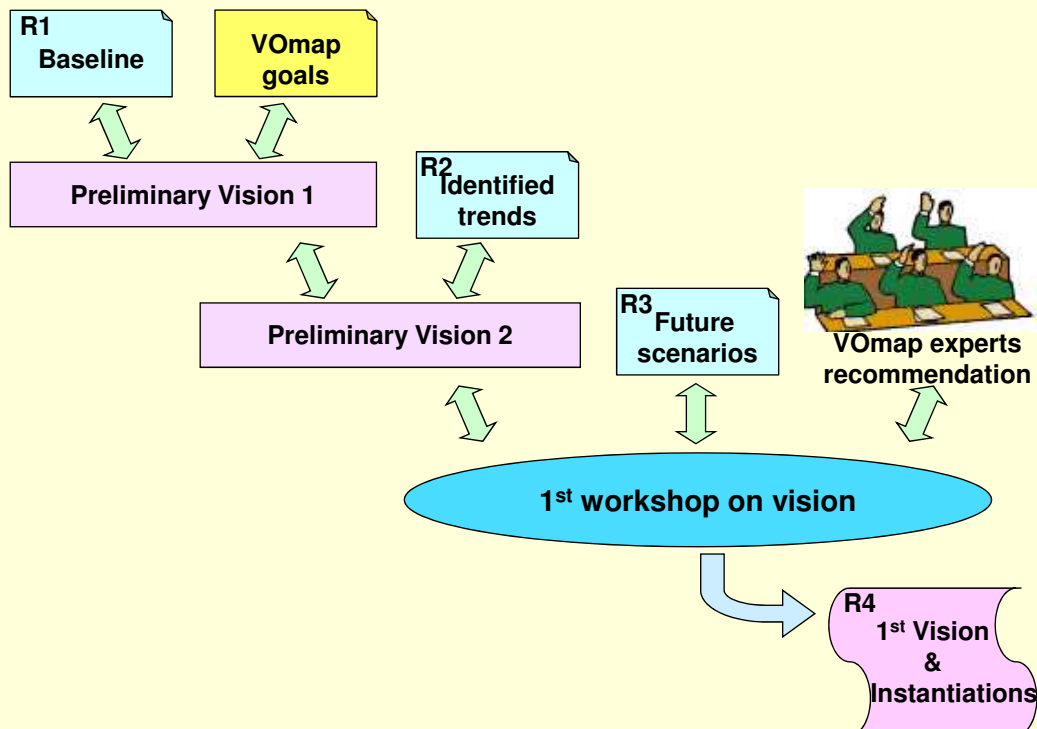


## 2 Perceive trends and design scenarios



# VOmap roadmapping procedure ...

## 3 Elaborate first vision statement and instantiations





## Building the vision

- ▶ **Building the Vision** is a main step in creating the **roadmap**
- ▶ **Roadmap** provides an **active plan** of how to reach the **desired Vision constellation for the future**

- Vision building is **not** a mechanism to foresee the future !
- **But to define the future state that we wish to reach**

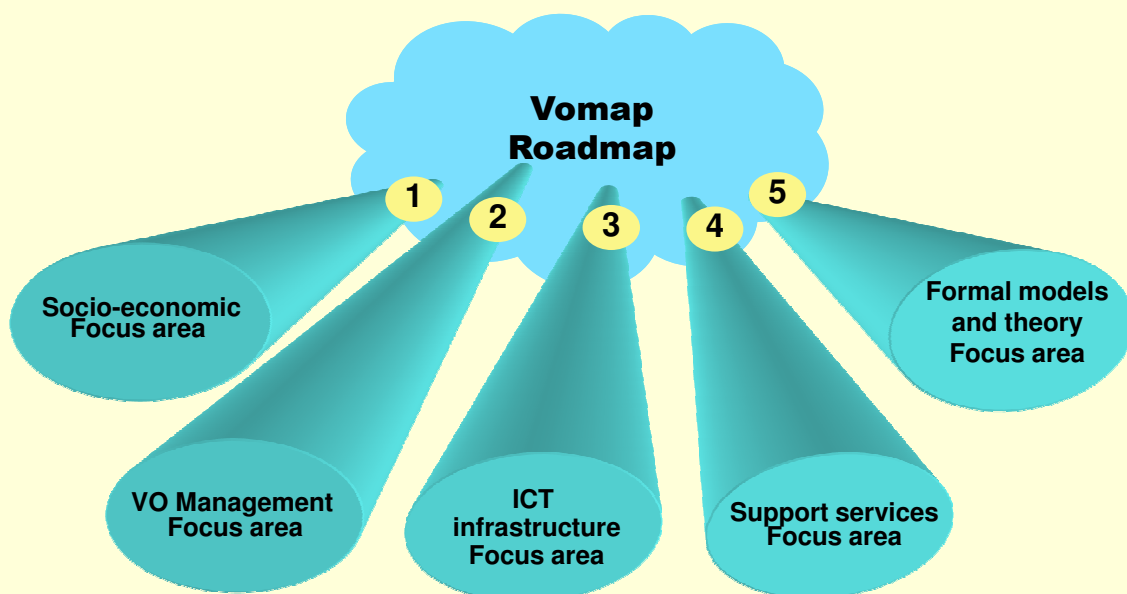
To **establish a vision**:

- **Significant market and technology trends**
- **Expert's recommended requirements for future success of the VOs**
- **The state-of-the-art & Consolidated baselines**
- **Elaboration and characterization of plausible future scenarios**
- ...

**Roadmapping is planning, not forecasting !**



## VOmap focus areas

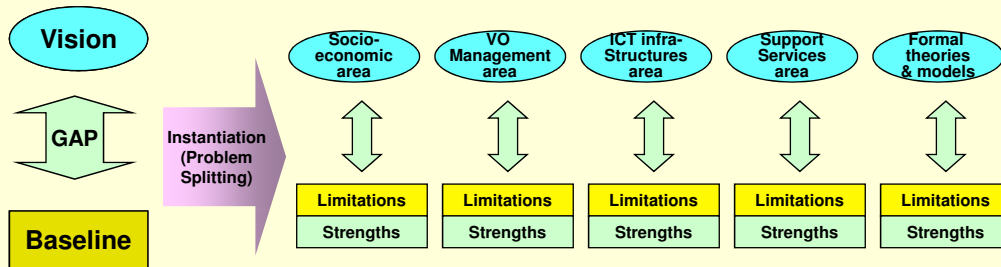


**Multi-disciplinary contributions**

# VOmap roadmapping procedure ...

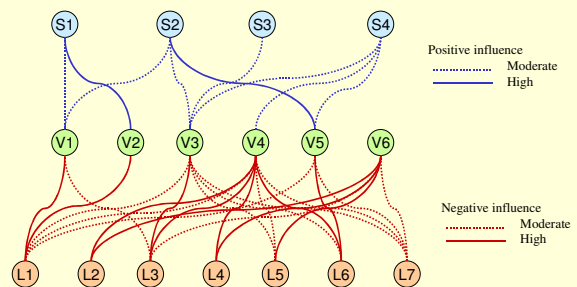
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Filling the GAP: "Where we are" – to – "Where we go"



## Influence maps

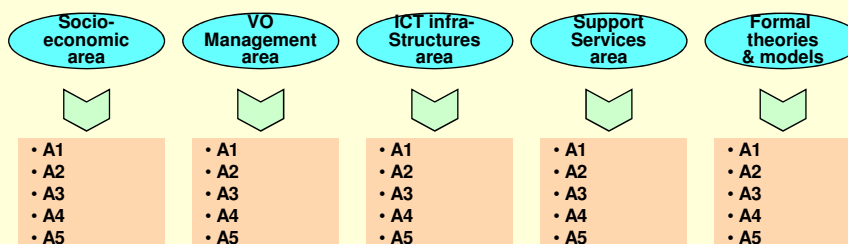
	V1	V2	V3	V4	V5	V6
S1						
S2						
S3						
S4						
L1						
L2						
L3						
L4						
L5						
L6						
L7						



# VOmap roadmapping procedure ...

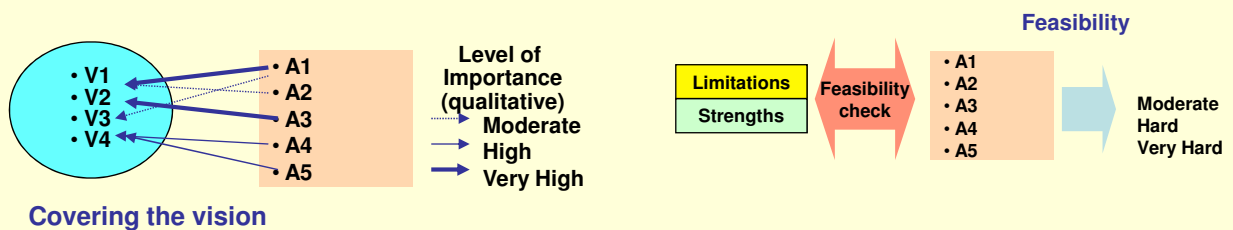
5

Propose a plan of actions (a set of unordered transition steps)



6

Verify the planned actions

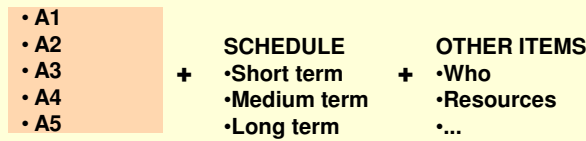




# VOmap roadmapping procedure ...

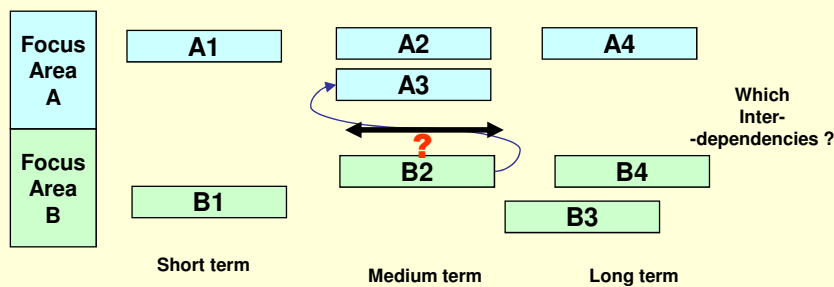
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## Plan the timing and other characterization of actions



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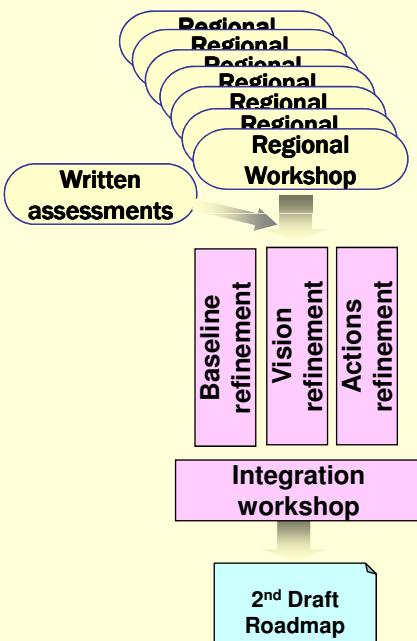
## Finalize the definition of the roadmap chart



# VOmap roadmapping procedure ...

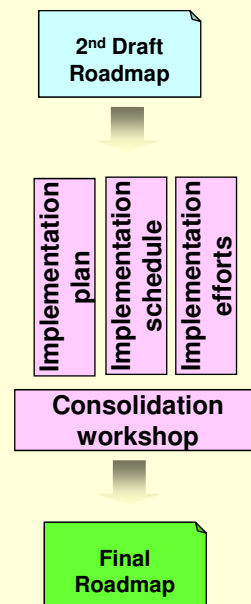
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## Perform consultation and refinement



10

## Perform consolidation







## How does a vision statement look like?



In 2015 the majority of organizations and individuals will be part of sustainable collaborative networks that will act as breeding environments for the formation of dynamic virtual organizations, in response to fast changing economic and social conditions.

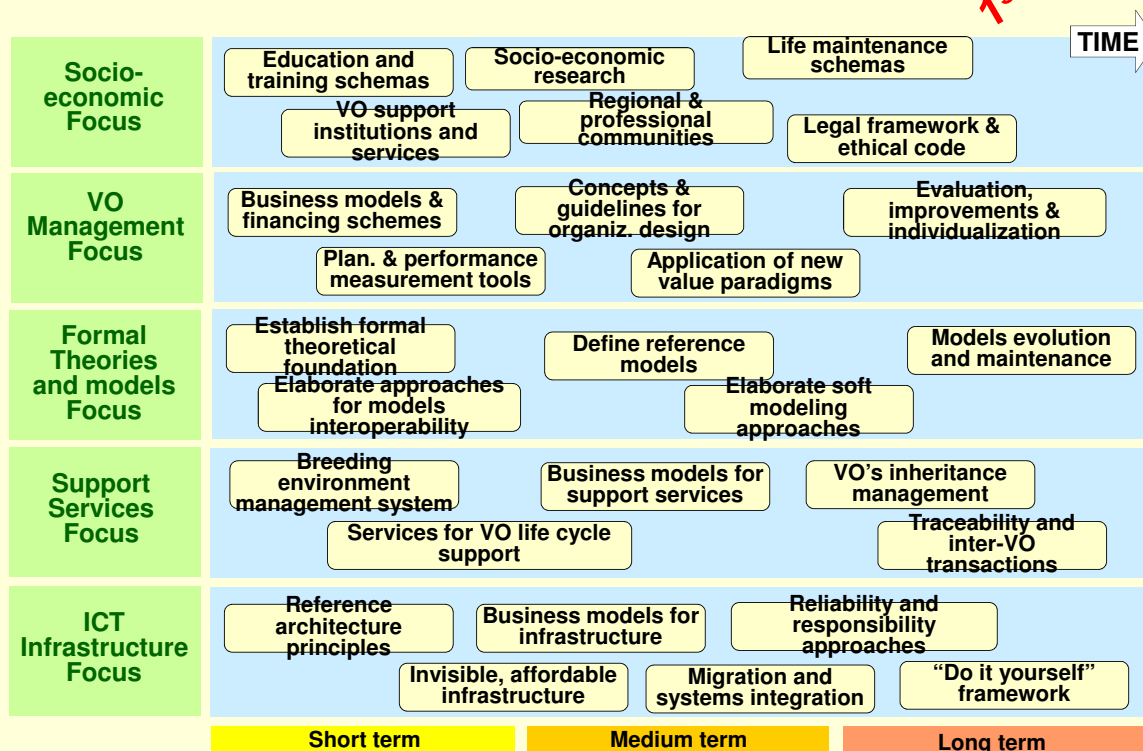
- Well founded models of collaboration
- Management systems for breeding environments replicable to a large variety of sectors
- Generic and transparent infrastructure and re-utilizable service toolbox, based on interoperability standardization
- Extensive use of pervasive computing
- VO management principles adapted to emerging behavior in complex networks
- Accepted mechanisms to handle innovation and new value systems
- Social responsibility, including “life maintenance”
- Better understanding and handling of VO-related cultural/regional issues
- Definition of moral / ethical code for VOs
- Comprehensive (international) legal frameworks for VOs

As a result, a strong and cohesive social fabric is built in response to turbulence and uncertainty.



## How does a roadmap look like?

**Vomap**  
1st attempt



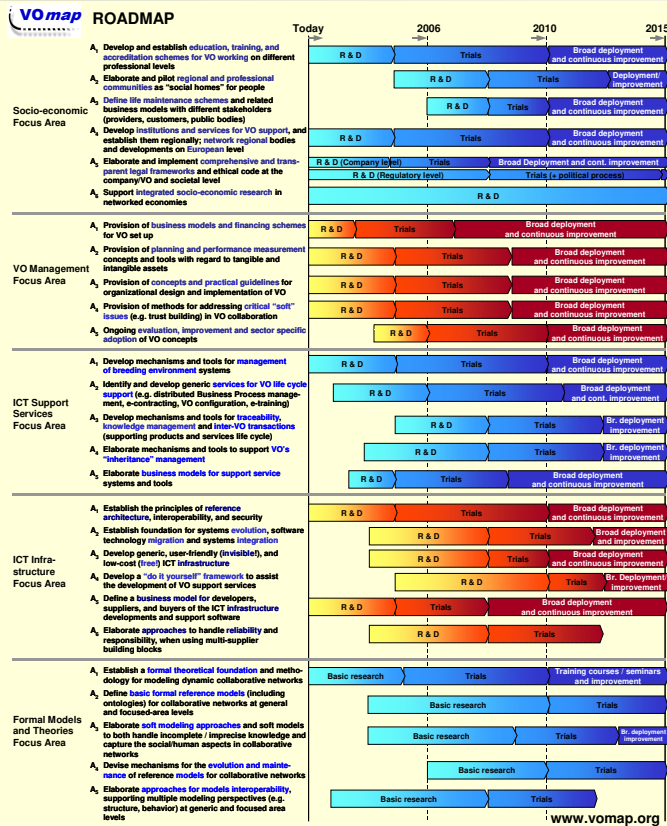


# How does a roadmap look like?

VOMap  
2nd attempt

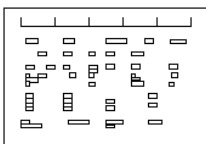
## Implementation Mechanisms

## R&D Trials Deployment & improvement



# How does a roadmap look like?

A roadmap can be represented at several levels of detail.

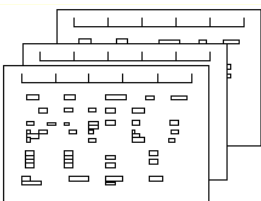


Toplevel roadmap

Single page

Poster

part of many presentations



Supporting roadmaps

Single page per view or per driver

Poster

part of many presentations



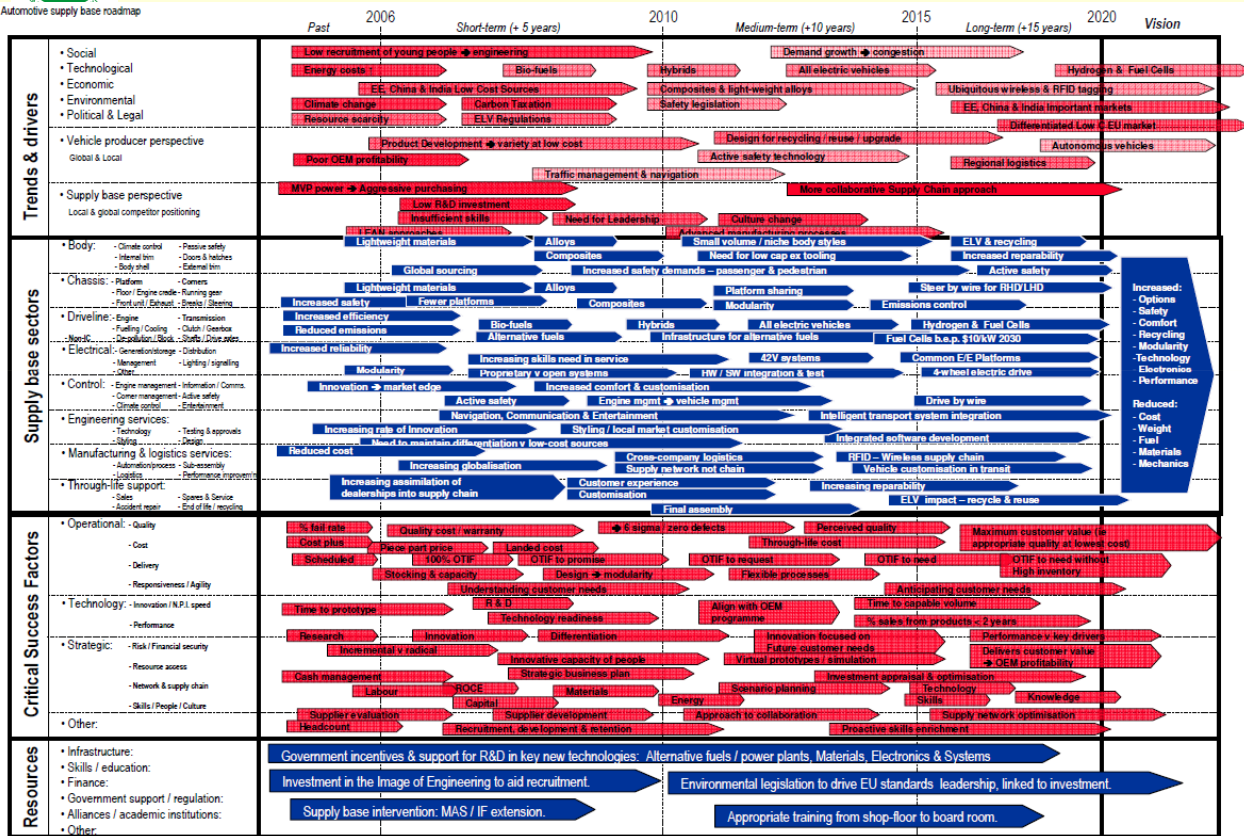
Supporting reports

Document per relevant subject



# How does a roadmap look like?

Automotive supply base roadmap



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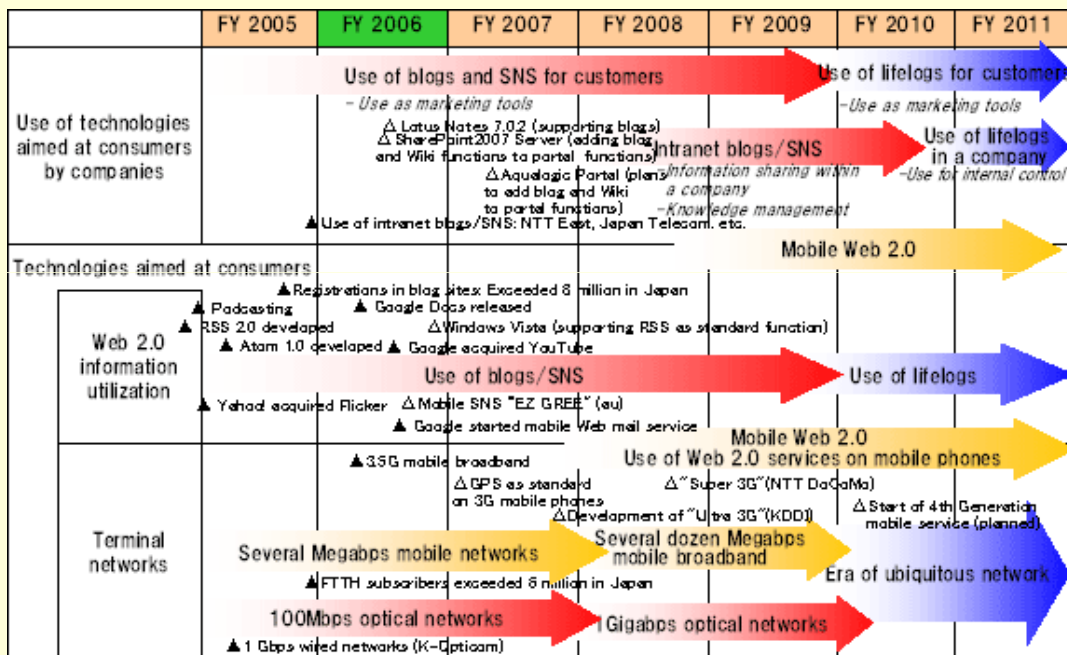
[http://www.ifm.eng.cam.ac.uk/ctm/trm/documents/automotive\\_supply\\_1.pdf](http://www.ifm.eng.cam.ac.uk/ctm/trm/documents/automotive_supply_1.pdf)

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# How does a roadmap look like?

## "IT Road Map" of Web 2.0 Technology Up Until 2011



<http://www.nri.co.jp/english/news/2006/061110.html>

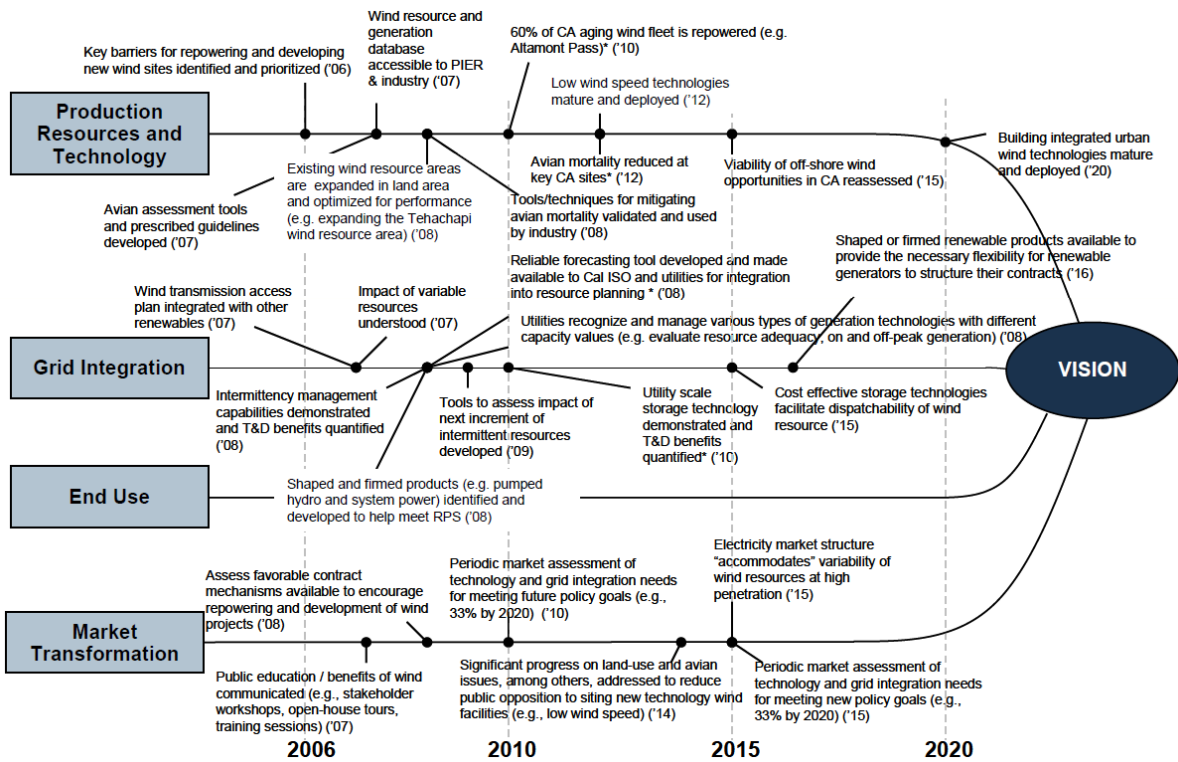
© L. M. Camarinha-Matos, 2009-2012

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# How does a roadmap look like?

## Utility Wind Detailed Roadmap (California)



© L. M. Camarinha-Matos, 2009-2012

<http://www.energy.ca.gov/2007publications/CEC-500-2007-035/CEC-500-2007-035.PDF>

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# How does a roadmap look like?

TECHNOLOGIES ROADMAP TO 2050										
KEY: TARGET/GOAL STATISTIC# PROCESS FINANCE TOOL/GADGET PLACE										
CYBERNETICS / AGRO&INDUSTRY / INFORMATION ACQ&DELIV / EMISSIONS ABATEMENT / PARADIGMS&FUNDAMENTALS / BIOLOGY&GROWTH / MATERIALS&MANUFACTURING										
2010	2015	2020	2025	2030	2035	2040	2045	2050		
<b>CC/ENERGY</b>										
china >> US CO2 production	2nd gen biofuels	coal price --\$	10% UK energy from biofuels	non-OECD 2/3 of world energy demand	production of bio-synthetic natural gas	india >> US CO2 production#	major shift to a bio-based economy	reduce carbon footprint to 1 planet economy	stabilisation of global climate	
nuclear production	photovoltaic concentrators	wide scale use of microgeneration	commercial CCS	centralized solar PV	nuclear growth	20% coal/gas has CCS	artificial photosynthesis systems			
wind power uptake#				non OECD using 2/3 world energy#	50% new vehicles elec or hydrogen			30% of transport by alt fuels	90% of liquid fuels biofuels	
								climate adaptation measures	world population > 8b#	
<b>VEHICLES</b>										
automatic parking	electronic vehicle ID	fuel cell recycling	autonomous emergence	total automated manuf.	fulfill CA for veh. manufacture	zero fault vehicles				
voice control	biofuels/aasification profitable	radar	intelligent speed adaptation	modular vehicles	environmentally neutral factory					
pedestrian sensors	360° vehicle sensing	adaptive systems for older drivers	no paint shop manuf.	engine manuf. energy 50% of '02						
veh. occupancy monitoring	switchable adhesives	composite engine parts	intelligent engine condition/age monitoring	switchable joining	emissions 5% of '02					
solid state lithium batteries										
<b>TRANSPORT SYSTEMS</b>										
reduce traffic noise 3dB	reduce traffic noise 4dB	reduce traffic noise 4dB	reduce traffic noise 6dB	reduce traffic noise 6dB	next gen fuel cells			average fuel economy 50% of 2009 levels	global vehicle ownership rate 13.6%	
diesel 40% eff.	diesel 45% eff.	diesel 50% eff.	diesel 55% eff.	diesel 55% eff.					30% all transport by alt fuel (alt7)	
	minimum/boost routing	60% hybrid bus fleets	infrastructure/vehicle cooperation	50% vehicle fleet on H2	full authority vehicle control					
CAFE 32.5 mpg	CAFE 39.6 mpg	CAFE 43.2 mpg								
<b>AGRI/FOOD</b>										
0.6 arable acres/cap	earth simulator for ag	1 ED greenhouses	climate change simulator for ag	modelling of nutrient circulation	robotics for aquaculture/fisheries			0.4 arable acres/cap		
bio-sensors	plant factories	marine farm	electronic tags	plant growth modeling	road modernization					
nanofabric recipes	0.3 t/ha rice yield#	freshness sensors	testo sensors							
<b>SCIENCE</b>										
automated remote species identification	large-scale sensor networks	purpose-made informed matter	foundational theory of global ecosystems	general unified theory or equivalent disproof	verifiable global ecosystem models					
LHC switch on	research data machine readable	translational memory	active xml for ubiquitous data							
distributed software is dominant	data deluge continues to increase	single cell simulation	comprehensive codification of biological knowledge							
reliable global climate/weather simulator	individualized medicine	modelling based vaccines	organ/organism simulation	higgs boson found						
molecular computer diagnosis available	mar disease pathways and gene networks identified									
computational model of carcinogenesis										
<b>COMPUTI</b>										
parallel processing	heterogeneous parallel processing	executable specification		web 4.0						
intelligent test bench	translational memory	active xml for ubiquitous data								
evolving semantic web	concurrent sw infrastructure	system design automation								
moore's law re-defined, move to parallel/multi-core	web 3.0	personal agents								
cloud computing										
<b>NANO</b>										
nan-enabled fuel cells and solar photovoltaics	high-value nanomaterials	quantum wire solar photovoltaics						efficient, integrated, solar-based fuel production	removal of greenhouse gases from atmosphere	
artificial productive nanosystems		next generation productive nanosystems							manufacturing based on productive nanosystems	
<b>REFERENCES</b>										
1	2	3	4	5	6	7	8	9	10	
Developing A Bioenergy Roadmap For The UK Bioenergy research roadmap workshop, April 2007 Working Paper REF: UNESC/WP/FSM/2007/017 Professor Gail Taylor, UK Energy Research Centre	Intelligent Vehicle Technology Roadmap Technology and Research Directions for Future Vehicles (v2) 2004 Foresight Vehicle SMMT ISBN: 0-900885-51-4	Intelligent Infrastructure Futures Technology Forward Look Towards a Cybe-Urban Ecology Bill Sharpe Tony Hodgson Foresight Programme of the Office of Science and Technology	"Academic Roadmap / Food Technology" Japan Society of Applied Physics Future Vision Reviewing Working Group, 2008	Towards 2030 Science: A Draft Roadmap Microsoft Research	"Productive Nanosystems, A Technology Roadmap" Wyatt Foundation, Battelle, Foresight Nanotech Institute, 2007	50 by 50 Global Fuel Economy Initiative www.50by50campaign.org	RIA Foundation, IEA AEL, International Transport Forum, UNEP			

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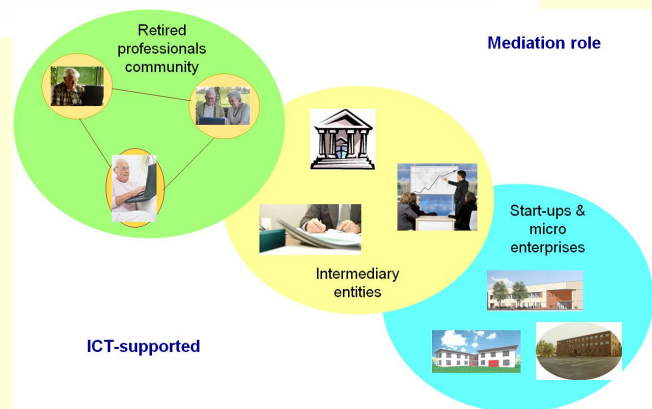
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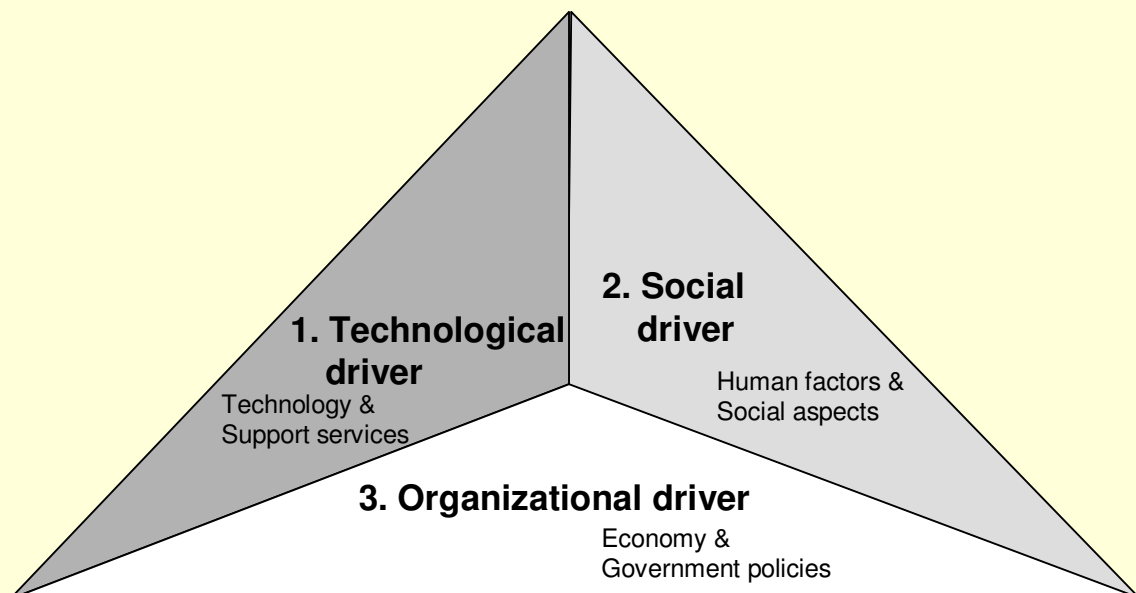
## ePAL project

### ePAL aimed at:

- Introducing new approaches and ways to create actively contributing professional communities in society
  - supporting framework for leveraging elderly's talents and expertise
  - creates value for the benefit of the Europe's economy.
- Supporting a balanced transition towards retirement
- Placing Europe as the leader in promoting active ageing / ageing well worldwide.

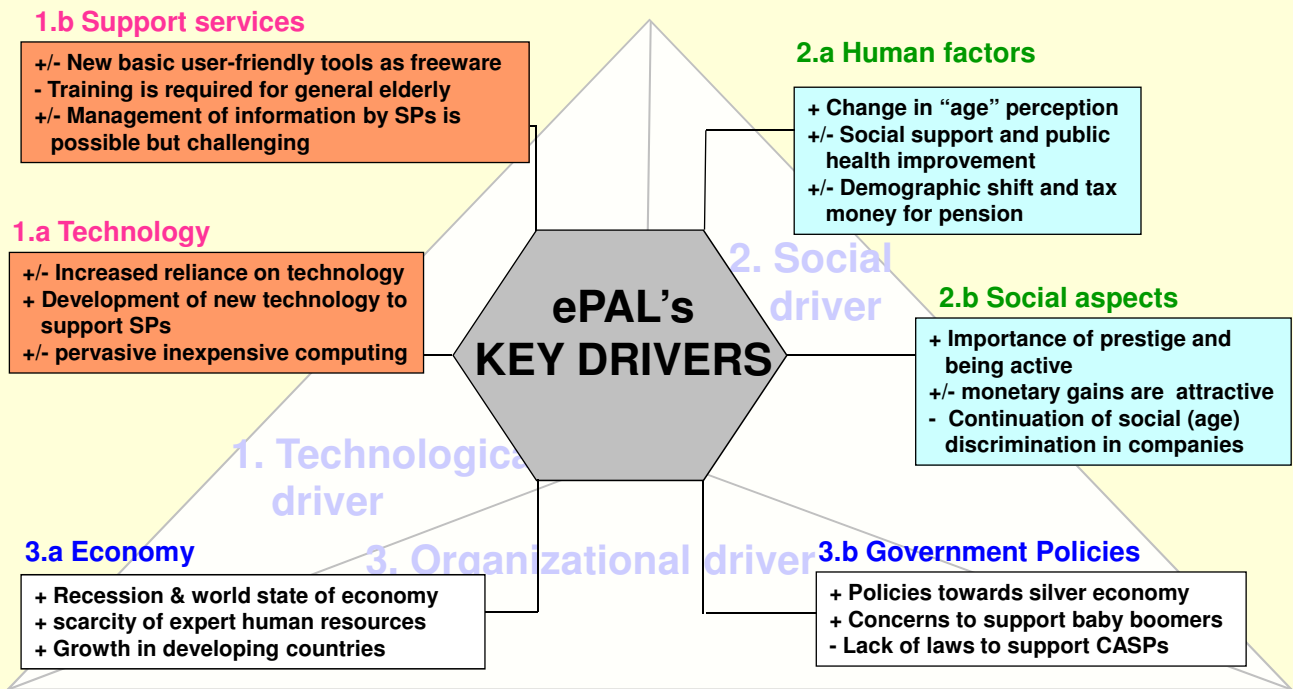


## ePAL focus areas and drivers



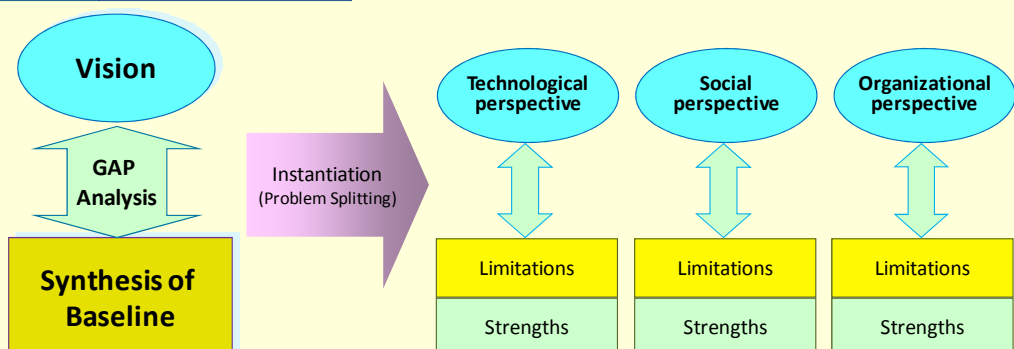


# ePAL key drivers and trends



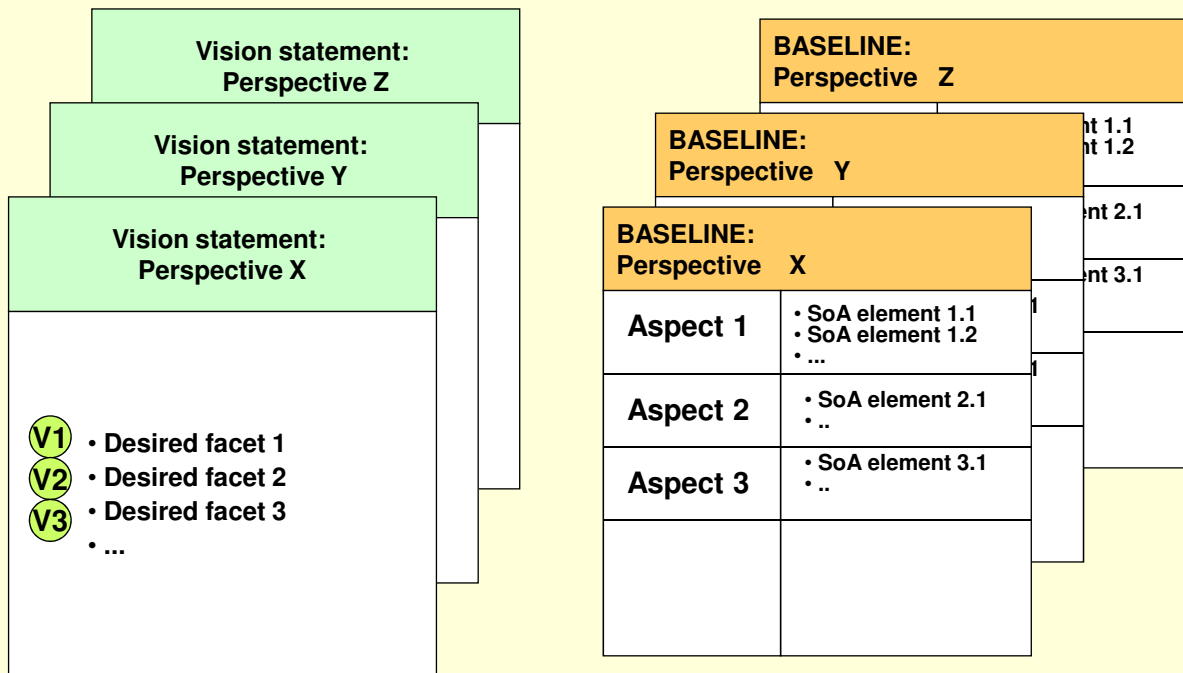
# ePAL refinement – GAP analysis

	Helpful to achieving the vision	Harmful to achieving the vision
Internally originated European Union level	<b>Strengths</b> <ul style="list-style-type: none"> <li>• Strength 1</li> <li>• Strength 2</li> <li>• ...</li> </ul>	<b>Weaknesses</b> <ul style="list-style-type: none"> <li>• Weakness 1</li> <li>• Weakness 2</li> <li>• ...</li> </ul>
Externally originated Surrounding environment	<b>Opportunities</b> <ul style="list-style-type: none"> <li>• Opportunity 1</li> <li>• Opportunity 2</li> <li>• ...</li> </ul>	<b>Threats</b> <ul style="list-style-type: none"> <li>• Threat 1</li> <li>• Threat 2</li> <li>• ...</li> </ul>





## ePAL refinement – GAP analysis



## ePAL refinement – implementation models

In order to define a research plan it is also necessary to identify promising organizational structures

**Individual Stakeholder: <Identification>**

**Description:**

**Characterizing dimensions:**

d1. <dimension>: <description>

d2. <dimension>: <description>

...

**(Potential) role(s) related to extending professional active life of seniors:**

**Organizational Structure: <Identification>**

**Description:**

**Participants:**

**Characterizing dimensions:**

d1. <dimension>: <description>

d2. <dimension>: <description>

...



## ePAL refinement – implementation models ...

<b>Initiative: &lt;Identification&gt;</b>	
<b>Organizational form:</b>	
<b>Characterizing dimensions:</b>	
<b>d1. &lt;dimension&gt;</b>	Relevant aspects of the organizational form regarding this dimension
<b>d2. &lt;dimension&gt;</b>	
...	

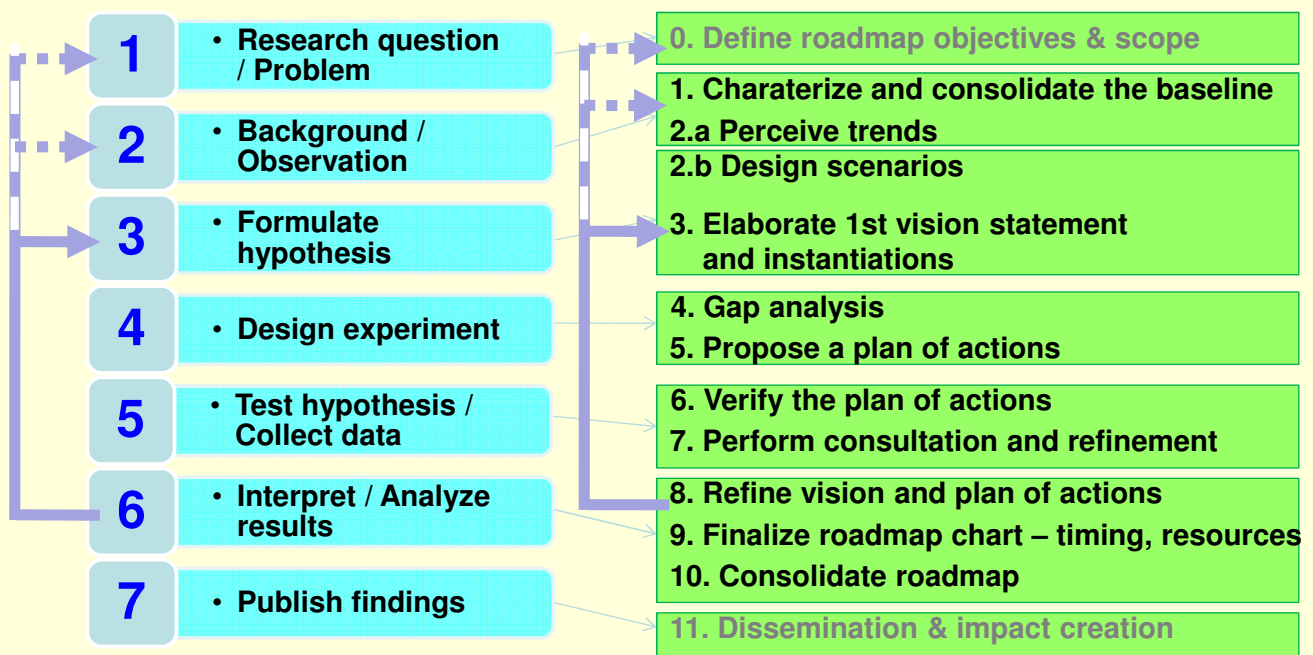
<b>Stakeholder: &lt;Identification&gt;</b>		
<b>Offers:</b>	<b>Constraints:</b>	<b>Needs:</b>
<Which "value" can be contributed by this stakeholder for a future silver economy?> • ... • ... • ...	<Constraints that might affect the delivery of "value" by this stakeholder> • ... • ... • ...	<Needs / expectations this stakeholder has regarding a future silver economy> • ... • ... • ...



## Roadmapping method – A scientific approach

### Classical scientific method

### Adopted roadmapping method

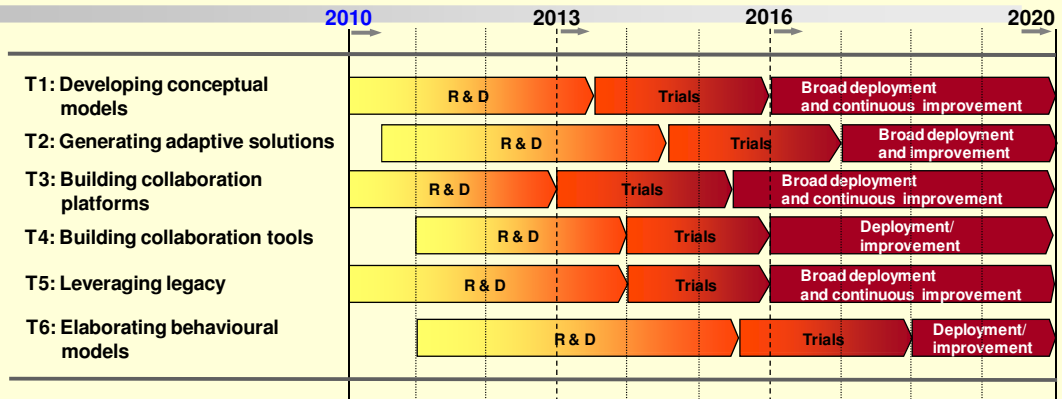






# ePAL ROADMAP – IMPLEMENTATION PLAN

## Technological perspective



T1.1 - Establish a reference model for extension of professional active life and active ageing.  
 T1.2 - Elaborate common ontologies for communities of senior professionals.  
 T1.3 - Develop contractual and business models for communities of senior professionals.

T2.1 - Develop self-adaptive interface systems.  
 T2.2 - Develop self-customizable collaboration environments empowering seniors to better use ICT.  
 T2.3 - Develop technology assistance wizards.  
 T2.4 - Increase involvement of seniors in the design of new technologies for seniors.

T3.1 - Develop advanced functionalities and systems for management of communities of senior professionals.  
 T3.2 - Develop affections / emotions management systems for communities of senior professionals.  
 T3.3 - Design and support reference governance systems for communities of senior professionals.  
 T3.4 - Develop trust building management systems for communities of senior professionals.

T4.1 - Develop marketing and brokerage support tools for communities of senior professionals.  
 T4.2 - Develop tools for virtual team creation, negotiation and e-contracting.  
 T4.3 - Develop tools for virtual team management and collaborative problem solving support.  
 T4.4 - Develop models and tools for management of Intellectual Property and performance.

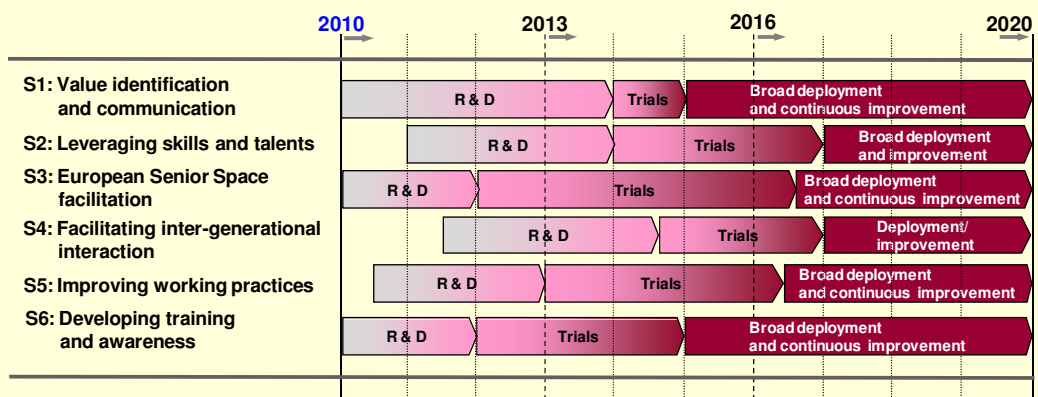
T5.1 - Define conceptual models of talents and develop user-centred knowledge acquisition tools  
 T5.2 - Create reward mechanisms (system of incentives) to attract user-generated knowledge.  
 T5.3 - Develop knowledge assets assessment and intellectual property models.  
 T5.4 - Mechanisms to promote inter-generational inheritance.

T6.1 - Develop a conceptual base for behavioural modelling.  
 T6.2 - Develop data-mining / machine learning approaches for behavioural patterns discovery.  
 T6.3 - Develop forecasts and simulation methods and tools for behavioural analysis.  
 T6.4 - Develop models and tools for emotional health management.

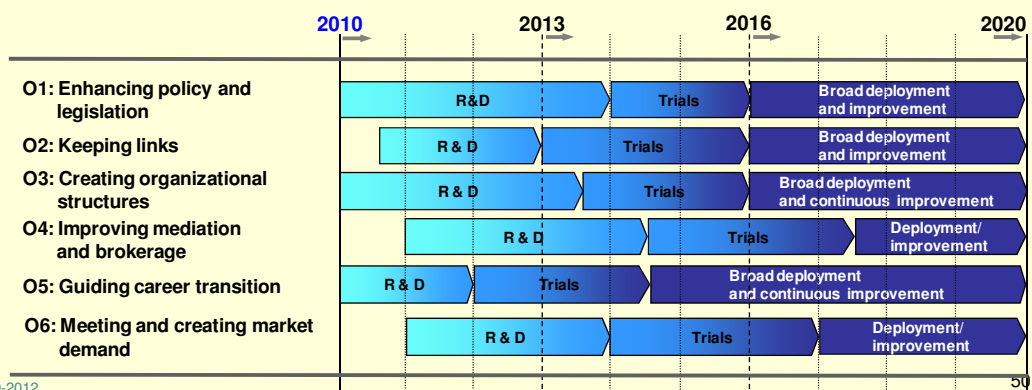


# ePAL ROADMAP – IMPLEMENTATION PLAN ...

## Societal perspective



## Organizational perspective





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PROGRAMRESEARCH DEVELOPMENT AND DEMONSTRATION ROADMAP

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**Roadmap examples: <http://emi-web.inel.gov/roadmap/examples.html>**