



## D3.1 Scenarios for TEL Futures

European Commission Seventh Framework Project (IST- - 257822)

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### **Report on Scenarios for TEL Futures**

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# Executive Overview

*Roadmap*: a detailed plan to guide progress toward a goal.

*Scenario*: a sequence or development of events especially when imagined; an account or synopsis of a possible course of action or events.

([www.merriam-webster.com/dictionary](http://www.merriam-webster.com/dictionary))

This document uses the terms Roadmap and Scenario in a precise way (as above) and also less precisely: in a colloquial and inclusive way, for example to include scenarios that are close in meaning to roadmaps, and roadmaps that involve scenarios. The less precise use is needed to widen the document's scope. This document reviews the roadmap and scenario work of others relating to TEL and close fields, as well as the new scenario work and scenario-related work delivered to date by the TEL-Map project.

The opening section looks at the types of scenario covered in TEL-Map, namely Desired Futures, wider Context scenarios, and Roadmaps, together with a brief overview of the methods we use to produce them and how they are used in TEL-Map Roadmapping activities. It also suggests a simple classification system to be used in the portal to enable stakeholders to find scenarios or approaches most relevant to them. As well as the Type of scenario, it provides the Projected Date for the scenario, the Sector/s it is relevant to, the Authors and the Date of production.

Section 2 then provides an extensive survey of future TEL scenarios already produced by others, highlighting some that are immediately significant to TEL-Map, and provides references to many more which could become significant if, for example, the costs of traditional approaches to education became unaffordable. This section first reviews scenarios produced by previous EU funded projects, both TEL-related and in areas independent of TEL but relevant to it.

It then reviews a set of TEL Future scenarios produced by others. From the large number of such studies, five were selected for fuller treatment and a further five given a brief overview. These were selected according to the following criteria, that they:

- 1) were conducted during the past 10 years
- 2) considered a medium to long term future timescale, not less than 10 years
- 3) represented a number of different sectoral, national and international perspectives
- 4) provided areas of shared concern and attention on educational futures.

The implications for TEL-Map are drawn out and a link to further sources is provided.

It also briefly reviews the findings of informally-linked groups with shared membership: the STELLAR project, and the New Media Consortium. This section is completed by a review of the major outcomes of a three-day workshop carried out by the New Media Consortium Horizons project and participated in by two TEL-Map project participants.

Before going on to the TEL-Map project's scenario work to date, a brief linking section, Section 3, sets out the main features of the Europe 2020 Strategy and explores the role that TEL can usefully play in its realisation.

The first of the two TEL-Map sections, Section 4, sets out the findings from TEL-Map's initial 'Capturing the Voice' workshops carried out with stakeholders at a number of different events.

The second TEL-Map section, Section 5, presents the early scenarios from its Roadmapping clusters, mainly derived from the first pilot, the UK HE cluster and the recently initiated European schools cluster.

The final section, Section 6, looks at the requirements needed to support future scenarios in the Learning Futures portal, which will become the updateable (living, online) version of this document. This focuses on two things:

1. on gaining feedback and further contributions from the wider TEL community through providing and commenting on future scenarios and visions for TEL,
2. on encouraging the wider TEL community to contribute or further develop new visions for TEL as a basis for enabling new roadmapping clusters, which share cognate and complimentary visions, to emerge.

# 1. Future TEL Scenarios, their Types and Role in Roadmapping

## Scenarios in TEL-Map and method evolution

### Introduction

The Future TEL Scenarios presented here come from multiple sources. As with other TEL scenarios, it is necessary on occasion to guess at the assumptions made by scenario authors, such as the nature of the intended audience for the scenarios; what needs to be made explicit to that intended audience; and what kind of reception (favourable, unfavourable) will be given to their scenario.

For example, from 1997 onwards, CISCO's pronouncements on the uptake and influence of TEL have been very optimistic, indicating great growth in demand for networking equipment and services, which coincidentally is CISCO's main market. So their scenarios of demand are at risk of being self-serving. Their white papers and press releases are rarely explicit about the intended audience for their scenarios, but are read by influential people like pension fund managers (whose opinions influence the stock price), or market analysts (whose opinions influence purchasing decisions). When that background information is available, it helps us to determine where opinion is masquerading as fact, and to place a proper weight on widely-reported statements such as this one from the CEO of CISCO, John Chambers: "The next big killer application for the Internet is going to be education. Education over the Internet is going to be so big it is going to make email usage look like a rounding error."

That particular scenario was exuberant and lacked a road map that would make it real, like other dot.com pronouncements at that time. But over the past decade, TEL has shown much more sign of becoming part of mainstream ICT, and its scenarios and methods have evolved. As part of this, there is a change in the mix of people involved in TEL, and a change in their awareness of the history of TEL (including the assumptions, background and experiences of the originators of pre-2000 TEL tools, products, scenarios and methods). TEL is moving from the research phase into the adoption phase, and as a result more attention may have to be given to checking for mismatches between the background and interests of the authors and audience for scenarios. To illustrate, there is likely to be a difference between the knowledge base of pre-2000 generations of TEL researchers and the knowledge base of the post-2000 adopters, regarding the history of TEL and details of why TEL is as it is today. It is a given that the providers of TEL tools should take into account the context, experiences and prior knowledge of the intended users of those tools. By analogy, the authors of scenarios or roadmaps may need to be explicit about the background, experiences and resources they assume of their readers. , Also potentially important is having a shared background: less attention tends to be paid today to the early history of TEL (1960s onwards) and its adjacent fields (e.g., educational psychology, library science) than to its recent history (post-internet). As a result, many practitioners,

decision-makers and visionaries are at risk of being poorly calibrated in the judgements they make about the scope of TEL and the rate of change that TEL can bring about. Remembering the ‘rounding error’ statement by the CISCO CEO, the historical evidence, available to him at the time, points to a far slower rate of change and far lower (but still important) level of impact. But optimism triumphed over evidence. How can this be avoided in studies of future TEL scenarios? Our provisional answer: by being well-informed about the past and present of TEL. This is likely to be harder to do than to say, unless TEL practitioners and vendors take account of how their field (and the resources currently available for it) has been shaped by the successes and failures of previous generations of TEL and precursors to TEL, and how legacy investments in educational assets (training, hardware, software, services) affect decision-making and change management today. Such points need to be factored into policy-making based on TEL, because they have a bearing on the assumptions made in formulating today’s TEL goals (visions, scenarios and roadmaps), and the extent to which those goals are realisable or relevant.

The wider issues raised here should be considered by the whole TEL community, and go far beyond the scope of TEL-Map alone. This report is necessarily limited to considering the elements of what could/should be taken account of today in thinking about TEL scenarios and roadmaps. But we can outline some ideas: a brief history of TEL would be needed. The zeitgeist of TEL (which shapes present-day forms of TEL and ideas about TEL scenarios and TEL roadmaps) has been shaped by its key events and projects, and by the kinds of public funding programs that were part of this. Examples include:

- today’s visions for outcomes-based education and time-to-performance (influenced by 1960’s programmed learning, teaching machines and instructional technology, and by national and military programs to introduce early forms of computer-assisted learning);
- today’s visions for personalised learning environments and hand-held/mobile devices (influenced by 1970’s pioneers of learning conversations, educational cybernetics and educational technology, and funding programs to widen access to higher education);
- today’s visions for collaboration, cognitive augmentation and performance enhancement (influenced by 1980’s intelligent tutoring systems, deep and surface learning, and problem-based learning);
- today’s visions for semantic web, e-books and smart books (influenced by the Memex idea of the 1940’s and by 1990’s pioneers of SGML and XML).

In addition to historical factors, there are local factors, arising for example from differences between member states. These give rise to multiple TEL sub-communities and stakeholders, using multiple ICT platforms. This document is not the place to document the vast variety, but we note that at European level, the TEL community is large enough to sustain such variety. Cross-fertilisation can come from this, for example because sub-communities have some goals in common but other goals that compete. Exposure to different ideas can be very helpful. Likewise, stakeholders have large variations in timeframes for desired changes; marked variations in practice; and significant differences in awareness and use of research relevant to TEL, including research into TEL futures. Projects such as TEL-Map, and TEL networks such as STELLAR, can provide channels for each group of stakeholders to become more aware of the larger context of their work; then manage any points of commonality or any differences; then

reduce counter-productive actions and choose whether to facilitate the emergence of win-win solutions.

All of those variations are healthy signs of vibrancy. Likewise, and also positive, in this TEL-Map study we found multiple groups looking at Future TEL Scenarios (meaning: scenarios for possible futures for TEL), with different goals, assumptions, partners, other resources, methods and timeframes. In this section we give some examples, beginning with general cases then drilling down to TEL-specific instances.

Before turning to those cases, we outline briefly some recent and historical factors that may influence the nature of past and current trends and practices in TEL (including work on Future TEL Scenarios and on associated methodologies). Such factors may affect the assumptions and perceptions we bring to this study and the ways in which we select and interpret cases.

Throughout its history, TEL has required greater levels of initial investment than non-TEL (e.g., sage-on-stage) teaching. The investment goes into some mix of technologies and processes to exploit those technologies for teaching and learning. During economic downturns, there is a greater focus on identifying the return on investment, ROI, that comes from investing in TEL. An example in the UK is the current re-appraisal of the role of the JISC. But, overall, TEL Scenarios do not pay as much attention to ROI as to other aspects of the scenarios. The need for investment has thus become a “given” in TEL Scenarios. For example, it is assumed that resources are available for developing or sourcing and maybe localising educational materials; providing access to those materials; acquiring needed equipment and related training; monitoring learner progress; accrediting learner performance; and updating all components as needed. This has influenced the development of the organisational systems and structures that support much of today’s approaches to developing and exploiting TEL. To illustrate, today’s TEL was preceded by various forms of Educational or Instructional Technology, including pre-computer systems such as the programmed learning machines and film-loop projectors of the 1960s. Their influences are still with us, even if not often traced back; appreciating the key influences may be helpful in assigning levels of significance to today’s trends and scenarios and methods. Likewise, there are early influences on today’s versions of scenario methodologies and Future Search techniques. Industrial-scale use of TEL can be traced back to the establishment of the first mega-universities such as the UK’s Open University. At that time, the major influences on TEL thinking included Cybernetics and the Systems Approach. Many institutions established specialist units focused on using the latest forms of Educational Technology in combination with Systems Thinking to improve the quality of teaching and learning; to drive down costs; and to widen access to further and higher education and to vocational training. That early investment led to the kinds of TEL communities we see today across Europe. It continues to shape thinking and practice in some of those communities.

Looking back 1-2 decades, as well as forwards, changes in the external environment are having large effects on many of the organisations and systems that are the base for TEL stakeholders. Today’s disruptive changes had their counterparts during that time, which affected many industries, and caused many incumbents to lose leadership in their business sectors. The trends seem faster now. But the needs are the same: to develop new products and services, in new markets. This requires their staff to acquire and polish new competences, if they are to

retain their jobs. So the demand for TEL continues and indeed seems to grow. Europe's organisations and systems continue to have to anticipate or at least react to change, or they will lose position to emerging competitors. ICT is speeding the information flow that is facilitating change, so TEL-as-could-be (scenarios for TEL futures) can come to have more influence on TEL-in-use. One factor that seems to be little represented in TEL scenarios so far is the drop in the lifespan of industrial organisations, which until now have been the largest users of TEL for training. TEL may become crucial to the stakeholders of such organisations as a key tool to enable them to reinvent their organisations' roles and business models,

## **General cases of Desired Future scenarios**

These include scenarios that may not be developed with TEL in mind but might be applicable to TEL as they stand or with minor modifications. Desired Future scenarios can be used by roadmapping clusters (groups of people engaged in developing roadmaps) to bring together their individual visions to weave a broader picture that they can all see their part in and are happy to collaborate on. Clearly, they describe aspects of the future that the participants feel they are able, at least potentially, to agree upon as desirable and maybe can jointly bring about. Ideally the shared desired future will be a creative synthesis of the various visions that participants bring to the table, which is both greater than the sum of the individual visions and which participants feel captures their original aspirations. However it would be sufficient foundation for a viable roadmapping cluster, if the shared desired future captures some important aspect of participants' future plans, or can be accepted as such. Where this is not the case, a participant will either not join the cluster or can soon be expected to drop out. Also, because collaboration can reduce risk in uncertain times, it allows participants to be more innovative than they might have been if they were working alone.

For roadmapping in general, an initial projected outline of how the desired future could come about, can be arrived at by participants projecting themselves into their desired future and 'looking back' on how they arrived there. This is sometimes referred to as 'Future History'. This can help identify some of the major challenges and obstacles, but, having 'lived' the desired future, it has been found to help ground it and make it more credible to its creators.

The Future Context scenarios that we refer to are the same as those typically produced by a scenario planning process. They are used to surface participant's assumptions about how their wider context may evolve. In particular, they highlight and build on those driving forces that are important to their task, but whose outcomes are uncertain. Each scenario must be a plausible and internally cohesive description of a possible future. They are not predictions and indeed, if treated as such, each one in itself has a low probability. Rather they function as a set outlining the corners of a whole field of possibilities, giving participants a better handle on the uncertainties they face.

Roadmapping scenarios are used to map out a pathway from the present to a desired future. They take account of the challenges that must be overcome, and the threats and opportunities that may be encountered. They may also take into account the collective strengths and

weaknesses of the cluster and include actions to build on strengths and address weaknesses. Roadmaps, as well as being high level implementation scenarios in their own right, may be augmented by more developed scenarios that explore in more detail the tasks, possible future contexts and actions.

A roadmap presupposes an agreed future that it leads to. It also tacitly makes assumptions about relevant aspects of the larger context in which it will operate. In uncertain times it is also necessary for a roadmap to be aware of these assumptions, acknowledge that they are likely to change and that the roadmap itself will have to adapt to these changes.

#### From General cases to TEL-specific cases

TEL-Map takes two pathways to form a TEL cluster and arrive at an agreed desired future. One, the top-down or ‘invited cluster’ approach, typically involves working with a sponsor with a given focus and inviting a range of stakeholders in the area, who between them have the wherewithal to implement an agreed roadmap. The other, the bottom-up or ‘emergent cluster’ approach, is to elicit and record a wide range of TEL stakeholders’ visions for the future and, by seeking commonality and complementarity, encourage cognate groups to elaborate a shared desired future.

To deal with the uncertain world in which they will be innovating, both groups are encouraged to articulate their assumptions about the wider context they are operating in.

For the ‘invited clusters’ the Future Search approach has been adopted. Future Search has developed over a number of decades as a successful approach to bringing diverse groups of stakeholders together to find common ground and agree on and commit to a shared desired future. In our case, these are groups of TEL stakeholders. Future Search is covered in detail in Appendix 3 of D1.2 Conceptual Framework. Typically, however, in a Future Search the planning horizon is relatively short term, so contextual uncertainties are not so important.

For the “emergent clusters” approach, we have developed and adopted an innovative methodology that we call “Capturing the Voices” (CTV), the basics of which are described in D2.3 (section 4.2). The application of the CTV methodology is described in detail in a separate report. The main idea is to use *directed conversations* with TEL-stakeholders as support for building roadmaps<sup>1</sup> around topics of interest, and then to empower those and other stakeholders to use these roadmaps to find and connect with potential collaborators (D2.3, p. 6). What we are aiming for is a kind of “semantic match-up service” that can assist TEL-stakeholders in finding partners who can have productive conversations that may lead to them performing useful actions together.

These conversations are often started in a synchronous way, by what we call “knowledge hearings” (D2.1, Section 3.4) by a group of people meeting - either in real (face-to-face) space

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<sup>1</sup> Note that we are allowing all sorts of different definitions and interpretations of what is meant by a roadmap. For example, as described in Section **Error! Reference source not found.**, a roadmap can be built around a phd-process.

or in virtual (electronically mediated) space – and starting a discourse that is continued in an asynchronous manner on the Learning Frontiers portal. The main methodologies behind supporting these conversations are various forms of what we term *Disagreement Management* – as described in the DoW and elaborated further in the TEL-Map Modeling Primary (Deliverable D1.1). Especially the techniques of *DM by Distributed Dialogue Mapping* (D1.1, Section 12.4) and *DM by Mental Modeling* (D1.1, Section 10) are important in this context.<sup>2</sup>

Returning to the “invited clusters” approach, this offers new ways to inform TEL policy and to respond to emerging needs of TEL policymakers, such as may follow from the structures and priorities of the updated ICT directorate in the European Commission.

To get a handle on the key driving forces and the uncertainties around them, Scenario Planning has been adopted. Scenario Planning has been widely, and now is increasingly, used to deal with uncertainties about the operating context when developing strategies. However it typically takes for granted that the organisational mission, what it is trying to achieve, is a given and hence pays little attention to the process of developing a desired future, let alone across a diverse group of stakeholders.

As a result, as far as we know, Future Search and Scenario Planning have rarely been brought together. In doing this, TEL-Map is working towards active meso-level of dynamic or adaptive roadmapping. Here, a cluster of organisations creates a roadmap in the expectation that they then will work together to implement their roadmap. For this, it is essential to first establish a strong desired future, which integrates participants’ existing visions and aspirations as a foundation for their commitment to work together to deliver the shared desired future. For this purpose, the Future Search approach is, in principle, a good way of establishing such a foundation.

However this form of roadmap is typically long term, lasting at least a few years. Therefore the uncertainties of a changing context need to be taken fully into account, and the roadmap itself seen as provisional and open to adaptation; hence the introduction of scenario planning.

In fact Future Search and Scenario Planning are highly complementary: Future Search focuses on the future that participants can, through their actions, bring about; Scenario Planning focuses on those aspects of the future that are beyond the control of participants yet have an impact on their actions. They are brought together in the following way.

Given an initial roadmap to a desired future, each context scenario can be used to test the roadmap to see if it stands up, or needs to be adapted for these different circumstances.

Where a roadmap has to branch to accommodate one or more possibilities, the signs and signals, which indicate the underlying driving forces are moving in the direction of a particular scenario or pair of scenarios, are articulated so that they can be watched for by participants and

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<sup>2</sup> Some of the results of the emergent clusters approach are described below, in sections 3.1, 3.2, and 3.3.

the wider community, through the TEL-map Observatory. An early alert back to an active roadmapping cluster can then be provided if any of them materialise. They can then adjust their roadmap, update or revise their context scenarios, or, in the more extreme case, revise or rethink their desired future.

However a critical issue arises in adopting the Future Search and Scenario Planning methodologies. Future Searches are normally implemented as large-scale, three-day face-to-face meetings. Scenario Planning is also typically a three-day to one-week workshop, sometime repeated over several months. However, scarce resources, the challenges of working with geographically widely distributed stakeholders, and their lack of availability make this approach infeasible, as confirmed by initial work with stakeholders. This has led to the project developing an innovative hybrid face-to-face and online integration of Future Search and Scenario Planning methods, more fully set out in D1.3 Conceptual Framework. The design for the supporting roadmapping portal is set out below and the prototype is described in D2.4 TEL-Map Infrastructure.

For the portal, a simple classification system is needed for all the scenarios we cover to enable users to rapidly find scenarios relevant to their concerns and focus. The following four metadata categories are proposed:

- Timeline: at what future date is any given scenario placed
- Type: Desired, Context or Roadmap
- Sector: School, HE, Commercial Training, Informal Learning
- Date scenario created

## 2. Collecting and analysing existing stakeholder views of the future

Existing views of the future of TEL are documented in various sources across the landscape of European and Global TEL industry. However TEL-Map is not able to build on these without a phase of prior analysis and synthesis. This process will enable the existing work to be integrated with TEL-Map scenarios, in order to produce a higher level roadmap to inform and guide future policy and practice. The analysis leverages the wide range of knowledge contained in the consortium and their links into the TEL community to identify the key existing stakeholder documentation to be taken into consideration.

Qualitative text analysis tools are used to draw out the key future relevant themes. The tagged and annotated results provide a basis for selective publication on the TEL-Map portal.

The high level categories for grouping material include:

1. Visions/Desired Futures (personal, company/ organisation, group/cluster)
2. Projections/Context Scenarios
3. Roadmaps

Sources made use of include:

- Web search, broadly defined, e.g.vc including Twitter, Google analytics, etc.
- EU Projects (resulting from TEL-Map work done with them)
- Literature Search
- National programmes, e.g. UK JISC, China, Uruguay – 1 LTTPC Programme

### 2.1 Scenarios from completed EU TEL projects

#### 2.1.1 BRIDGES project IST-1999-14038, (Roadmap 2002)

***Methodology and process:***

The objective of the BRIDGES project was to prepare a strategic roadmap for digital business. Although not related to learning or TEL, it is presented here for historical reasons: its Roadmapping approach was very influential for most of the Roadmapping projects that followed. It was one of the very first EU projects that produced a roadmap. The project has developed a generic Roadmap model called BRIDGES ROADMAPPER which similarly to time2learn project used an exploratory approach to define the future state. BRIDGES viewed Technology Roadmapping as a “needs-driven” technology planning process to help identify, select and develop technology alternatives to satisfy a set of products needs. Similarly to Time2Learn it based its methodology on the IMTI approach but took a more strategic view. Bridges developed the ROADMAPPER model, as generic methodology for building roadmaps see figure below:

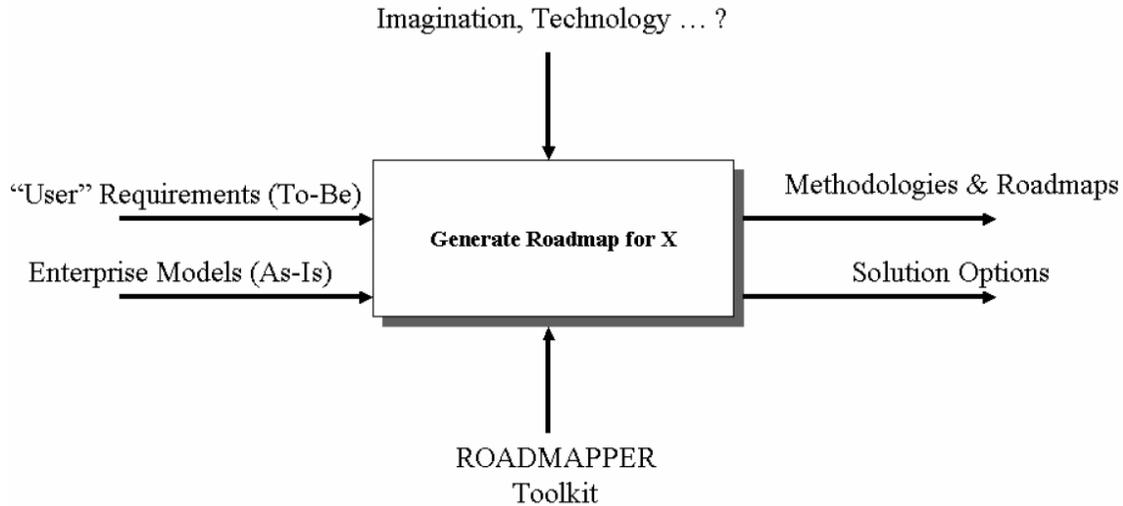


Figure 1: Functional Model of Roadmapper

It contains the following elements:

- a) AS-IS analysis
- b) TO-BE analysis
- c) SWOT analysis
- d) EU-US similarities/differences
- e) Relevant information and projects

A market analysis and a conceptual model of the digital business domain were also produced. The process used for gathering information is depicted in the figure below:

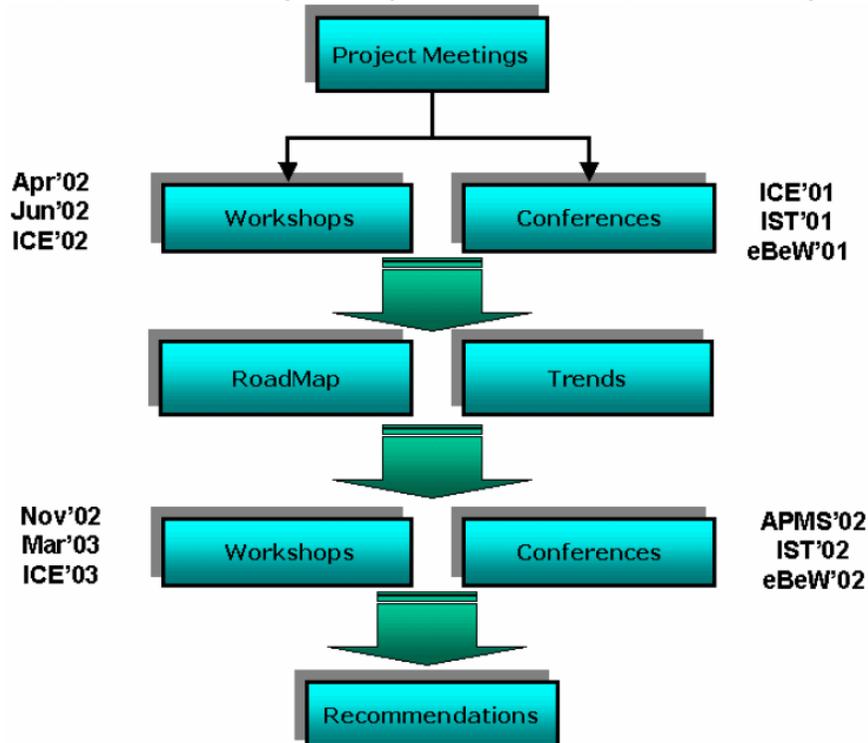


Figure 2: Information Gathering Process

They also built an interesting approach to perform Gap Analysis between the state of the art and the scenarios using a SWOT methodology.

<b>Internal elements</b>	<b>AB -&gt; Have &amp; Want (Strengths)</b>	<b>A^B -&gt; Have &amp; Not Want (Weaknesses)</b>
<b>External elements</b>		
<b>Options</b>		
<b>^AB -&gt; Not Have &amp; Want (Opportunities)</b>	<b>SO:</b> Strengths can be used to capitalize or build upon existing or emerging opportunities	<b>WO:</b> The options developed need to overcome weaknesses if existing or emerging opportunities are to be exploited
<b>^A^B -&gt; Not Have &amp; Not Want (Threats)</b>	<b>ST:</b> Strengths can be used to minimise existing or emerging threats	<b>WT:</b> The options pursued must minimise or overcome weaknesses and, as far as possible, cope with threats

### Mapping Strengths & Weaknesses to External Opportunities & Threats

During this phase, SWOT analysis was used to identify the strengths, weaknesses, opportunities and competence-related threats to realize each future scenario. This analysis provided us with the distinct competencies that we have today (Strengths) and the key capabilities (opportunities) that we need in the future in order to realize the Roadmap scenarios. In addition, the negative or problematic factors (weaknesses, and threats) that hinder the realization of the scenarios were identified. The problem with such an approach to GAP analysis is that it doesn't differentiate between internal (micro) and external (macro) threats. Although, a classification of micro and macro drivers was attempted prior to SWOT analysis, the impact of the macro trends was not clearly documented. External threats, which produce tensions that can have either positive or negative impact on the future planning, usually have related trends and weak signals, enabling them to be monitored so that relevant alerts can be produced.

**Results:** Roadmapping methodology, PESTLE & SWOT analysis, trends, challenges-recommendations.

## 2.1.2 Time2Learn project, IST-2001-38263, (Roadmap 2004)

### Methodology and Process

TIME2LEARN project developed a roadmap for ICT-enabled European professional and vocational training, which demonstrates how to reduce the ‘time to performance’ of workers and professionals, in order to enable them to be more effective, adaptable and employable. Time to performance is now a widely-used metric in TEL-based vocational training, so this project is very relevant to TEL practice. Time to performance represents the period of time that elapses from the initial creation of the knowledge to the ability to apply that knowledge in a particular situation by a particular learner. It encompasses the entire learning and training value-chain from content creation to production and delivery of the ICT-enhanced training service and learner support.

The goal of the project was to shorten the time needed to:

- identify knowledge gaps
- identify existing learning/training offers or potential providers for the needed educational scenario
- produce/adapt the needed learning processes
- deliver the needed training
- assess the needed training.

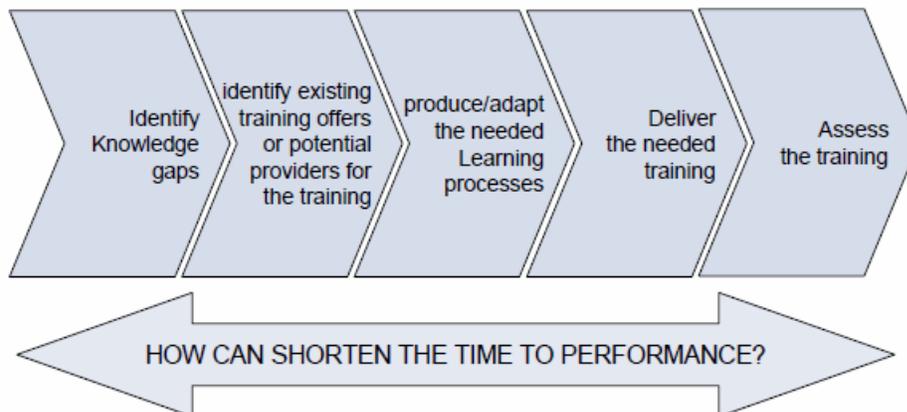


Figure 3: Time2Learn shortening the time to performance

The Time2Learn project adopted a Roadmapping methodology developed by the US Integrated Manufacturing Technology Initiative (IMTI). IMTI Roadmaps was an industry/government partnership facilitating collaborative development of critical manufacturing technologies. The time2Learn model consists of six levels in a top-down pyramidal structure.

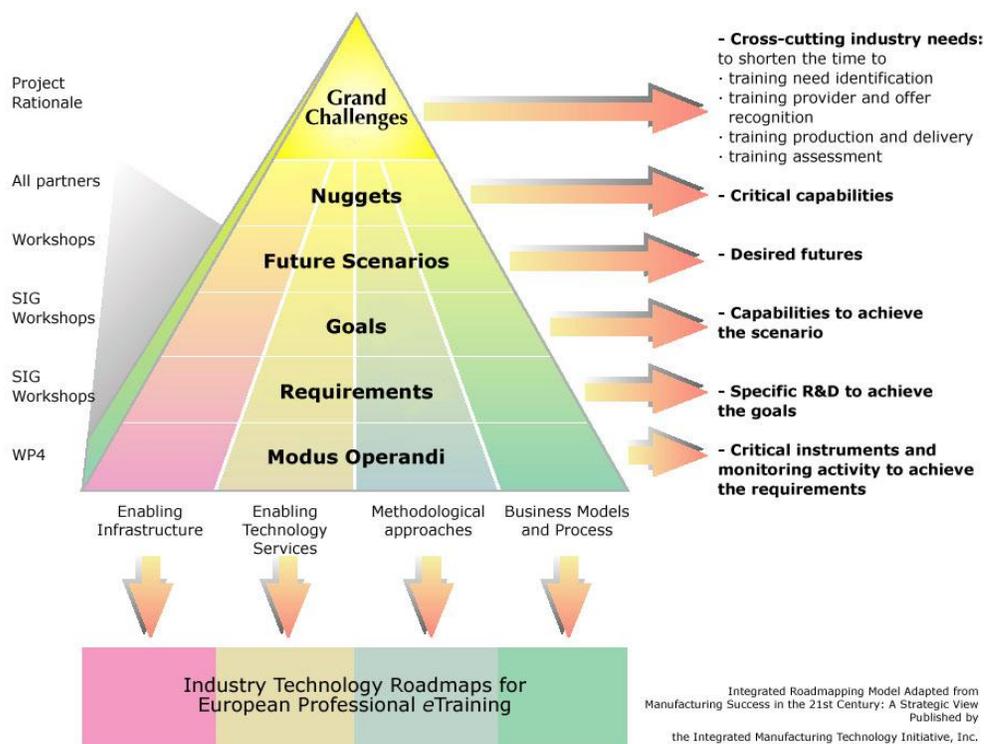


Figure 4: IMTI 6-Level Model for Industry Roadmapping

This methodology provided a detailed top-down process consisting of several steps starting from defining the big picture in Professional training (Grand challenges, nuggets comprising the grand challenges, and critical capabilities to achieve these challenges); developing scenarios describing alternative futures; and performing a gap analysis based on an assessment of the state of the art in terms of the maturity levels of technology to achieve the critical capabilities identified in the scenarios and in the big picture. The process in this approach was guided by providing answers to the following questions: How can we use learning to shorten the time to performance? What challenges will we face in the future? What capabilities will we need to meet these challenges? How can these solutions be developed? How can we shape and speed the outcome? The Time2Learn project recognized that the importance of the value of Roadmapping lies “largely behind its capabilities to enhance consensus building”; the method used for creating the roadmap was based on an expert top-down approach, which started from a predefined set of grand challenges that drove the creative process of the foresight activities.

In addition, a set of 4 scenarios were developed. “The aim of scenario planning was to describe what professional eTraining might be like for ordinary people in 2010” (Koskinen, 2004). Time2Learn followed an explorative approach in the scenario planning based on a 2 by 2 matrix that outlined 4 different scenarios.

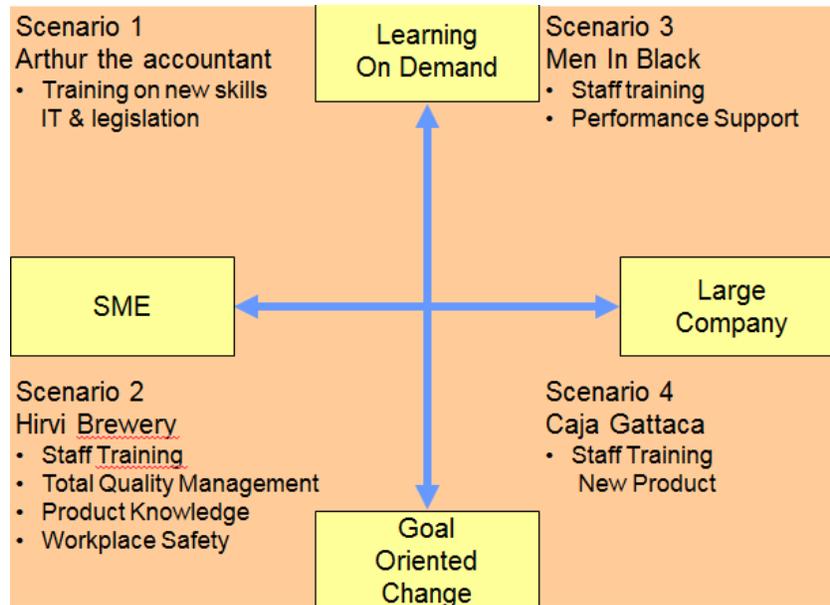


Figure 5: Time2Learn 4 Scenario Matrix

This kind of approach may limit the innovative and creative aspects of Roadmapping by focusing on the current state of developments and current needs via a very small number (4) of scenarios based mainly on microscopic views.

In order to draw the roadmap between the current situation and the desired future states, the future scenarios were analysed and studied. This approach was used in order to rank the Nuggets (and identify the most important critical capabilities), get an indication of the key future developments in infrastructures, technologies, methodologies and compare them to the identified current state. (Gap analysis process)

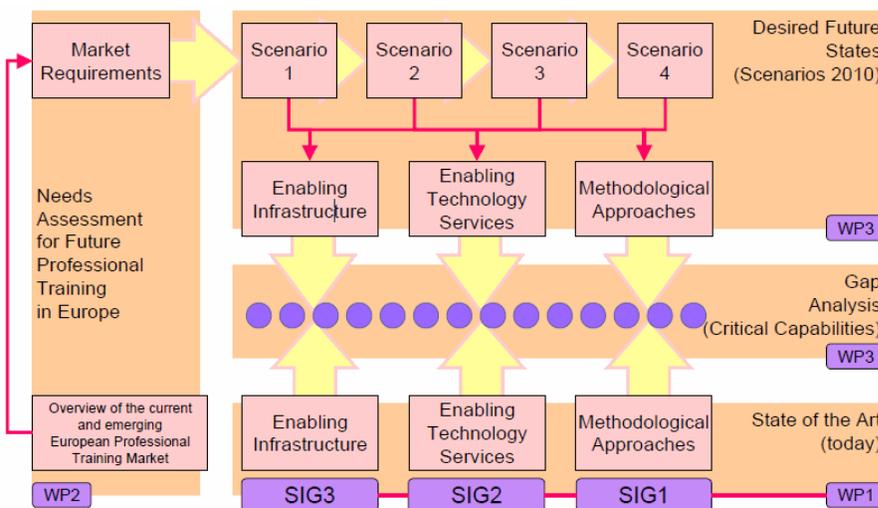


Figure 6: Gap Analysis of Both Required & Current Enabling Infrastructures, Technologies & Methods

**Outcomes:** Roadmapping methodology, Grand challenge, nuggets comprising the Grand challenge, State of the art assessment (methods, tools, infrastructure), Market analysis and future needs assessment, context/domain scenarios, gaps, critical capabilities, R&D priorities and threats & challenges.

**Results:**

**1. Methodological approaches:**

3 main areas of R&D goals: 1) Adaptation of content and services, 2) competency mapping 3) Digital Portfolios, 4) collaborating for learning, 5) Developing pedagogical applications

Key critical capabilities:

- **Creation, Storage and delivery of personalized re-usable, shareable content**
  - Capturing expertise
  - Dynamic management of content (content that is continuously assembled on demand)
- **Learner modelling, profiling and personalization**
  - Customized e-training
  - Easy customisable content
  - Knowledge gap analysis
  - Precision predictability to match user needs and learning requirements
  - Portable performance portfolios
  - Competency skills assessment -systems and processes
- **Managing the Learning Process**
  - Collaborative knowledge building
  - Exploratory Learning
  - Simulation based Training

**2. Enabling Technologies:**

Main areas of R&D Goals: 1) Learner-centred artificial intelligence models, 2) Educational Virtual Reality Technologies, 3) Semantic Web Learning Systems, 4) Learner-Centred Adaptive Environments, 5) Learning oriented Rule based Expert Systems

Key critical capabilities:

- Language translation
- Delivery tools
- Real time assessment

**3. Enabling Infrastructure**

Main Areas of R&D goals: 1) (AI) Human centred intelligent & dynamic systems, 2) Open protocols & Standards (software hardware), 3) HCI, Visualization Image & video processing coding, 4) Dynamic & Semantic Web Technologies, 5) High capacity optical & wireless systems, 6) Grid & distributed systems, 7) User Centred Adaptable Networks, 8) Nanotechnology, 9) Biomedical Engineering & Neuroscience

Key critical capabilities:

- **Standards, Specifications, Reference Models**
  - Dynamic user profile can foresee demand - comparison with other similar profiles
- **Integration and APIs**
  - Plug and play interoperable systems components
- **Storage**
  - Easy (better) ways to find, select and retrieve information from huge amounts of data like the data available on the WWW
  - Dynamic content simulations
- **Networks**
  - General use of broadband communications
  - Adequate connectivity anytime and anywhere when needed, both wired and wireless
  - Anytime, anywhere access and Delivery capabilities
  - Natural language queries
  - Intelligent Search Agent, Intelligent Agents
  - Virtual reality technologies
  - Augmented intelligence
- **Middleware**
  - Diverse learning architecture can be supported and communicated
- **Devices**
  - Biometrics enabled solutions

The influence of this approach is now widespread. Thus, there is a close match between the outcomes in this roadmap, in the areas of research and critical capabilities for TEL, and the recently developed GROE American Roadmap for TEL. (see description later in this section). ROLE and ICOPER projects followed up some of the R&D areas, especially in personalized learner centred systems (Role) and competency frameworks (ICOPER).

### 2.1.3 The PROLEARN Project: IST-507310, (Roadmap 2008)

#### **Methodology:**

The PROLEARN project developed its own Roadmapping methodology, based on Time2Learn and a number of other projects. Recognising Roadmapping as a forward chain activity “invent our future first and then find the current that lead us there” PROLEARN has developed a normative proactive approach in developing its roadmap for Professional Learning. Following this principle, the starting point was to invent the future first and to “plan backwards” from there in order to link up with today.

PROLEARN employs the following instruments in its Roadmapping methodology:

- A modified version of SECI framework for Knowledge Creation (Roadmapping as a knowledge creation process)

- Foresight activities such as Trend-analysis, surveys, interviews, user requirements analysis, expert workshops and symposiums (learning cafes), literature review, state of the art assessment, scenario development, SWOT analysis and modelling
- Disagreement management based on distributed discourse management (from dialogue –induction, to discussions –deduction)
- Conceptual modelling using semantic modelling tools for capturing and extending the knowledge and positions of different communities

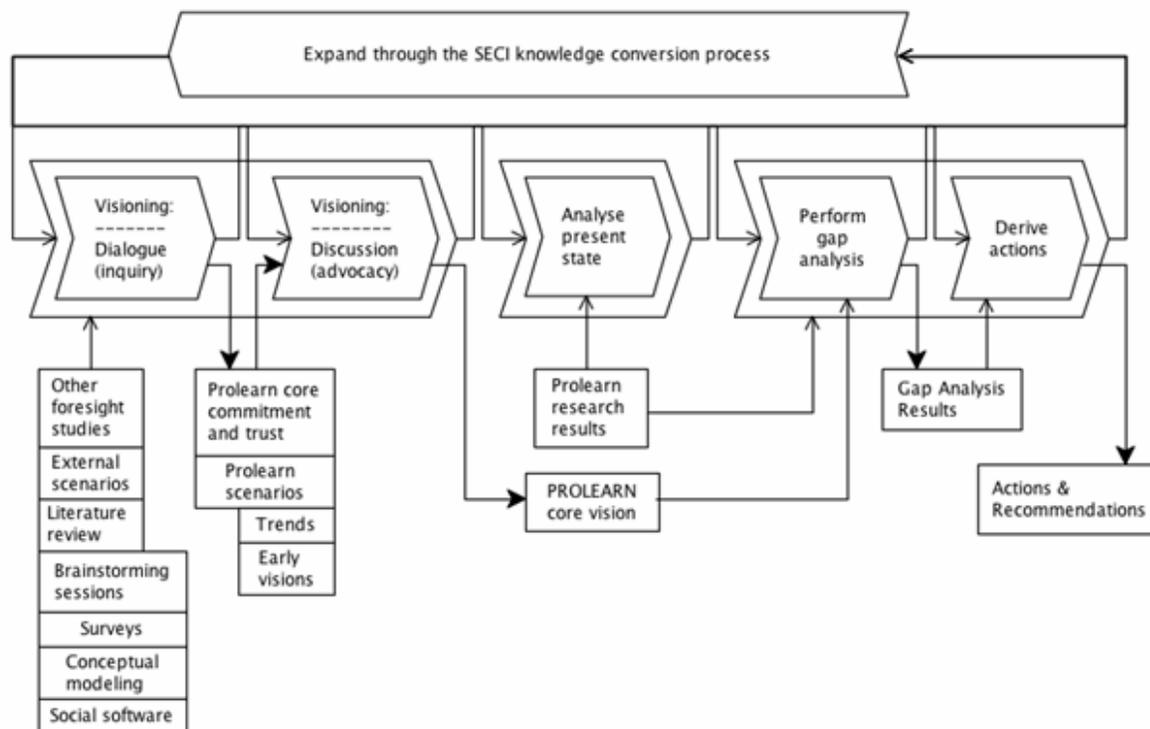


Figure 7: PROLEARN Roadmapping process

### SECI Framework for Knowledge Creation – Roadmapping as a knowledge creation process

PROLEARN added another component to its methodology: The application of the SECI spiral of Knowledge creation framework by Nonaka and in order to a) develop a value accumulating Roadmapping process which is dynamic and has high potential for sustainability and b) promote a knowledge network of Roadmapping that amplifies the efforts of various groups and crystallizes them at the European level, influencing a large part of the EU TEL community.

In PROLEARN, Roadmapping is a knowledge creating process that spirals outwards from the core partners of the PROLEARN Network (individuals, groups, the whole Network) via the Network’s associated partners, to the entire scientific community and industry. Therefore, it is both a learning activity and a knowledge creation process for the community that builds the roadmap. This knowledge creation process has been modelled using the general SECI process framework (figure 2), known as the “SECI Spiral” (Kamtsiou 2007).

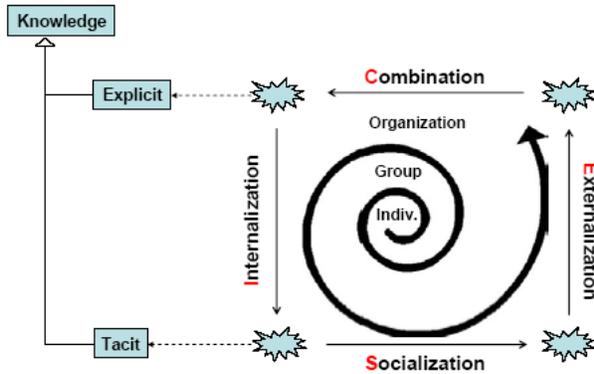


Figure 8: SECI Knowledge Creation Spiral (source A. Naeve, 2005)

According to Nonaka (2003, 2000, 1998, 1995, 1994) the key to knowledge creation lies in the following four SECI modes of knowledge conversion, which occur when tacit knowledge and explicit knowledge interact with each other: socialization, externalization, combination, internalization. Because tacit knowledge includes mental models and beliefs in addition to know-how, moving from tacit to the explicit is really a process of articulating one’s vision of the world – what it is and what it ought to be. (Nonaka, 2003)

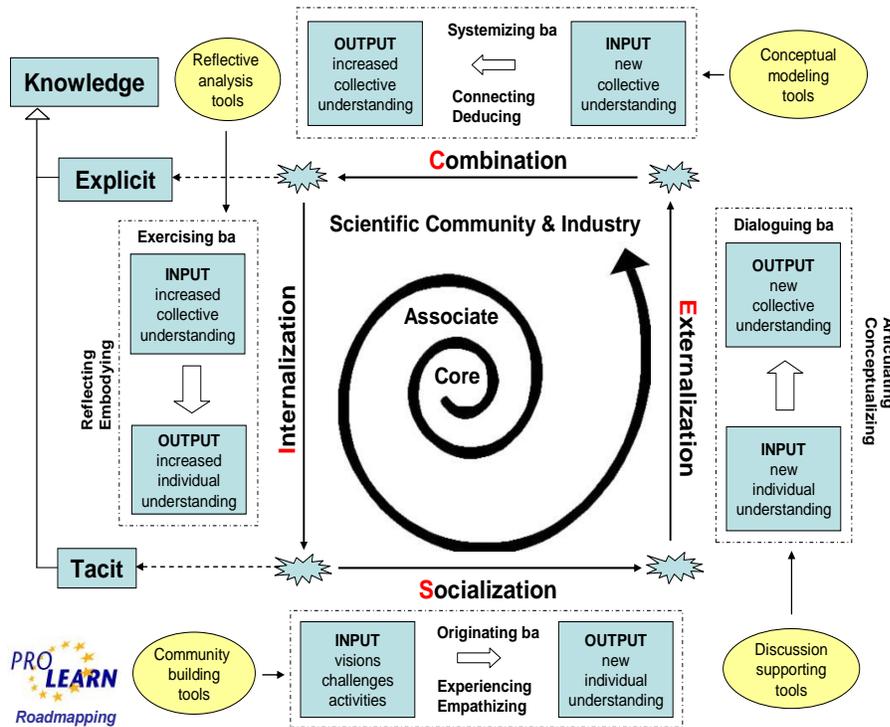


Figure 9: PROLEARN Version of SECI Knowledge Creation Spiral

PROLEARN Roadmapping process framework (Figure 7) is derived from the general SECI process framework (Nonaka, 2003, 2000) by replacing the triplet of social entities {Individual, Group, and Organization} with {Core Partners, Associate Partners, and Scientific Community & Industry}.

*During the Socialization process*, networking activities and community building tools are important. Face to face meetings, various workshops, and virtual meetings have been organized in order to bring together the wider community of the PROLEARN network on a common contextual platform and tap into their collective experience and knowledge. PROLEARN teams played a central role in this knowledge creation process of building the roadmap because they provided the shared context where the team members interacted with each other and engage themselves in common projects and activities on which effective reflection depends. This provides a new individual understanding of the relevant concepts and their relationship.

*During the Externalization process*, this new “know-how” is articulated and expressed via a constant dialogue where teams pool their information and examine it from different angles, thus integrating their diverse individual perspectives into a new collective perspective.

*During the Combination process*, the resulting “seed” knowledge is modelled and conceptualized and thus is easily communicated to external groups in order to synthesize information from many different sources and bring in different perspectives and contexts. In that way, an increased collective understanding is achieved where the actual concepts and their contexts are reinvented and extended by others. The principle is to find what we agree on, what we disagree on and presenting it in a way that we all agree on (Naeve, 2005).

*During Internalization process*, the manifestos and the results of gap analysis were further analysed and a portfolio of short term, mid term and long term actions and recommendations were produced. This explicit knowledge, in turn, can be reflected upon and internalized into new tacit knowledge, completing a full turn of the SECI spiral. Reflective analysis tools were used during this stage.

This enhancement of the mainstream framework is an especially important improvement for TEL, since the roadmap is a commonly agreed and accepted vision, and not a mechanically derived result. PROLEARN extended the Roadmapping activity to go beyond strategic planning (time2learn), to be dealt as a knowledge creation process specialised for TEL, where the importance of disagreement management through discourse is emphasized. In addition, it added conceptual modelling as a core of the Roadmapping activities in order to facilitate the stages of convergence and synthesis of the new knowledge and transcend individual understandings in increased shared understandings.

The PROLEARN roadmap was focused primarily on the desired future. The roadmap was built in terms of its purpose focus, bringing out the visions and purposes of the TEL community. In the years since PROLEARN, its methodology has spread to other TEL projects (e.g., ICOPER, TEN-COMPETENCE, PROLIX, ROLE, ODS), and influenced the STELLAR network of excellence.

Each PROLEARN vision has a stakeholder distinct overall perspective and focus. They represent different and complementary views of the core vision, such as information society view, industry views, learner view, market and societal dimensions. Figure 10 illustrates the six PROLEARN vision statements. As depicted in this figure, the PROLEARN vision statements provide a holistic picture of the desired future of TEPL (Technology Enhanced Professional

Learning) in an outwards spiralling way that highlights the aspirations of 4 stakeholders: the individual (V1 & V4), the enterprise (V2 & V3), the market (V5) and the European society as a whole (V6).

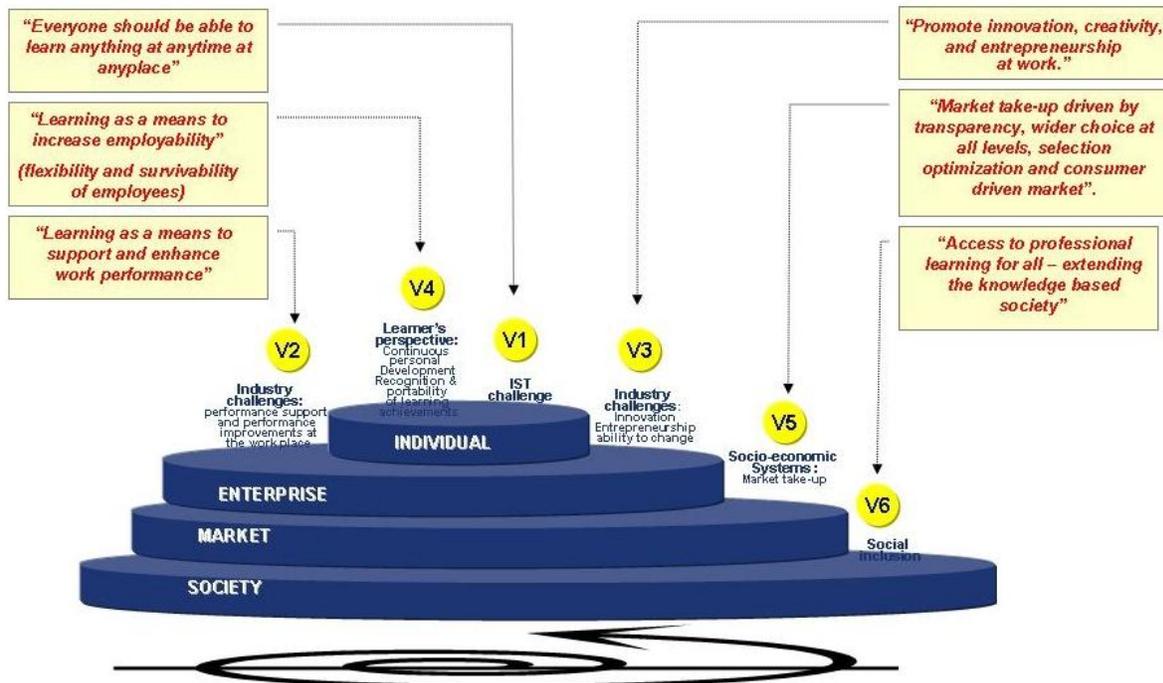


Figure 10: PROLEARN's 6 Levels of Vision Statement

An example of a PROLEARN vision statement is shown in the following figure:

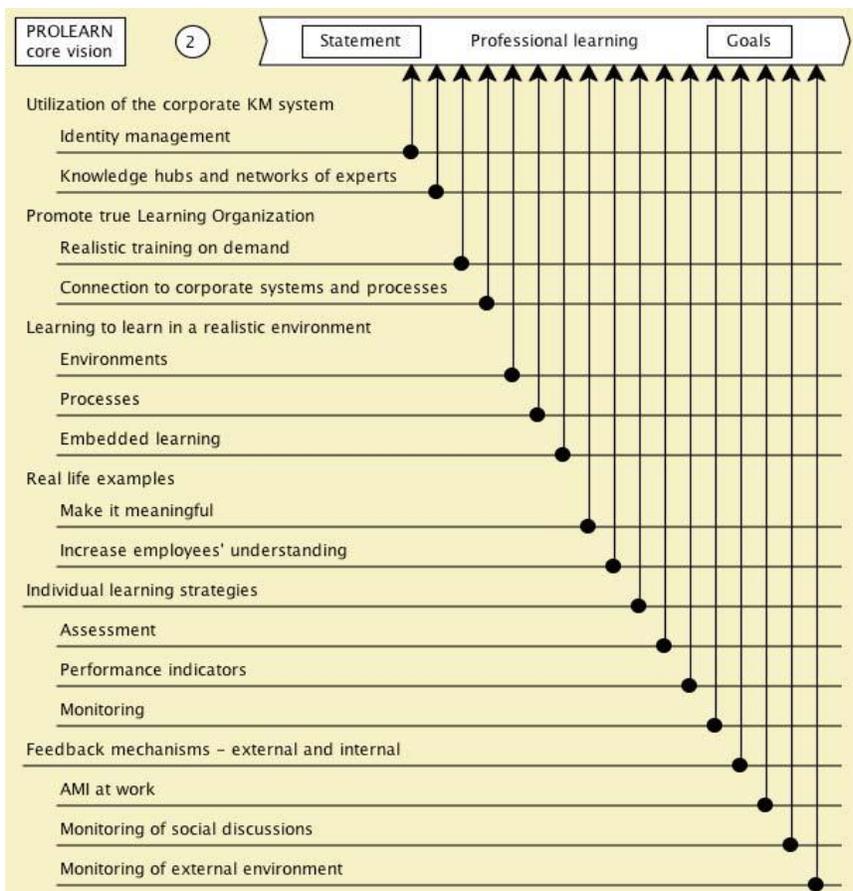


Figure 11: Example PROLEARN Vision Statement

The resources available during PROLEARN did not allow for investing effort in developing methodologies to identify threats that could challenge these visions and risk the implementation of the desired future. At the same time, although the SECI model used did provide an understanding of how do we go from representation of Knowledge work to the dynamic knowledge creation, and what is involved in this transmission, it did not provide any means for the management of the Knowledge creation. SECI tells us what are the types of knowledge conversion that can apply in knowledge creation and how they appear. In that sense, a complementary mechanism is needed in order to better determine the relevance of the strategic issues identified, the seed input chosen as a starting point for discourse, and the management of knowledge creation in terms of increasing the motivation of communities to participate as well as manage effectively any conflicting interests of these communities.

**Results:** visions, goals, factors, assumptions, preconditions, gaps, and recommendations.

According to the PROLEARN Roadmap, in the context of Professional Learning, the prevalent visions for 2020 are centred on leveraging technology, a) to enhance and support work performance for businesses and directly link learning technologies with business needs; b) to promote innovation, creativity, and flexibility in order to support change in organizations; while at the same time c) to promote increased security for individuals in the form of employability and assuredness of equal opportunity; and d) to take into account both the social and market dimensions.

### **PROLEARN core vision:**

“To support knowledge workers with technology-enhanced learning by promoting motivation, performance, collaboration, innovation and commitment to lifelong learning.”

In this context, a knowledge worker is defined as someone who doesn't just consume knowledge but who is able to create it and who reflects critically on every level of activity in the organization and contributes back.

The Core vision has been broken into **6 individual vision statements** that synthesize and explain the core vision:

**Vision statement 1:** (IST challenge) “Everyone (in the community of current, potential and future knowledge workers) should be able to learn anything at anytime at anyplace.”

“*Vision statement 1* is closely linked to the IST challenge and is focused on the individual. It is related both to personalization and to access to learning at any time at any place. The aim is to create and deliver a personalized learning experience to everyone. The word “everyone” in the vision’s statement title and goals signifies that everyone should have the ability to learn anything where and when he (sic) wants. In that sense, this vision statement tries to integrate all different interpretations of learning and learning approaches. How technology can support the different learning processes in the life of people and provide many choices to learning and how to utilize all different technologies that exists to remove the barriers to learning including what people don’t know that they need to learn. This goal also commands that everyone should have different tools at his disposal available that will help him/her to find, select and choose among the abundance of options. Therefore, the goal of this statement is not only to create many choices but also help people decide what’s just right for them.”

Goals:

1. Provide the right learning experiences at the right time for the target person (who can be anyone)
2. Everyone should have access to all public learning materials at any time at any place

**Vision statement 2:** (Industry challenge) “Learning as a means to support and enhance work performance.”

*Vision statement 2* is related to specific industry challenges, such as performance support and performance improvements at the work place. It is focused on the organization and how to use TEL as support and enabler for increased work performance. It is linked to organizational issues where the company deals with work performance that increases the company’s productivity. This statement is therefore related to the standardized, structured and known business processes of the organization. This differentiates it from Vision Statement 3 which focuses on the use of TEL to support innovation and creativity in the organization and support large scale changes within the organization - often related to project-based work and process-oriented activities that are unstructured and complex. A conceptual framework of how to link

learning technologies to work performance and link the results of learning performance to work performance is of paramount importance. (Such framework is suggested in PROLEARN D1.10, D7.5 and D7.7) This translates in a need for new tools, methodologies and services in order to a) to link business process management to learning design methodologies (such as competency-based business process analysis) and b) to measure learner performance in relation to the defined learning goals and business needs. The new learning systems should be able to understand the skills and competencies required by the new business processes and match them with learning experiences in a way that will be transparent to the user. At the same time individual learning strategies for performance assessment and indicators to monitor the results of learners and their performance must be in place in order to effectively measure the impact of learning on performance.”

Goals:

1. To support human performance improvements and to provide links between business processes, competencies and learning processes
2. To use TEL to design high quality work-based learning activities so that learning and working becomes seamlessly combined

**Vision statement 3:** (Industry challenge) “Promote innovation, creativity, and entrepreneurship at work.”

*Vision statement 3* is related to industry challenges such as investment and development of the human capital of companies and use of learning to support the ability to change in organizations. It is focused on the organization and the role of its employees as something much more than just simple actors in a process chain. It recognizes human capital as the key to organizations’ complete advantage. Employees are not passive consumers of knowledge, but are capable of critical reflection who can provide feedback to the processes of the organization. This is a new view of the organization, where search-based learning is coupled with reflection within the organization. The big challenge is how to create an atmosphere of collaboration within the organization to foster innovation, and also how to create an atmosphere and attitudes of people in the organization to make room for reflection and contribution to get new products out of TEL. There is a need to link the top-down management views of today to this new bottom up business reality. Move away from central control and allow for the “creative chaos”, fluent behaviour and redundancy needed for collaboration, creativity and innovation. To facilitate this type of innovation, a new educational culture and mindset is required which relates more to informal learning methods that differ from teacher-centric models and allow for creativity and collaboration to be at the centre of the learning process. Networking and Collaboration technologies play a big role in supporting this type of learning and knowledge sharing such as Web2.0 applications and Social Software.”

Goals:

1. Learning that supports radical change in an organization and improves the ability to change
2. To support innovation in an organization by enhancing knowledge-sharing and collaboration

3. To develop specific competences related to thinking out of the box, creativity, asking the right questions, leadership

**Vision statement 4:** (Employee perspective) “Learning as a means to increase employability.”

*Vision Statement 4* focuses on the Learners’ perspective, the employees’ continuous professional development, and the need to increase their future employability. Use of learning to increase employability means acquiring "competencies that can increase professional choices", over the whole of one's lifetime.. These "competencies" may relate to fields and qualifications that do not exist yet. The "professional choices" include looking for new jobs or new ways of working, e.g. self-employment, entrepreneurship, portfolio careers, consultancy, project-based work and short-term employment or delegating such inquires to software systems that are "intelligent" in some way. Similarly, the term “workforce” in this vision statement refers to “knowledge workers”. In the knowledge economy, everyone can be knowledge worker by aggregating knowledge, filtering it, reflecting on it and adding value to it. This vision statement aims at both increasing professional choices for knowledge-workers (for example by reducing the barriers to becoming a competent member of other professional communities and sharing their knowledge widely) and also assisting them to find activities (or create activities) that count as being employed. Sharing knowledge within a community of knowledge-workers, to help everyone to improve on-the-job performance, is the key towards this aim.”

Goals:

1. To promote resiliency, personal growth and fulfilment
2. To enhance mobility, employability and competency of the workforce

**Vision statement 5:** (Market dimension) “Consumer driven market take-up, based on increased market transparency and the availability of a wider range of offers”.

*Vision statement 5* focuses on market take-up for TEPL. It involves the development of all segments of the market, ranging from the low-end commodity market to the high-end, upscale, high value-added segment, with a range of different segments offering a consistent variation in the price/benefit ratio, relying on emerging European industry players. This vision focuses on market take-up of technology-enhanced professional learning, both on the demand side (customer) and on the supply side (provider, investor). It targets the ability to provide and purchase content and learning services regardless of their type and of the location of the learning supplier in a unified transparent market.”

Goals:

1. To enable the customer to purchase, not only at any time and in any location (as described in vision statement 1) but also:
  - any type of professional learning/training technology-enhanced service or combination of services, from the most basic ones to the more complex ones
  - at any price, as market transparency and the increased availability of products and services allow the customer to understand the price/performance ratio of a wide range of offers

- from any channel or vendor, ranging from online marketplaces to high-end consultancies.
- 2. To achieve significant TEPL adoption in three different market segments:
  - large corporations and organizations in knowledge-intensive industry sectors
  - SMEs, which represent 90% of companies in Europe : widespread adoption
  - individuals : for life-long learning
- 3. To address the wide range of needs of these three main market segments, with product/service offerings ranging from the basic low cost offering involving static content to services targeting communities of practice such as content creation and sharing.
- 4. To enable the emergence of strong European TEPL industry capable of competing on a level field with North American and Asian TEPL-vendors

**Vision Statement 6:** (Social inclusion) “Access to professional learning for all – extending the knowledge based society”.

*Vision statement 6* is closely linked to social inclusion, as it is perceived in the context of the knowledge-based society. It views the different stages of the Digital Divide through the dimensions of Access, eAccessibility & Usability, Service Development, Individual Capacity Building, Human & Social Capital, and Citizen Participation. The aim of the vision is to ensure that the current knowledge workers, the potential knowledge workers, and the future knowledge workers are able be part of a society that fulfils the criteria expressed by recent European policies and strategies related to the knowledge based society and/or information society. The issues addressed by vision statement 6 are somewhat similar to those addressed by the first vision statement, which is focusing on the individual knowledge worker, while unlike the other visions, this vision statement focuses on societal issues.”

Goals:

1. To promote e-inclusion and equal opportunities for all
2. To provide the needed support for SMEs to ease the first steps in the acquisition of professional leaning tools and techniques
3. To provide ubiquitous access to multiple information channels & the knowledge needed to filter, understand and use them

**Key PROLEARN recommendations for each vision:**

### **Vision 1**

**“Federation of learning resources”** Establish a public platform where people collect, aggregate and share learning resources (or their references), annotate (metadata), evaluate, recommend, and discuss them. This platform should be based on modeling different combinations of “contextualized content” in order to provide overview of available resources in relevant contexts. The platform should be decentralized and open for contributions by anybody. A “long tail” approach used in other fields such as publishing, music etc. needs to be adopted considering the three forces of: a) democratization of production, b) democratization of distribution and c) social filtering (Anderson, 2006).

**“Contextual delivery of learning resources”** Implement semantic search (and filtering) based on various types of metadata (e.g. educational, contextual, usage) and adaptive delivery (mobile, ubiquitous) of learning resources, supporting both pull (self regulated) & push (centralized) learning approaches while taking into account the learners preferences, interests and degree of preparation.

**“Production tools for support of contextual delivery of learning resources”** Develop new production of online tools that will simplify the production of standardized (reusable, interoperable) learning material, including adaptive interactive components.

**“Innovative business models for learning exchanges”** Develop feasible business models to enable efficient sharing and exchange of learning resources. These models should support both open/free and commercial learning offerings and provide the needed sustainability for such ventures and initiatives. (eg innovative models for facilitating exchange, copyright management, quality assurance, revenue generation, etc.)

## Vision 2

**“Methodologies for skill-based performance management”** Develop a methodological approach for skill-based work performance. (i.e. competency-based business process analysis and measurements of learner performance in relation to the defined learning goals and business needs.)

**“Open services for integration of learning and knowledge management”** Integrate technologies such as open content repositories with learning and knowledge management technologies to create an open services framework for learning and content.

## Vision 3

**“New Learning Models”** Develop a new, more social, personalized, open, dynamic, emergent, and knowledge-pulling learning model, characterized by the combination of knowledge management, and formal, non-formal, and informal modes of learning within a social context.

**“Flexible Organizational Structures”** Establish knowledge-based organizations with less hierarchical, less centralized, and more flexible structure, enable knowledge workers to interact outside the boundaries of the organizations and allow different actors from different institutions to come together for a short time to solve a specific problem.

## Vision 4

**“Share-insights”** Establish an EU-wide experience-tapping system based on open standards and social software, for users to share, annotate, compare and describe experiences of competencies that are in-demand & good ways to acquire those competencies and plan for personal development.

**“Share good practice in HR”** Develop localizable Semantic Web Services to help match jobs to job-seekers, using EU-standard ways to describe competencies, levels of performance and links to specific job roles.

**“Personalize learning strategies”** Develop semantic tools to help individual learners to match their learning opportunities and their ways of learning to their career aspirations, to build e-

portfolios more purposefully, and better integrate what they learn informally from practitioners, in authentic settings (e.g. at work and in social networks), with what they learn from formal e-learning courses from employers.

**“Develop a Pan-European alerting system for innovation”** Extend access to digital learning content and services platforms for all (as everyone will be a knowledge worker) - including advanced services related to competency development, with an emphasis on areas where adoption today is low: SMEs, individuals (life-long learning).

**“Secure legal environment”** Provide a less complex and more secure environment for content authoring, production and distribution within the EU that effectively removes hindering factors for professional as well as for user generated content. (e.g. encourage the use of standard open licenses such as “Creative Commons” licenses from mainly public environments to commercial environments. Or develop similar standard licenses specific to commercial environments.)

### Vision 5

**“Quick, easy and affordable access for all”** Extend access to digital learning content and services platforms for all (as everyone will be a knowledge worker) - including advanced services related to competency development, with an emphasis on areas where adoption today is low: SMEs, individuals (life-long learning).

**“Secure legal environment”** Provide a less complex and more secure environment for content authoring, production and distribution within the EU that effectively removes hindering factors for professional as well as for user generated content. (e.g. encourage the use of standard open licenses such as “Creative Commons” licenses from mainly public environments to commercial environments. Or develop similar standard licenses specific to commercial environments.)

### Vision 6

**“Digital literacy for all”** Develop educational systems and curricula that emphasize development of learning skills, digital literacy and life management. Promote reforms in Academic institutions for the rapid skills development of the European workforce. (e.g. Complement the formal curricula of higher educational institutions with informal flexible curricula that can be re-packaged and personalized to accommodate learning that is driven from emerging demands).

**“Diminishing the social divide - no citizen left behind”** Establish social and economic prerequisites for disadvantaged groups to be able to take advantage of the possibilities of the emerging knowledge-based society. This action is a necessary condition for reaching the goal of enabling every European citizen to become a knowledge worker. Ensure a minimum level of economic support for people to be able to devote attention to LLL and democratize access to economic and social resources.

It is worth mentioning that several EU research projects have taken-up the further development of Prolearn visions and actions. e.g ICOPER and TEN-COMPETENCE work and roadmap relates to vision 4, PROLIX project relates to VISION 2, ROLE project relates to vision 1 & 3, and e-Start project relates to vision 6, ODS to vision 1 to mention a few.

## 2.1.4 The ICOPER best Practice Network

### Methodology

The ICOPER Best Practice Network developed a technological roadmap and a reference model (IRM) for standards development in the domain of Learning, Education and Training. ICOPER raised issues of how to improve requirement gathering when designing solutions for a unmapped territory as competency-driven learning and teaching. Through Roadmapping activities ICOPER worked on models describing how community requirements are fed into the specification design process and valorised in the standards consensus process. The project provided methodologies of how to utilize conceptual modelling techniques that are publicly available in order to enable different groups to map emerging trends, opportunities and threats and provide a European insights tapping system for their communities and stakeholders. The ICOPER Roadmapping methodology made extensive use of foresight analysis methods, including “visioning” (scenario development), “futuring” (force-field analysis - weak signals analysis), and “gap analysis” (gaps identification, SWOT, gaps assessment and recommendations). In addition, modeling tools (Cmap) were used for capturing and extending the knowledge and modeling activities of the targeted group communities. The results of these models were compared and contrasted in order to map out the differences and similarities among them and in this way, enable disagreement management (Naeve 2009, 2010) among the positions of the different groups.

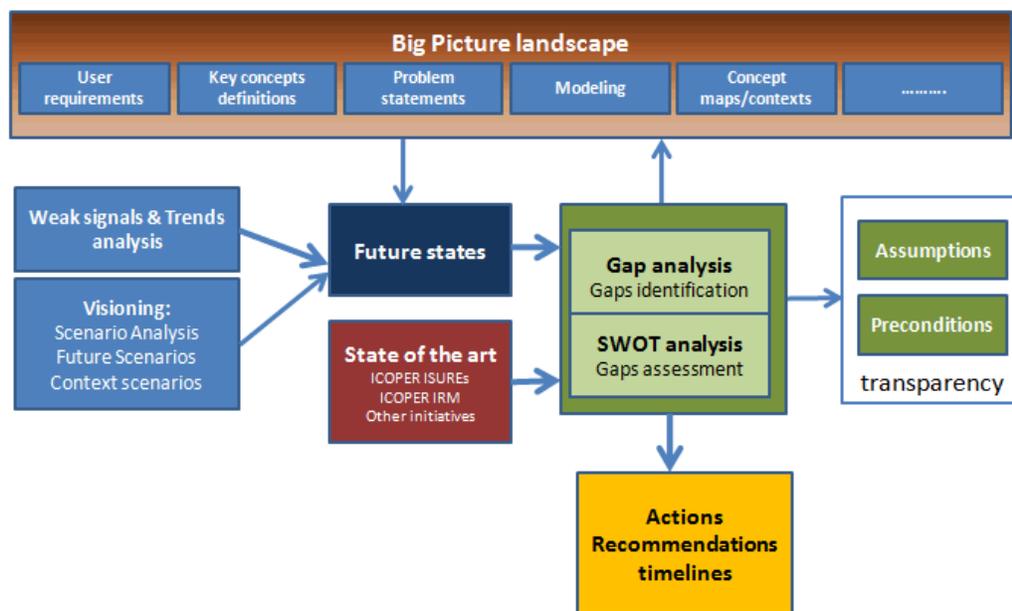


Figure 12: ICOPER Roadmapping components

ICOPER had developed and collected desired scenarios for competency based learning and context/domain scenarios. The desired scenarios were either submitted by other TEL projects working in the same area or were developed internally by the project participants. The domain scenarios were based on the following matrix as shown in the figure below:

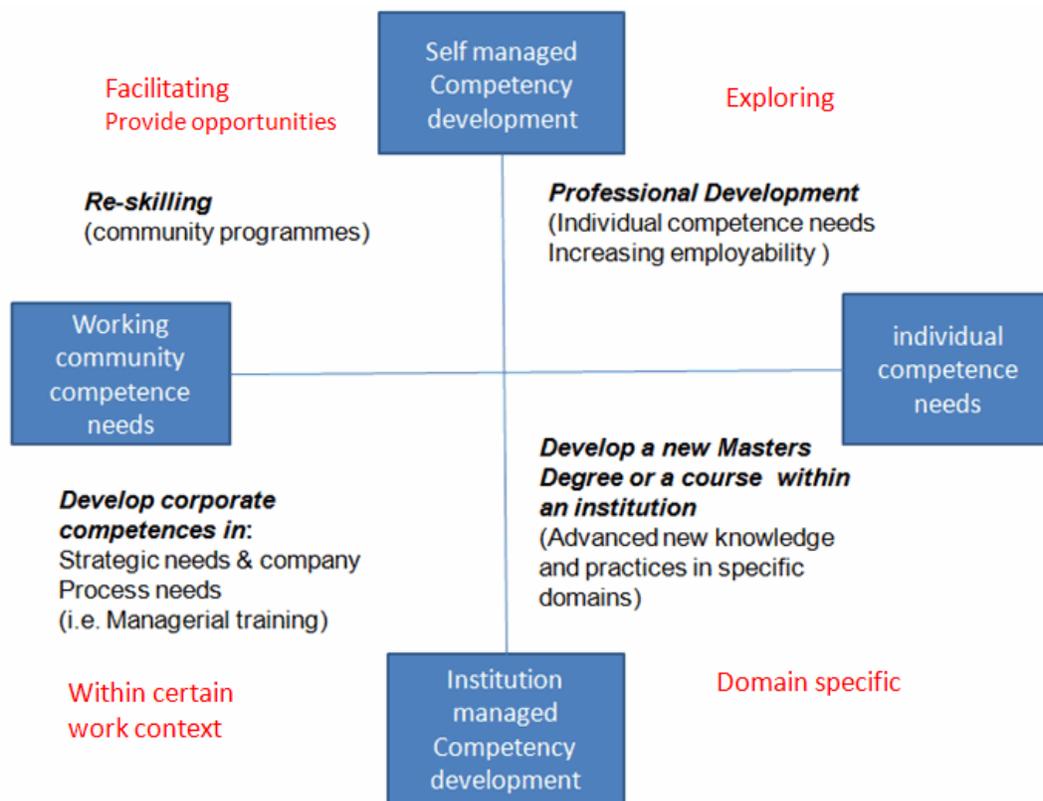


Figure 13: ICOPER scenario matrix

The scenarios and gap analysis processes are depicted in the figure below:

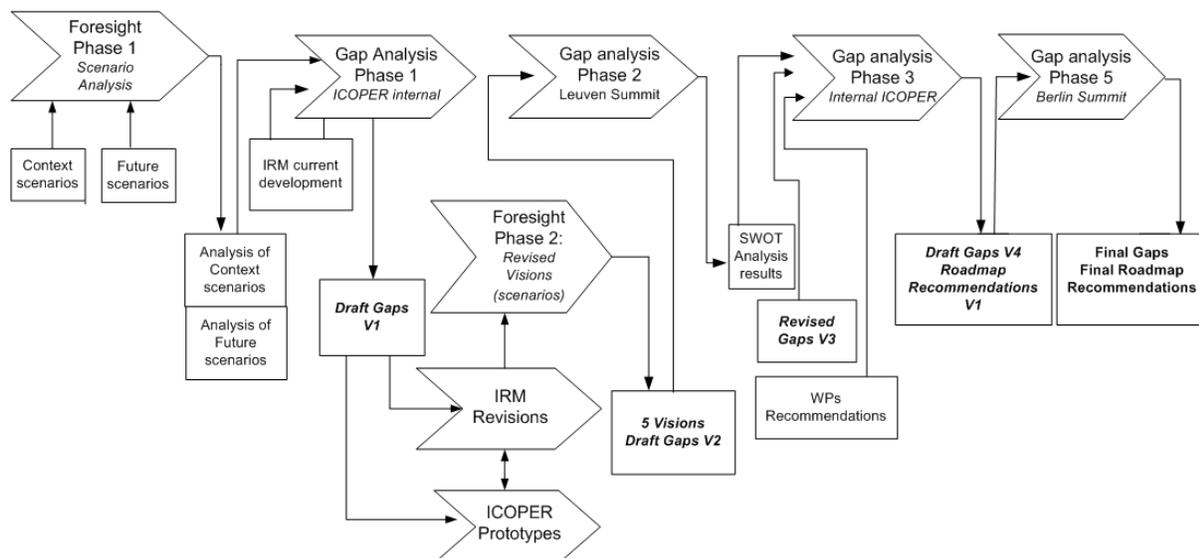


Figure 14: ICOPER scenarios and gap analysis processes

A dedicated SIG, the European Competency SIG was created under the CEN WS-LT workshop umbrella in order to facilitate these discourse and modelling activities among the groups working in the competency domain. This SIG continues. Its main aim is to promote a common European

understanding and practice regarding competencies in relation to schools, academic, lifelong and professional learning. Founding members of this SIG were ICOPER, EA-TEL association, CEN WS-LT, and several other EU TEL and CEN projects.

Although very successful in providing the scenarios and domain, process and service analysis that have governed the development of the ICOPER Reference model (short term Roadmapping recommendations & actions), a dynamic monitoring for the mid and longer term recommendations was not equally successful.

In some cases, however, when disagreement management approaches via conceptual modelling were applied, it did lead to new standardisation proposals (for example the InLOC proposal to CEN and PALO specification).

See figure below:

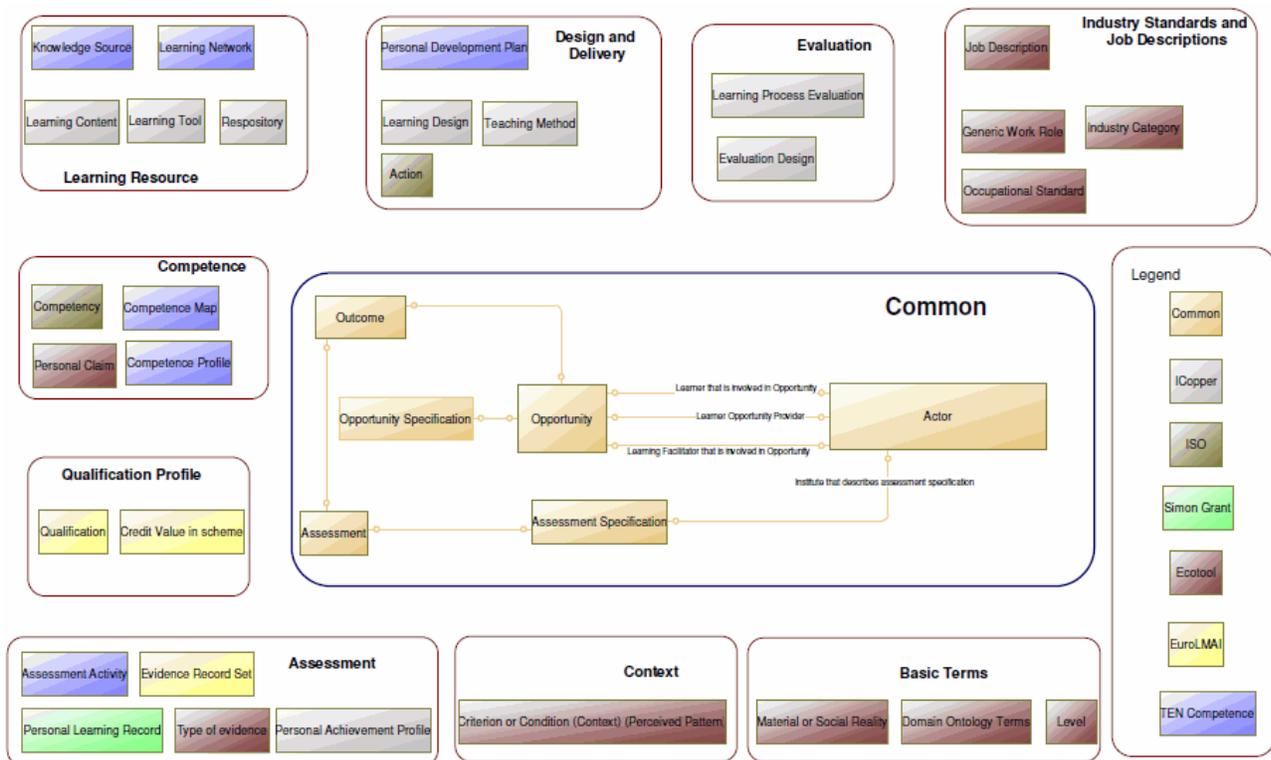


Figure 15: Concept clusters in a harmonised common model

This is a good example, where the Roadmapping activities were followed by different stakeholders working under an umbrella of special interesting groups in the area. During the implementation of the long term recommendations, and the monitoring and continuation of this work, it is important for the developers of the competency models to provide evidence of the application and fit of their models in real life, with the actual adopters of their models, whether they are providers or users of competency based education and provide any concrete examples or at least set of requirements that have based their models on.

At the same time, we need to find domain-specific cases against which these models can be tested for adoption and fit. This will lead to a better understanding of how the perceived value and impact of the offerings will be measured against how the user community understands rates and understand them. Ideally, according to our Roadmapping philosophy, it should be the model trying to adopt/fit the users specific requirements and not the other way around. A bottom up perspective and process for creating standards and specifications using concrete situations, where the actual user needs are taken into account would strongly support the adoption of standards. The European Competency SIG is one of the instruments created for this purpose. Otherwise, any standard will remain an academic exercise of pre-conceived theoretical notions of what a competence should be.

**Results:** desired scenarios, context/domain scenarios, trends, weak-signals, gaps, recommendations, assumptions, top-level harmonised conceptual model. The following Figures set out the main driving and restraining forces impacting on key themes. They can be used a basis for identifying trends and weak-signals to be watched for.

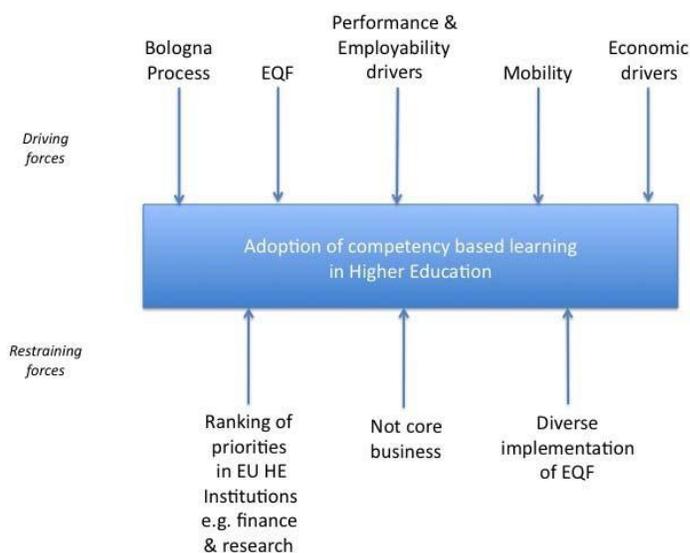


Figure 16: Competency-based learning (EQF)

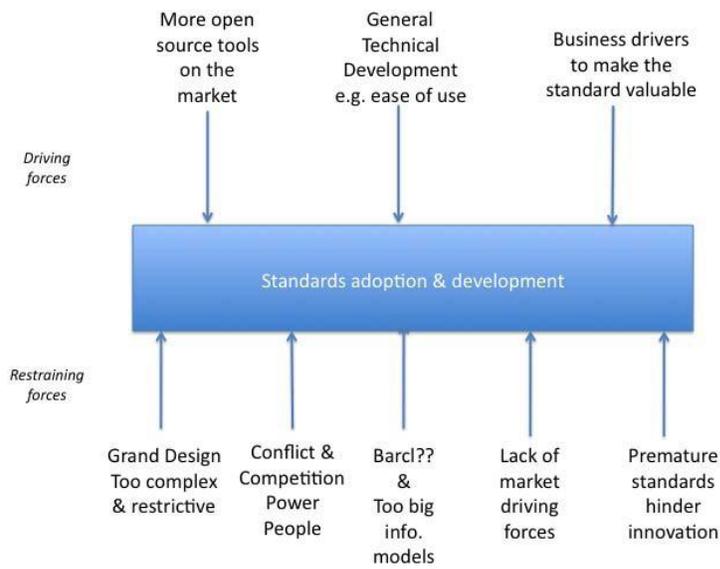


Figure 17: Standards and Frameworks

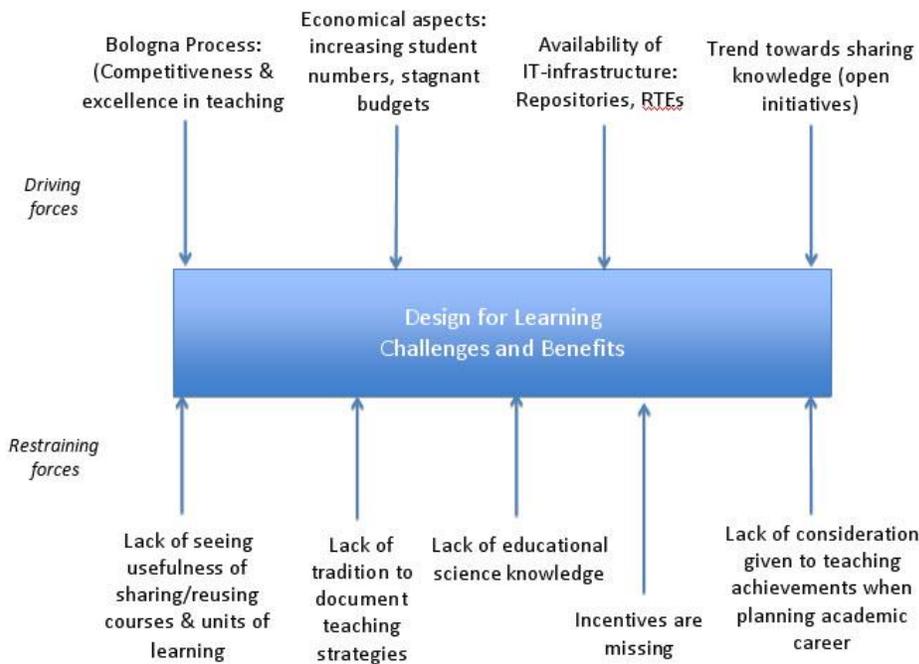


Figure 18: Learning Design

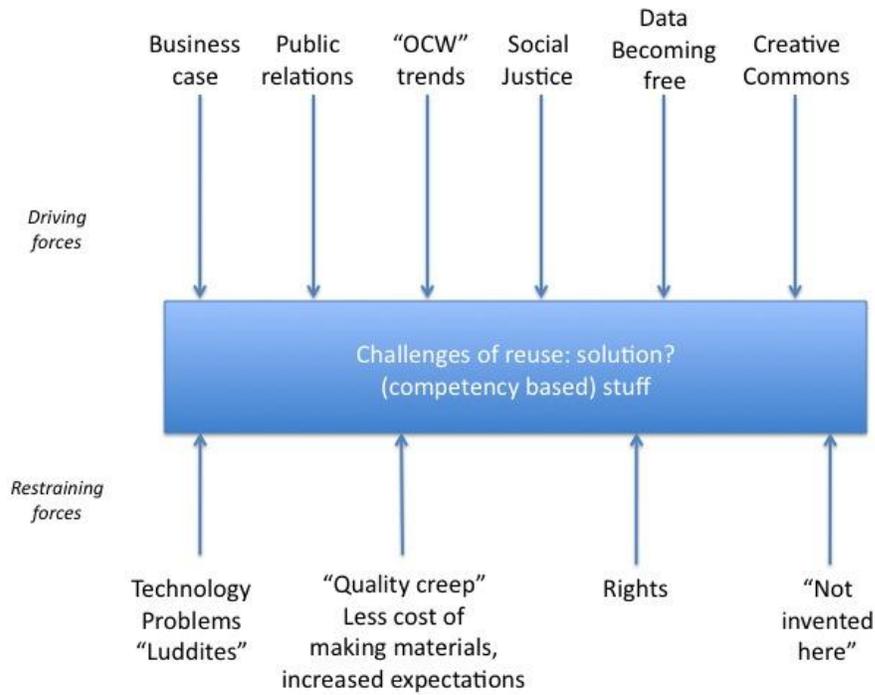


Figure 19: Reuse Units of Learning

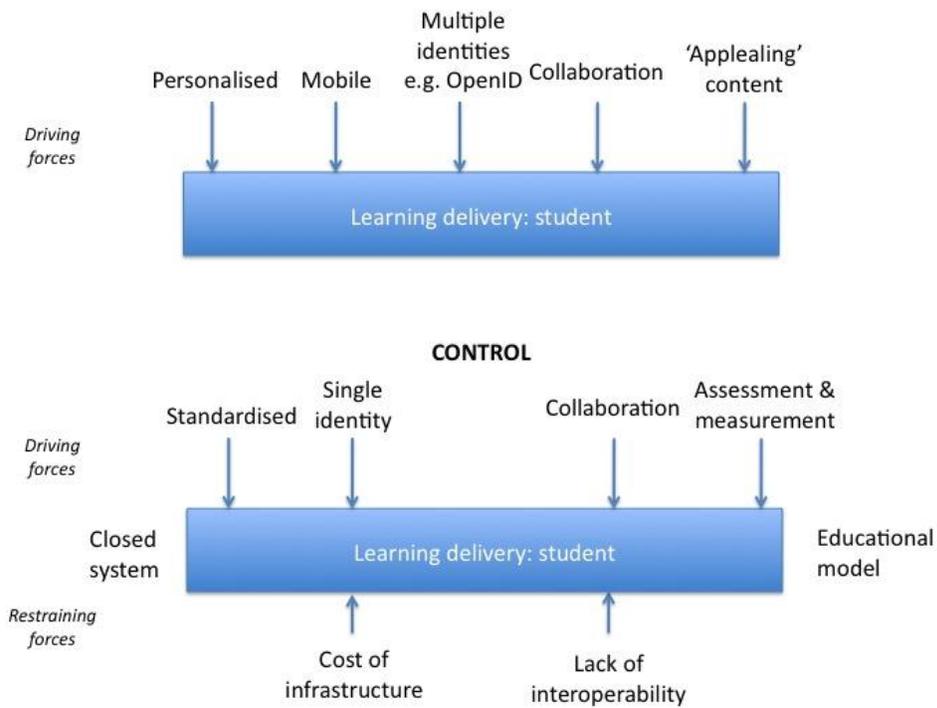


Figure 20: Learning Delivery

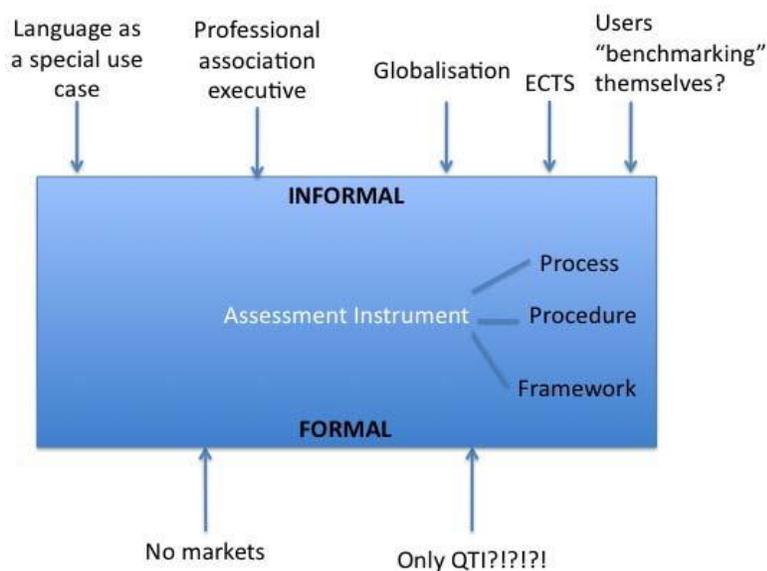


Figure 21: Assessment

## ICOPER VISIONS

Five, standards-driven interoperability scenarios related to outcome-based learning

### Vision 1: Sharing Learning Outcomes: From the Study Programme into the Learner’s Achievement Profile

This first scenario is based on the key concept “Learning Outcome” that is described as follows:

- Learning Outcomes refer to statements of what a learner knows, understands and is able to do on completion of a Learning Opportunity (European Commission 2008). "The student is able to list a number of learning technologies and their properties." is an example of a Learning Outcome.
- The focus in this vision is on the interoperability of Learning Outcomes, for example, when Learning Outcomes are provided for re-use in the planning of courses, i.e. the creation of Learning Designs, or when students, after successful completion of a course, aim at including these Learning Outcomes in Personal Achievement Profiles.

### Vision 2: Sharing Learning Designs: Collaborating around the Design of Courses

ICOPER investigated a scenario around the key concepts “Learning Design” and “Teaching Method” that was described as follows:

A Learning Design is a re-usable representation of a concrete Learning Opportunity. A Learning Design arranges Teaching Methods, Assessment Methods, Learning Content and Learning Tools towards Learning Outcome attainment. A sketch of a Learning Design can for example be described as follows: "After taking this course a student is able to list a number of learning technologies and their properties. In order to achieve this learning outcome we will ask the students to attend a presentation on learning technologies that will also include some demos. After the presentation the student will be confronted with a short test."

### **Vision 3: Sharing Learning Content - An Authoring Round Trip**

ICOPER investigated a scenario around the key concept "Learning Content" that was described as follows: Learning Content refers to any digital and non-digital material that can be used in Learning Opportunity such as a course. An example of such Learning Content is a PowerPoint Presentation providing an overview of existing learning technologies.

### **Vision 4: The Life Cycle of an Assessment Resource: From the Authoring to the Learner's Personal Achievement Profile**

ICOPER investigated a scenario around the key concept "Assessment Resource" that was described as follows:

An Assessment Resource is a special type of Learning Content used for the assessment of a learner's learning activities, thus stimulating some kind of interaction or reaction by the learner. An Example of an Assessment Resource is a test question such as the following: "What is typically used for training high-level skills such as flying an airplane? Simulations, Talent Management Systems, Assessment Tools, Authoring Tools" Assessment Resources are authored by using all kinds of authoring tools and deployed by learning management systems or other Learning Tools. Based on the Assessment Resource a normalized Assessment Record is created, which provides evidence for a learner's Achievement.

### **Vision 5 (future vision): Adaptive Study Programme Design and Delivery**

A Study Programme is a definition of an educational offer that aims at the development of a set of Personal Achieved Learning Outcomes that are aligned with learning requirements from job profiles or society as a whole. Study Programmes are described via a set of Learning Outcomes. In this scenario we assume that Learning Outcomes are strongly inspired by Job Offerings. In this scenario, we envision technologically-support for identifying relevant learning outcomes based on job profiles and job applications. We foresee that interoperability between CV authoring environments, electronic job markets, Study Programmes, and Learning Opportunities focusing on the Learning Outcome artefact, which is developed, shared, and reused in all the different applications.

### ***Main Conclusions of the Expert Summit in Leuven 31st May 2010***

During this Summit experts have evaluated the ICOPER visions:

- The underlying **pedagogical assumptions** need to be made clear,
- In the context of learning outcome definitions **vocabularies** play a key role,
- **Teaching methods** and **learning designs** are ready to be shared from a technical point of view, but more guidance on how and why sharing shall take place needs to be given,
- When it comes to content **sharing Web 2.0 technologies** and related standards also need to be looked at in the educational domain,
- A strategy that deals with the heterogeneity of describing **assessment resources** needs to be developed.

## GAPS

**A set of gaps have been identified (listed below) and classified into seven groups, relevant to:**

- learning outcomes definition,
- assessment, recognition and verification of learning outcomes,
- learning design and content authoring,
- outcome based descriptions of learning opportunities and search,
- adoption and change issues in HEIs,
- collaboration and re-use issues,
- strategic issues related to outcome based learning for organizations and, specifically, HEIs.

### **Group A: learning outcomes definition and linkage with qualification profile**

- Description of learning outcomes is imprecise & meaningful relationship with qualification profile is difficult

### **Group B: assessment methodology, recognition and verification of learning outcomes**

- Lack of standards for assessment methods other than objectives-based multiple choice questions
- How can we integrate ubiquitous, real time assessment data to drive continuous improvement of learning resources and learning design?
- efficient and effective systems for recognition and accreditation of informally-obtained learning outcomes are lacking
- How can we recognise achieved learning outcomes?
- How can we verify claimed learning outcomes?

### **Group C: learning design and content authoring**

- Resistance of teachers and lecturers to the adoption of formal tools for learning design- especially learning design definition languages – and the reuse of learning materials
- How can HEIs, publishers, and other stakeholders adapt to new content production cycle for mobile devices?

### **Group D: outcome based definition of learning opportunities and search**

- Limited availability of description of learning opportunities with associated learning outcomes
- Need for search engines that are easier to use and deliver more relevant results

**Group E: adoption and change issues required in Higher Education Institutions**

- Limited availability of formal accreditation process in EU educational organizations
- Lack of understanding and adoption of the concept and methods for explicit outcome based education by European HEIs
- Lack of resources to transform HEIs into learner centred education facilities

**Group F: collaboration and re-use issues**

- Lack of Infrastructures to support cross organisational collaboration
- Lack of value and reward system to foster collaboration in learning design and teaching
- Need to promote content development and re-use?

**Strategic issues**

- Need to make the impact of increased employee competencies, training and motivation on organisation performance more explicit and measurable
- HEIs need to manage the strategic alignment of new e-learning services with their core missions (goals and innovation, role of technology at HEIs)
- Insufficient European competitiveness in the use of technology to support learning
- Difficulty in ensuring the adoption of standards, guaranteeing their impact on quality and effectiveness for learners

**ICOPER Roadmap - Key Recommendations**

<b>Policy</b>
Use learning outcomes that are common and agreed upon by a domain / subject interest group, national/international framework or HEI
Develop a framework for assessment bodies and cooperation between different stakeholder groups concerning assessment of informally obtained learning outcomes
Relate assessment resources to intended informally obtained learning outcomes
Support a coordination effort at industry level for the recognition of the meaning of obtained learning outcomes
HEIs should offer training and support to teachers when adopting IMS-LD software.
HEIs should associate learning outcomes to learning opportunities in their learning program descriptions and make these opportunities available to learners via federated repositories, e.g. OICS
HEIs should provide program managers and curricula developers with tools that facilitate attaching intended learning outcomes to program/learning opportunity descriptions.
Embed societal issues into the design of programs: values for society, ethics, citizenship, biodiversity, democracy, building the EU, European identity, societal role of HEIs.
Promote a culture of reuse respectful of rights of authors
Disseminate the open content philosophy and develop the expertise in OER at European HEIs
Adopt quality insurance and content acquisition strategies.
Promote the adoption of service-oriented architectures (enterprise architecture) that make shareable educational resources accessible from the environment where educational processes take place.
Encourage HEIs to focus on what people need to know for the development of an autonomous,

complete and free human being
Find the right balance between productivity gains that technology enables and quality of learning
Support European HEIs and e-learning companies, especially SMEs, to become world-class players in the design of high quality content
Establish a dialogue between the standards community and the quality community for e-learning, with a focus on learner needs and benefits
<b>Standardization</b>
Experiment with the PALO model and investigate how to extend its reach
Develop extensions (in MLO-AD or the European Learner Mobility suite of specifications) that support structured description of learning outcomes
<b>Research</b>
Develop new support mechanisms and tools that can provide the required interoperability and align the various learning outcome taxonomies/ terminologies (these mechanisms can take the form of vocabularies, platforms, techniques or tools).
Elaborate an ontology of assessment methods
Develop case studies with IMS-LD to establish more evidence of the need and usefulness of unbundling learning design and course content
Study existing concepts and theories concerning learning and instructional strategies to explore possibilities to validate them
Explore the use of DITA as a standard for e-text books
Improve search through integration with social networks and the use of social metadata
Create learning outcome related data structures and ontologies that support advanced search mechanisms, e.g. semantic web based search.
Develop research on expected impact of changing learning environments, tele-working, critical thinking, social networking.
Study how adoption of standards impacts quality, and how quality in e-learning translates into enhanced learning experience and effectiveness for learners
Study adoption of service oriented architectures that makes shareable educational resources accessible from the environment where educational processes takes place.

The ICOPER roadmap outcomes will be used as input to the ODS project (Open Discovery Space) which aims to develop a virtual Pan European infrastructure to provide a single point of access to educational resources to Schools.

## 2.1.5 LEONIE: Observatory on National and International Evolution (2003-2006)

### Methodology and process – Policy Roadmap

The LEONIE (Learning in Europe) project developed a policy foresight methodology for analysing learning systems evaluation which was carried out by agencies such as EURYDICE and CEDEFOP. It contributed to the establishment of a European level observation capacity on education and training; in this way it facilitated policy orientation and contributed to the take-up of the open coordination method among Member Countries and European Institutions in the domain of lifelong learning and, specifically, in the achievement of the long term objectives for European education and training. LEONIE project addressed the issue of learning systems evaluation and education and training policy development. In order to achieve realistic and comprehensive scenarios of the possible future developments of the learning systems, the project focused on five main domains of change: structure, content, interface, globalisation, and market development. The impact of a variety of trends was studied in detail.

LEONIE first introduced the concept of weak-signals as a foresight methodology in EU projects. It also utilised Desk research, Selection of indicators, DELPHI survey, and 8 national stakeholders seminars. The final results are synthesized in a report & final workshop.

The main figures of the Weak-signals and DELPHI surveys are shown in the figure below:

Type of Survey	Delphi Survey	Weak Signal Survey
<b>Main Features</b>		
<b>Target Groups</b>	E&T knowledgeable experts in Europe	E&T Stakeholders (students, parents, researchers, teachers...)
<b>Objective</b>	Forecast, consensus building on trends of change and policies	Acquiring divergent/creative signals/views
<b>Methodology</b>	Three-round consensus building process quanti-qualitative carried out on line	Anonymous quanti-qualitative online survey based on the weak-signals theory
<b>Results</b>	Set of trends and change likely to affect learning systems from inside and outside, set of policies related to these trends considered likely/appropriate	Set of strong, rather strong and weak or divergent signals: narrations of future learning

**Results:**

LEONIE project identified *10 core tensions* for the future of learning systems:

1. Convergence vs. Context;
2. Continuity vs. Experimentalism;
3. Access vs. Excellence (Quantity vs. Quality);
4. Market Dynamics vs. Public Good Values;
5. Generalisation vs. Specialisation;
6. Information vs. Knowledge;
7. Individualisation vs. Socialisation of Learning;
8. Encouraging Traditional Providers vs. Bringing New Actors to drive Innovation in E&T;
9. More Investment vs. More Efficiency;
10. Focus on Young People vs. Re-directing Resources to Adult Learners.

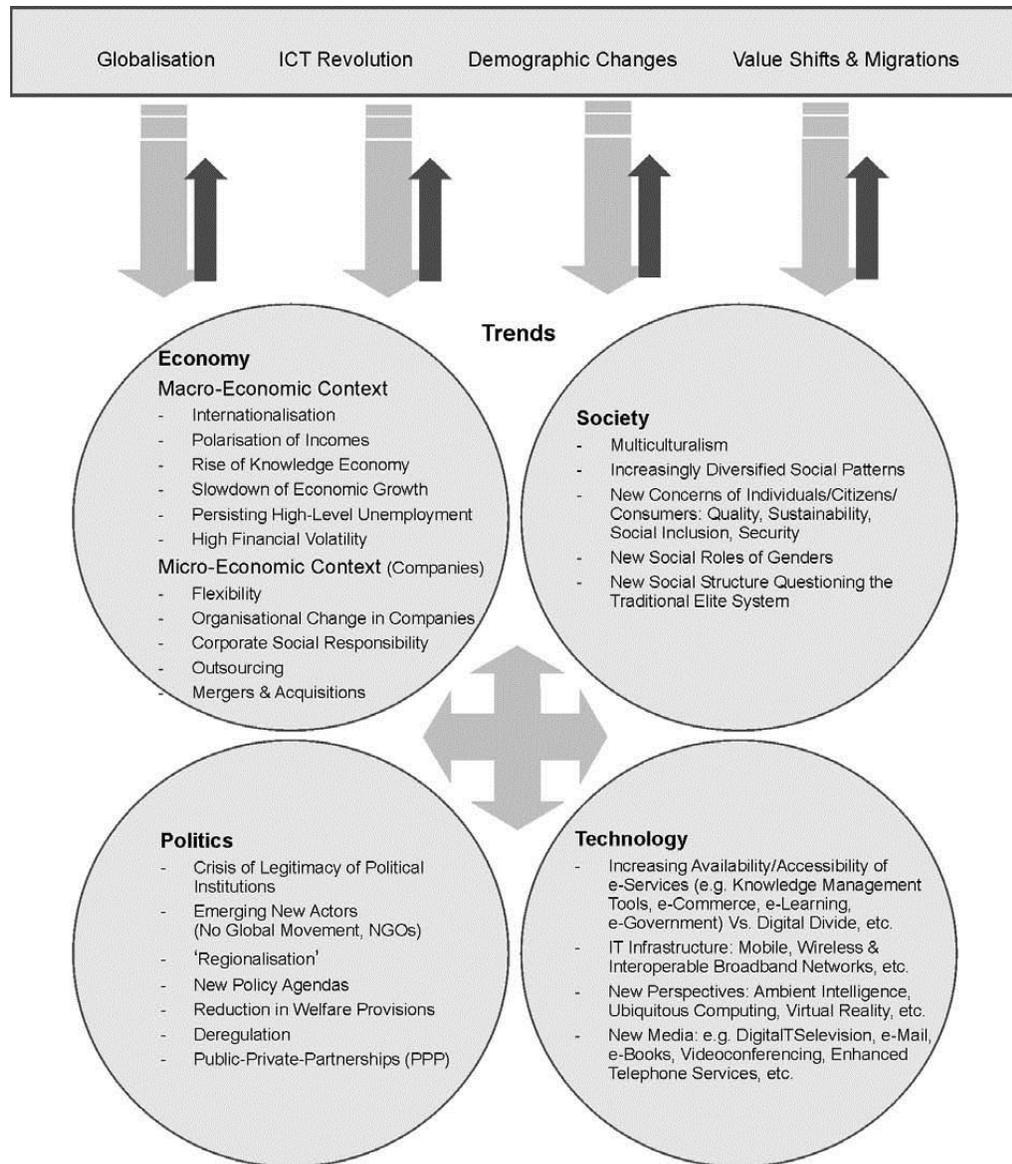


Figure 22: Exogenous Drivers of Change in Education & Training

*Endogenous Trends affecting Education and Training*

*Six broad categories of domains of change:*

1. *Institutional context of learning;*
2. *Organisation, market and distribution;*
3. *Allocation of resources/value added;*
4. *Range and Quality of provision;*
5. *Access to learning;*
6. *Learning practice: Learner -Provider and Learner- Learner relationship.*

*LEONIE recommendations for Policy Actions:*

Promote research and dialogue on education and training at the international level  
Cope adequately with policy tensions

Re-define and re-align learning systems vis-à-vis the State, the civil society, the voluntary sector and the market

Avoid self-referentiality of Educational, training and informal learning systems

Consolidate the European dimension of education

Improve and diversify investment in social capital

Let lifelong learning become reality for all citizens

In addition, LEONIE project identified four different attitudes to change processes that individuals and institutions could assume, including being victim of change, understanding, adapting to change and shaping the future.

## 2.1.6 Learnovation (2007-2010)

Life Long Learning Programme: Grant Agreement n. 2007-3612/001-001

### Methodology and processes – (Policy Roadmap)

Learnovation used foresight activity to build ***a new vision of technology enhanced learning in Europe***, by means of a consensus process which overcomes traditional borders of education and training and addresses learning in a much broader perspective, ***centred on its role in innovation and lifelong learning implementation***, and in light of a ***policy*** advising perspective.

Two parallel processes, feeding one into the other and provide the basis for this foresight exercise:

- Exploring *emerging innovation paradigms* and the actual and expected role for ICT across the lifelong learning land, *mapped and investigated* in its 12 eLearning territories, through a *desk/field research activity* also aimed at inquiring the impact of TEL *on policy discourse and priorities* throughout the territories, so as to build a picture of where we are and where it seems we are going.
- *consensus building*: organised, open and result-oriented dialogue through multi-stakeholders seminars, aimed at discussing and validating the work done and open up new issues feeding the Learnovation results.

The findings of the exploration exercise, combined with the outcomes of the *Learnovation Open Forum* defined the “*Learnovation statements*”, setting more *urgent actions* for change in each territory as well as cross cutting their borders. The Learnovation foresight activity starts from these findings as well as from an autonomous exercise of *scenario planning* - building on literature review, previous relevant projects and internal brainstorming within the Learnovation consortium – aimed at identifying both likely *forthcoming trends and actions to shape the future*, hereby defining on going *drivers of change and domains of transformation*, together with *priority actions* to deal with them.

This methodology followed by Learnovation project is based on experts’ seminars and Delphi survey, as well as desk-top research, trends analysis and scenario planning. The methodology seems to rely more to exploratory foresight activities such as trends analysis in order to define

drivers of change and future context scenarios (“so as to build a picture of where we are and where it seems we are going”) rather than a normative approach using desired scenarios in order to define the desired states first and then look backwards to today (e.g Prolearn roadmap).

**DELPHI study:** The DELPHI survey carried out within the LEARNOVATION project, through three consecutive rounds of questionnaires, was aimed at collecting experts’ opinion and reach consensus *on the expected future* of learning:

- the experts’ view on the main factors affecting change of learning systems;
- the experts’ opinion on the future evolution of learning systems if no relevant policy is implemented;
- the experts’ suggestions for the priority actions to be undertaken in order to reach the desired (rather than the undesirable) scenarios of evolution in the future.

200 experts have been invited to participate in the survey and, among them, 44 have participated in the first round, and a 50% of them completed the DELPHI survey.

The first and second round questionnaire was launched in June 2009. The respondents were asked to provide a rating from 1 to 5:

- Macro factors and elements of the scenarios likely to affect learning in the future (2020)
- Most likely scenario in each lifelong learning area (the so-called “e-learning territories”), if no new policy is activated.
- Most urgent actions for change.

The third round investigated more general positions on major trends emerged from the survey around the future of learning as a whole. The respondents were asked to rate the following core tensions:

- Generalization VS Specialization;
- Status quo/continuity VS Experimentalism and change pushed from the bottom;
- Supply VS Demand;
- Systems adapt to individuals VS individuals adapt to systems;
- Adult learning organised around compulsiveness and urgency VS Interest and motivation as main drivers of learning in adulthood.

## Results

### Delphi study

The experts ranked the impact of a list of exogenous factors likely to produce the most important changes in the way people learn. DELPHI identified Technological progress, social networking on-line, decrease in public funding, globalisation, and multiculturalism among the main external factors that will produce the most important change in the way people learn.

Technological progress is expected to have the highest impact on the way people learn in the future, while crisis of legitimacy of political institutions is perceived to have the least impact.

**Which of the following factors will produce most important change in the way people learn? Please rate from 1- very little impact to 5- very significant impact**

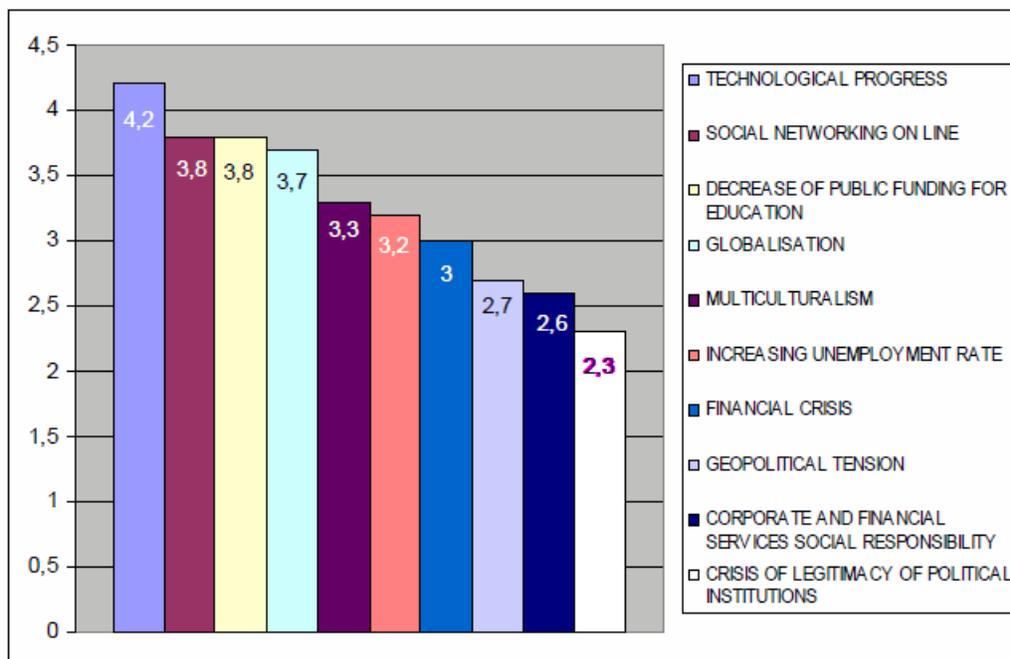


Figure 23: Learnovation Delphi Learning Factors Impact Ratings

### Learnovation Future Scenarios

LEARNOVATION adopted the four future scenarios developed within the SINCERE project (<http://www.cfp.upv.es/webs/sincere/inicio/main.jsp>). These were formulated focusing on two critical uncertainties affecting future learning: “Convergence vs. Context” and “Innovation vs. Inertia” in education and training systems.

Four resulting scenarios:

	<b>Convergence</b>		
<b>Inertia</b>	<b>“Mc-learn”</b>	<b>“Babelogue”</b> The world becomes a global network of learning occasions/spaces available any time anywhere	<b>Innovation/ pro-activity</b>
	Hyper competition of providers on a global scale will lead to a “strive for survival” of learning providers		
<b>Inertia</b>	<b>“The monad”</b>	<b>“Civitas”</b>	<b>Innovation/ pro-activity</b>
	Education becomes more and more insulated from the context and unable to explore emerging innovation practices into learning environments.	Education improves its “profile”, its “relevance” to the context, i.e. the learning patrimonies of local communities and “responsiveness” to stakeholders’ needs	
	<b>Context</b>		

Figure 24: Learnovation future scenarios (source: Learnovation foresight report)

In general all learning areas are expected to move differently and to different degrees towards innovation scenarios. Babelogue and Civitas are in fact all in all the most rated scenarios, whilst an innovation-oriented understanding of Mc-Learn emerges from the DELPHI survey, dismissing the learning fast food view in favour of the effectiveness and updating of learning supply and its providers in view of relevant goals of individuals and organisations.

	Mc Learn	Babelogue	Civitas	Monad
Learning in schools				
Learning in VET				
Teachers training				
HE				
Learning at work				
Professional learning networks				
Distance education				
Individual development through e-l				
Communities generating learning as a side effect				

Figure 25: Most likely scenario in each lifelong Learning area

According to Learnovation Delphi results, knowledge, learning and human capital are entitled to be milestones for building a desirable future, but require a further embedding at all levels of social activity to fully express their potentialities.

1. Building learning around the individual from cradle to grave in a veritable learning ecosystem
2. Recognizing in all learning spaces the catalysts for innovation and development
3. Old mechanisms for new goals: moving from reproduction to innovation: new challenges for research

**Tuning strategies for Technologies and ICTs exploitation: capacity building**

Building capacity to tune strategies and approaches to TEL and ICT-led innovation is the milestone of such a challenge, and should push forwards the passage from a first generation “hardware” approach, to a second generation’s understanding of ICT as a means to support tailored processes of flexibilization, cooperative knowledge construction, communities creation and exchange, virtual mobility, blended learning environment creation and innovative distance education, able to fulfil the double goal of increasing access and exploitation of learning opportunities and of fostering innovation.

### Mainstreaming innovation in procedures:

- Assessment strategies supporting creativity beyond conformance and control, and learning strategies able to give value to difference, beyond mere tolerance.
- A New Quality assurance approach embedding requirements for innovation, as a mechanism necessary to preserve reliability within an enlarging learning system whose borders become harder to catch as well as to ensure a certain room for creativity, including understanding of quality assurance in informal domain
- New virtuous policy cycle employing relevant indicators from planning to evaluation able to measure innovation and push it forwards through tuned strategies.

### Favouring decentralisation and bottom up definition of learning solutions

The expected reorganisation of learning solutions according to instances of decentralisation and localisation is supported as a positive one, able to provide more tailor-made solutions coming from grass-roots needs and able to express excellence, against centrally imposed priorities and related standardised provision failing to unfold local potentialities for innovation.

### Lernovation Vision for 2025:

“Being a Lifelong learner becomes a condition of life. Thanks to their massive and natural use in everyday life, technologies acquire an emancipating power on people opportunity and ability to learn, favouring a spontaneous tendency towards meta-cognition and ownership of their learning process”

### Segment: Schools

**Trends** linked to formal education (schools and vocational learning)

- From top-down (as a long-standing educational institution/policy tradition) to general, bottom-up, learner-driven initiatives - increasing experimentalism and change in learning pushed from the bottom.
- Decreasing intergenerational gap between “demand” and “offer” of formal education
- A slow shift from “Supply” oriented education (in which most of education is still organised by education and training providers) to a “demand-led” education, in which individuals and groups are the main organisers of their own learning experience
- Increasing role of local stakeholders in determining the success of ICT for learning in formal education specialisation of the learning offer
- Increasing adaptation of learning systems to individual needs

There **are two core tensions** emerging from the above listed trends: top-down vs. bottom-up innovation (including, in a way, intergenerational clashes) and centralised vs. decentralised management of innovation processes.

The most surprising result, from this foresight exercise is that most experts agreed that the **monad scenario** is potentially associated only to school education (and attached the same predictability of a civitas evolution). Basic schooling is on the other hand considered the bastion of central authorities provision, on behalf of their role in basic public goods delivering. It is

therefore the learning domain more expected to suffer of a structural lower level of openness to internationalisation and flexibility, due also to the inner need of formalisation/structuration of the learning experience as mean of knowledge capital transmission through subsequent generations in society. The firm grasp of state authorities combined with traditional resistance of longstanding institutions is expected to produce its strongest effect on school, as one of the loci of national identity reproduction. However, a **civitas scenario** is equally expected to be the natural evolution in school as much as in teacher training, unanimously entitled to be the very catalyst of change in the formal education domain.

### **Imperatives for change 2025**

An overarching call for action:

- Face openly the issue of relevance of current learning provision: change is urgent

Cross-sectoral & structural recommendations:

- Re-integrate education into real life
- Devolve responsibility and governance to community and stakeholders and share a common vision of learning

Focus on the learner:

- Increase focus on learning processes and attitudes

The key point of assessment

- Ensure that assessment supports learning

Teacher training and informal learning

- Enhance the innovation capacity of teacher training systems
- Help teachers and trainers to recognise and respect the value of informal learning

### **Research recommendations for Agenda 2010 (short term):**

- Monitor more systematically the contexts and processes in institutional educational innovation
- Place more emphasis on policy impact assessment, and based on that, build incremental learning policy quality loops
- Develop further studies on informal learning of digital natives so to highlight successful mechanisms to be transferred and adapted to formal education (such as peer learning as a mean to enhance empowerment and creativity of learners)

### **Segment: Learning to work and working to learn in 2025**

**Trends:**

- specialisation of the learning offer
- increasing adaptation of learning systems to individual needs
- motivation and interest as the main levers of learning in adulthood
- increasing experimentalism and change in learning pushed from the bottom.

Mc-Learn and Babelogue emerged as the most expected scenarios as concerns learning at, through and for work. Both scenarios stand within the convergence trend, implying internationalisation, universalisation and de-territorialisation of learning and of learning value and increasing networking activities as a source for learning.

### **Imperatives for change 2025**

- Celebrate and recognise learning achievements
- Remember that not all workers are stereotypical knowledge workers
- Encourage all forms of learning at workplace
- Encourage the business community to adopt learning as a priority in its strategic development and change management approaches

### **Research recommendations for Agenda 2010 (short -term):**

- Elaboration and testing of valorisation and certification of prior learning in companies as a key lever to motivate low skilled and low end workers to undertake Lifelong learning opportunities.
- Studies on quality and reliability assessment mechanisms of the information circulated through online communities (particularly professional networks)
- Elaboration and testing of new learning models for trainers so to support their (already happening) transition to learning facilitators, peer mentors in professional networks and catalysts of inter-organisational relations.

### **Segment: Higher Education - “Over and inside the ivory bridge”**

#### **Trends:**

- Specialisation/diversification of education of Education providers (concerning the full spectrum of lifelong learning, not only higher education).
- Emergence of worldwide and regional interdisciplinary centres of excellence.
- Learning initiatives by education and training institutions more and more linked to the needs of local context.
- Informal learning through networking emerging as the XXI Century learning model allowing for diversity and dialogue in education.
- increasing adaptation of learning systems to individual needs.
- motivation and interest as the main levers of learning in adulthood.
- increasing experimentalism and change in learning pushed from the bottom.

**Higher education:** Civitas was rated as the most likely scenario as concerns higher education. With regards to the core tensions (contextualisation/convergence and inertia/innovation) the Civitas scenario falls into the innovation/contextualisation quadrant highlighting that – though innovation is hoped and expected, the need to concentrate the interests and activities of Higher

Education on the local context is felt as predominant. Nevertheless, the need to increase the international dimension of HE is stressed by respondents.

**Distance Education:** Mc-Learn followed by Babelogue. Mc-Learn is the prevailing scenario as far as Distance Education is concerned, followed by Babelogue.

### **Imperatives for change 2025**

- Face openly the issue of relevance of current learning provision: change is urgent
- Establish more connections among the different areas of Lifelong Learning

### **Recommendations for Agenda 2010 (short term – policy actions):**

- The strategic choices for education policy in the EU shall include a commitment to lifelong learning and the implementation of student-centred learning. ICT has much to offer to student-centred learning. Due to the specificities of the distance learning field, this has been much more present in the evolved Distance Education sector from the beginning.
- Quality assurance has much to contribute to both lifelong learning and student-centred learning. Ways to identify and certify non-formal or informal learning should be found and one should be able to assess credibly what has been learned.
- Increasing attention should be paid to virtual mobility in order to build intercultural dialogue, support the internationalisation of curricula, make international study experience accessible to all students and promote cooperation with third country universities (as an alternative to “brain-draining” strategies). Within the EU, virtual mobility is starting to be perceived as a potential component of the Bologna process, bringing together joint titles in a cooperative way (rather than betting on the recognition of national degrees in different countries).

### **Segment: informal learning in 2025**

#### **Trends:**

- First, online communities are not only experiencing an impressive increase, but they are naturally opening up to sectors such as school education and higher education, as in the case of the many university Groups in Facebook.
- Second, in terms of technology, the unexpected is starting to happen: unlike the classic computer business paradigm, the social software sector seems to have accepted the need to move towards convergence; most of the main community-based systems are now connected and interoperable amongst themselves and the tendency is increasing.
- Third, in terms of learning dynamics, it must be noted that there has been an increase in the use of storytelling as a pedagogical technique (most of the time without it being considered in these terms), as it happens for example in many communities dealing with excluded social groups, where the learning process takes place by telling and listening to others’ experiences.

Individual development through e-learning: **Mc-Learn and Babelogue, followed by Civitas**

Evolutions linked to three main scenarios, all implying a high degree of dynamism. All the comments and recommendations provided by respondents go in the direction of supporting individual development as an integration to formal learning processes, rather than “formalising the informal”. The need to develop quality assessment mechanisms is highlighted as a key challenge to be addressed (despite the risk of formalising the informal) given the increasing trend of giving more reliability to the information provided by groups of peers rather than by traditional learning providers.

Non professional learning communities and Communities generating learning as a side effect: Civitas and Babelogue. Not surprisingly, the two prevailing scenarios for these territories fall into an innovation/proactivity attitude and share the two sides of the coin of informal learning communities: orientation to local context and to the international one. Recommendations by respondents are linked to supporting further the development of these communities by pushing forward the value of education and Lifelong Learning and by developing more and more user-friendly applications. In line with the comments related to the individual development territory, the issue of quality assurance is highlighted as a serious and urgent challenge to be faced.

### **Imperatives for change 2025**

- Re-integrate education into real life
- Increase focus on learning processes and attitudes
- Help teachers and trainers to recognise and respect the value of informal learning

### **Research recommendations for Agenda 2010 (short -term):**

- Strengthen the analysis of the pedagogical and social models emerging from informal learning in online communities so to suggest new models to be adopted in formal learning.
- Investigate how the European Qualification Framework could support recognition of informal learning achievements.

## **Learnovation: Creativity and Innovation Roadmap**

### **Creativity and Innovation in Europe: from a shared vision to a common action plan1 – September 2010 (Version 23rd of September 2010)**

The Learnovation Stakeholders’ Roundtable ([www.learnovation.eu](http://www.learnovation.eu)) has launched an internal consultation in order to provide a likely framework for action for each one of the seven priorities set by the European Ambassadors for Creativity and Innovation Manifesto. ([www.learnovation.eu](http://www.learnovation.eu)) . Here we present the actions related to learning.

**Manifesto priority:** Nurture creativity in LLL process where theory and practice go hand in hand.

POLICY LEVEL	ORGANISATIONAL/GRASSROOTS LEVEL
<b><i>Main Orientations for Action</i></b>	
<ul style="list-style-type: none"> <li>• Put Lifelong Learning at the centre of policy concern in a knowledge society.</li> <li>• Reward citizens' learning initiative and learning achievements and encourage learning processes in and by policy making.</li> </ul>	<ul style="list-style-type: none"> <li>• The European workforce is being and will be required with continuous upskilling actions for Europe to be able to compete worldwide: innovators should be recognised and rewarded at all levels and in all sectors.</li> <li>• Embed learning focus in any transformation process at organisational level.</li> </ul>
<b><i>Actions</i></b>	
<ul style="list-style-type: none"> <li>• De-tax all investments in learning.</li> <li>• Public administration should pioneer the principle "best jobs to best lifelong learners" by choosing leaders able to lead change.</li> <li>• Implement micro-credit lending schemes for all types of learning.</li> </ul>	<ul style="list-style-type: none"> <li>• Develop and sustain learning organisations benchmarks.</li> <li>• Use ICT potential to generate and sustain inter-organisational communities of practice and project-based learning.</li> </ul>
<b><i>Catalyst Initiatives</i></b>	
<ul style="list-style-type: none"> <li>• Generalise the practice of a lifelong learner self-assessment for all European citizens to strengthen their identity as learners and citizens.</li> </ul>	<ul style="list-style-type: none"> <li>• Set up a European Foundation for Creativity (or a Unit on Creativity at the EIT) promoting the creation of community laboratories at local level within the Member States. Such laboratories should be open to the members of the community (regardless of their age) and provide the infrastructure and support for people to make their ideas come true.</li> </ul>

**Manifesto priority:** Transform workplaces into learning sites.

POLICY LEVEL	ORGANISATIONAL/GRASSROOTS LEVEL
<b>Main Orientations for Action</b>	
<ul style="list-style-type: none"> <li>• Promote a paradigm shift from the concept that skills development shall merely follow the needs of the labour market to the concept that the labour market shall support the achievement of societal aims such as equity and environment sustainability.</li> <li>• Promote Mobility, Collaboration and Co-opetition within and among companies, flexibility (e.g. e-Working from home), openness, alliances (e.g. public-private, corporate-education), and Integration of Technologies.</li> </ul>	<ul style="list-style-type: none"> <li>• Learning already takes place in workplaces through peer-to-peer interaction and problem solving. The issue is not only and not so much to promote learning, but to valorise the learning outcomes workers do achieve on the job and to set up mechanisms to facilitate exchange of work knowledge and experiences.</li> <li>• Promote innovative workplace structures, top-down (e.g. competence development) and bottom up (e.g. empowerment), documentation of 'abilities' e.g. individual e-Portfolios, organisational e-Portfolios ('org-folios'), individual, group-based, inter-organisational, and inter-sectoral learning.</li> </ul>
<b>Actions</b>	
<ul style="list-style-type: none"> <li>• Agreeing on EU-wide guidelines on recognition of workplace learning (e.g. project management) and disseminating them in the Member States.</li> <li>• Encourage and support cooperation between stakeholders on encouraging learning at the workplace, keeping on fostering public-private partnerships.</li> <li>• Introduce/generalize incentives for learning, including subsidisation of e-Portfolios costs, with a granular and customised approaches for different settings, e.g. large companies, SMEs, public sector, self-employed persons.</li> </ul>	<ul style="list-style-type: none"> <li>• Support the use of ePortfolios and ePortfolios Management Systems by employees and make sure that they are accepted by the industry networks.</li> <li>• Create conditions for (self-organised) learning, including Open Learning and Web2.0 oriented programmes.</li> <li>• Foster social learning and communication, by implementing both managerial (top-down) and collegial peer (bottom-up) support.</li> </ul>
<b>Catalyst Initiatives</b>	
<ul style="list-style-type: none"> <li>• Launch a permanent observatory on innovation skills in Europe, with the tasks of monitoring the progress of national governments and regional authorities in providing compulsory training and re-training actions for the unemployed.</li> </ul>	<ul style="list-style-type: none"> <li>• Produce showcases of good practices, based on the logic 'Let learners tell their stories', based on individual statements and accounts of learners and of managers on barriers, solutions and benefits.</li> </ul>

**Manifesto priority:** Make schools and Universities places where students and teachers engage in creative thinking and learning by doing.

POLICY LEVEL	ORGANISATIONAL/GRASSROOTS LEVEL
<b>Main Orientations for Action</b>	
<ul style="list-style-type: none"> <li>• Creativity, openness and flexibility should be enhanced by allowing freedom of expression and by valorising the creative profiles of individuals since the early stages of the learning path.</li> <li>• Exploit all the potential that ICT and media developments can offer to support learner-centred education.</li> <li>• Consensually maintain long-term objectives of Education and Training policy beyond political and government discontinuities: A really integrated Lifelong Learning system, easy to understand and access by all learners, should be a common policy aim across Europe.</li> <li>• Put learning competences on top of the "PISA tower".</li> </ul>	<ul style="list-style-type: none"> <li>• Bring education closer to the societal needs.</li> <li>• Curricula and examination practices should be fundamentally revised, overcoming existing system resistances.</li> <li>• Ways to identify and certify non-formal or informal learning should be found, building on what has been developed in the Accreditation of Prior Learning field.</li> </ul>
<b>Actions</b>	
<ul style="list-style-type: none"> <li>• Teachers training should include creative and innovative approaches; ways of incentivising creative people to apply their creativity to teaching should be explored. Moreover, teachers and trainers should be supported in exploiting the potential of informal learning.</li> <li>• Utilise virtual mobility to make international experiences accessible to all students and teachers, to build intercultural dialogue, to support internationalisation and to promote global cooperation between universities.</li> <li>• Develop a European policy on Open Educational Resources and Open Educational Practices, able to take into account all stakeholders concerns and expectations.</li> </ul>	<ul style="list-style-type: none"> <li>• Project work should be promoted as a curricular activity throughout all school levels.</li> <li>• Examination practice should be transformed to allow differentiation of learning paths and recognition of skills and competences developed.</li> <li>• More focus should be put on explaining and demonstrating processes such as problem solving, self assessment, information search and filtering, team work, evaluation, critical thinking, networking.</li> </ul>
<b>Catalyst Initiatives</b>	
<ul style="list-style-type: none"> <li>• Introduce in the LLP funding streams for the design and implementation of training programmes to strengthen the educational competences of all parents.</li> <li>• Open a permanent strand in Comenius for teachers training on creativity and innovation.</li> <li>• Set up a "Young education policy makers club" at the EU level in order to get their views included in the discussion, thereby also exploiting the potential of "digital nativeness heterogeneity" in the process of educational policy making.</li> </ul>	<ul style="list-style-type: none"> <li>• Set up a EU competition among national governments/regional authorities for the development of rewarding systems for innovative teachers.</li> <li>• Set-up an Award for Universities/schools/VET establishments which apply the learning outcomes approach and are able to recognise achievements of prior learning.</li> </ul>

The emphasis of the Learnovation Project is on the socio-political aspects of Life Long Learning futures in different learning contexts. In addition, it analyses the emerging learning paradigms

as forces of change for both policy development and the learning Institutions (schools, HEIs, vocational training). The findings of LEARNOVATION and LEONIE projects were used as seed input by VISIR project, during its first consultation event with experts and policy makers, in May 9<sup>th</sup> 2012 in Bologna. The aim of this event was to discuss and define a shared vision on how to exploit the full potential of ICT to leverage for innovation and change in European lifelong learning and as a way to increase digital and key transversal skills of European citizens.

### **2.1.7 e-START Digital Literacy Network, No. 2006-4530/001-001 (2006-2009)**

e-START project aimed at creating a network of key stakeholders for providing a communication base for understanding, supporting and promoting “Digital Literacy” in Primary and Lower Secondary Education (K-9) across Europe and beyond in order:

- To offer a range of high-quality information and other services to do with the meaning, status and the development of “Digital Literacy” in Primary and Lower Secondary (K-9) Education.
- To build consensus towards a “common” curriculum framework for “Digital Literacy” in Primary and Lower Secondary Education (K-9) across Europe.
- To provide a discussion and policy advice/consultative forum on Education Policy and Teachers’ Training needs in order to meet the Digital Literacy Challenge.

For achieving these objectives, the e-START network fostered the adoption of participatory, bottom-up approaches for its network development, which could act as a hub of networks, involving the establishment of smaller networks and sub-networks of “experts” and educational key-stakeholders with differentiated roles and activities. Furthermore, the e-START project cultivated multifaceted mechanisms of knowledge sharing which may enable a good understanding of the unique “realities” of individual countries with respect to digital literacy, as well as identification of generic features of digital literacy and a roadmaps for its “acquisition” in primary and lower secondary (K-9) education. This methodology included:

- The establishment and development of international and national networks
- Collection, translation, and descriptive analysis of National Curricula for both Media and ICT Literacy of many European countries. Over 50 Digital Literacy-related curricula from 21 countries have been collected, 11 of them translated into English (available from the internal community space at [www.educanext.org](http://www.educanext.org) ).
- Desk top research and descriptive analysis of international and/or European conceptual and other theoretical frameworks
- Organization of three successful International Symposia (Athens Symposium on “Digital Literacy conceptualizations”, Finland Symposium on “Quantitative and Qualitative Factors and Indicators affecting the pursuit of digital literacy”, Brussels Symposium on “Factors and Indicators of Digital Literacy”) as consultative workshops for building the e-start roadmap of digital literacy

- The International Conference of Digital Literacy (London, 17-18 Nov 2008) which attracted over 100 international experts and practitioners, and its website has since proved to be exceptionally popular.
- A new IFIP–TC3 Special Interest Group on Digital Literacy was founded in Sept 2007 under IFIP TC-3 (Education) by core members of the e-Start project team. It is anticipated that this new SIG will provide long-term sustainability to the work of the e-START network, and offer fruitful synergy and collaboration with other international communities.

**Results:** Roadmap for digital literacy, Qualitative Factors of Digital Literacy, Quantitative Indicators of Digital Literacy

**E-start Roadmap Recommendations for digital literacy:**

*Curricula and school environment*

1. A broader reconstruction of the school is needed to support bottom-up curriculum development. Involve local communities, in particular parent and family populations, as key actors in the process of curriculum design. Re-position Digital Literacy into an open, inclusive, modern, and democratic school environment and make it relevant to the children’s life situation and social context (for example, by taking into account the dynamics of their social networks, their digital culture, and their contemporary modes and context of interaction and communication e.g. mobile phones, computer gaming, social web networking, video creation and use, etc.).
2. Adapt the ICT curriculum to community needs and interests. The relevance factor is very important. Make the curriculum (a) as inclusive and (b) as relevant to the daily lives of the children as possible. Place emphasis on informal learning and peer-to-peer learning inside and outside of the classroom.
3. The development of Digital Literacy in the School should be targeted to a specific group, community, or population and should be informed by the local social, socio economic and cultural context.
4. Adopt curricula development strategies that help increase the quality of use of ICT in the school, and not just the level/quantity of use.
5. There is a need for a wide redefinition of the skills that are essential in the modern 21st century digital media world
6. Curriculum development for Digital Literacy will benefit from better integration of pedagogy theory, research, education policy and practice in the classroom.
7. Educational goals in Digital Literacy development should be informed by and aligned with the broader social and political agendas.
8. Give teachers more freedom in the ICT curricula to (a) design interventions in the classroom, (b) afford children more independence and increased motivation and challenge, and (c) encourage children to think critically and be more creative in the

classroom. Ideally, the teacher should be the main 'curriculum developer'. This will raise the quality of Digital Literacy development practice.

9. Attention and effort should shift more towards policy and practice, while continue to engage in the useful discourse on the concept of Digital Literacy (useful, in the sense that it informs policy and practice and helps move this issue forward).

### **Teachers' Education**

1. Raise awareness around the problems of Digital Literacy amongst the teacher communities.
2. Emphasize the need to differentiate the curriculum, method and practice of the Digital Literacy development according to the different needs, aspirations, interests and cultural contexts of the local community.
3. Encourage the exchange and sharing of information, experiences, practices, and educational materials and tools, amongst different communities of teachers in different countries.
4. Opportunities for the formation of local networks and groups and the delivery of seminars on the subject of Digital Literacy development are beneficial and welcome by teachers.
5. Develop a common understanding among the teacher community of the multidimensionality of the concept of Digital Literacy and its close affinity to other literacies (particularly to the Media Literacy)
6. Teacher education on Digital Literacy will benefit substantially from providing a holistic view which links theory and research with the policy and practice of Digital Literacy.

The previous mentioned initiatives have adapted and built on each other's roadmapping and foresight methodologies.

The following figure shows this evolution and the interrelationships between these roadmapping and foresight methodologies.

TEL-Map, ICOPER, PROLEARN, Time2Learn, BRIDGES, IMTI and IMS are Technology Roadmaps, while L-Change, LEONIE, LEARNOVATION and VISIR are foresight and Policy documents.

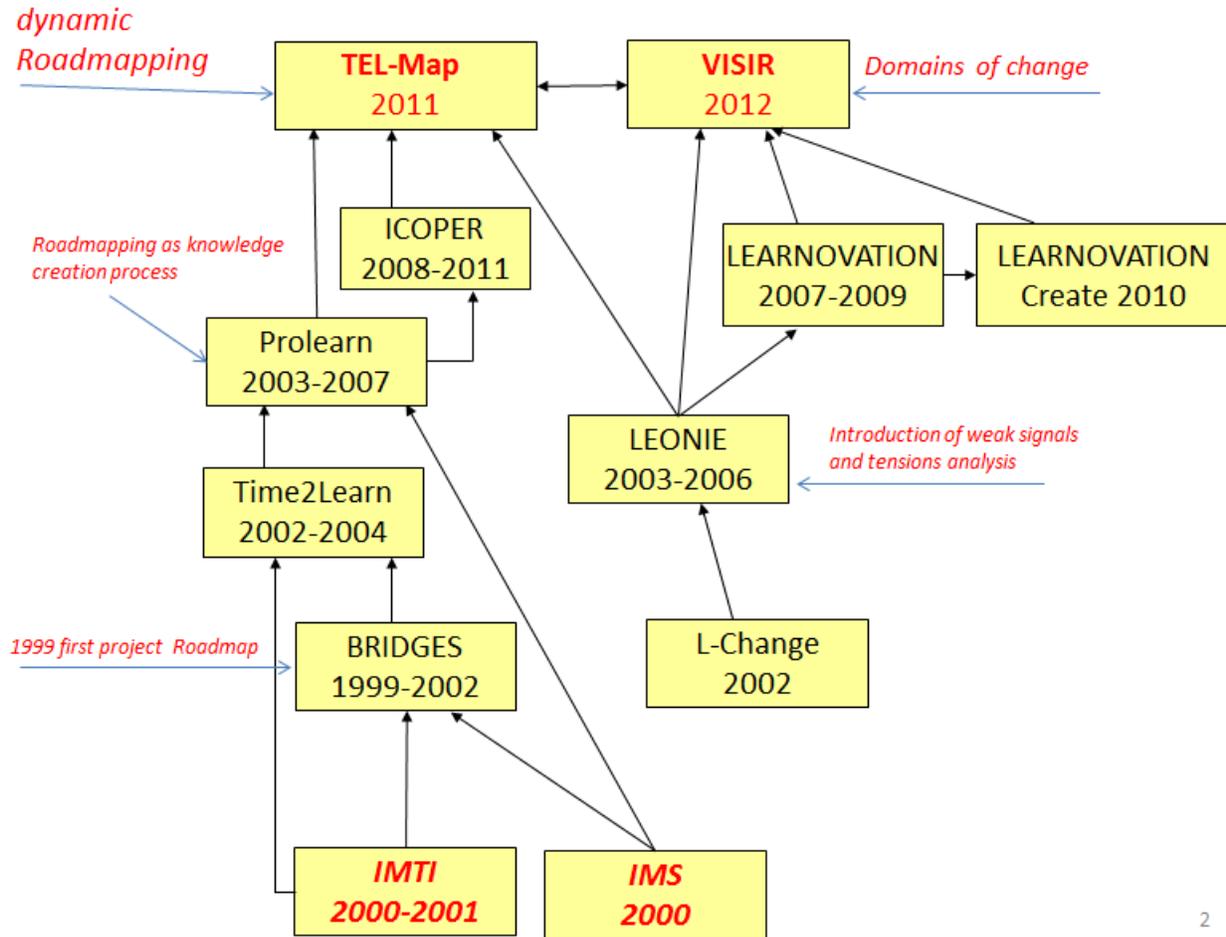


Figure 26: Interrelations of Roadmap Methodologies(IMTI<sup>3</sup> IMS<sup>4</sup>)

### 2.1.8 GROE ROADMAP – US

#### Methodology

GROE Roadmaps used several workshops convened in 2009 to consider the future of education and in particular the role of technology and computer science on education. Through a series of facilitated collaborative workshops, leaders in several disciplines engaged in conversations that cast computation as a basis for education and recommended a research agenda for federal funding. This report is the product of several facilitated meetings, together with months of analysis and discussion by the participants and others consulted. The discussion groups involved over 40 researchers from several nationalities chosen for their expertise in particular fields, spanning computer science, psychology, and education. These discussions were part of Global Resources for Online Education (GROE), a project sponsored by the National Science Foundation (NSF) and the Computing Community Consortium (CCC).<sup>1</sup>

<sup>3</sup> The Integrated Manufacturing Technology Initiative is a US industry/government partnership that facilitates collaborative development of critical manufacturing technologies,

<sup>4</sup> Intelligent Manufacturing Systems Expert Group, Technology Map for Manufacturing

The primary mission of the GROE project was to envision the future of educational technology and to recommend research agenda(s) for federal funding of that vision. The participants suggested several pilot programs that should be funded to identify the education and technology challenges (e.g., assessment, interoperability). They proposed coordinated pilot programs that provide concrete examples to inform and continue discussions. This report is not about predicting or forecasting the future. Instead, the starting point was simply to consider some of the greatest challenges and opportunities for education in the 21st century. This report articulates a vision of education technology towards 2030 and identifies specifically what the education community and policy makers might do to instantiate that vision.

## Results

GROE Roadmap has identified **several educational challenges**, specifically personalizing education, assessing student learning, supporting social learning, diminishing boundaries, developing alternative teaching strategies, enhancing the role of stakeholders, and addressing policy changes. They have also suggested **opportunities for** research and development of promising technologies, including user models, mobile tools, networking tools, serious games, intelligent environments, educational data mining, and rich interfaces.

A map of Challenges, Technology, and Future Educational Capabilities is shown in the figure below:

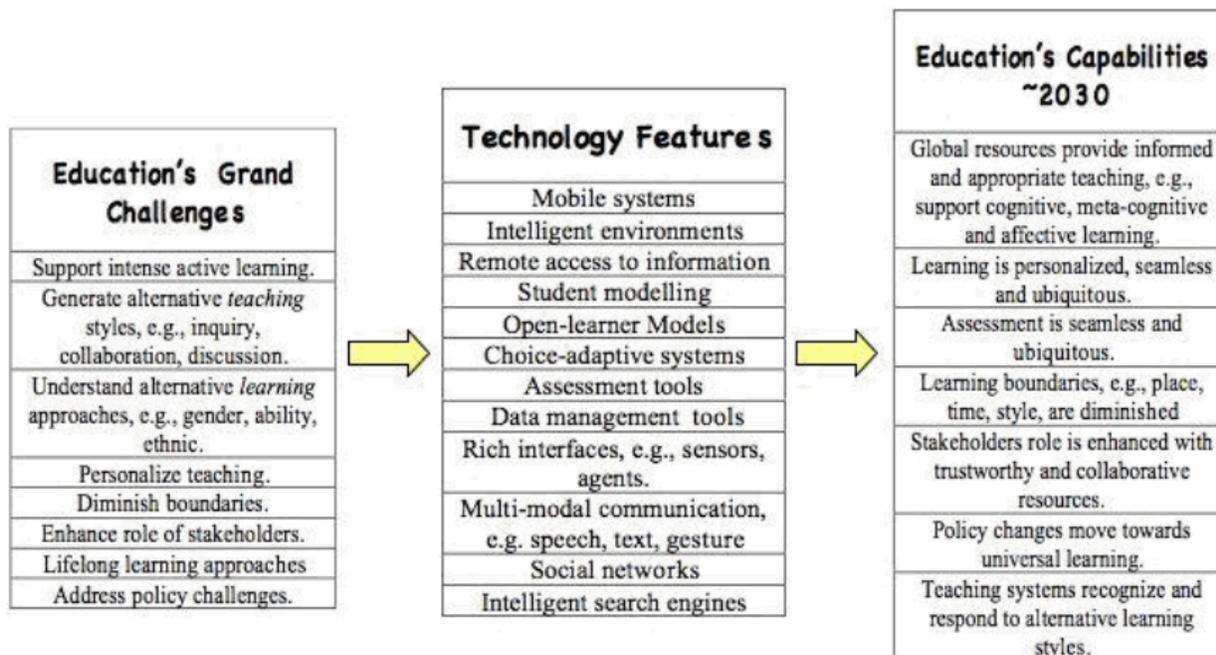


Figure 27: GROE Challenges, Technology, and Future Educational Capabilities

## The Seven Challenges/Visions identified in GROE Roadmap

### 1. Personalising Education

“We suggest that in the next few decades education will be personalized to harmonize with each student’s traits, for example, personality, learning style, and states, such as, affect, and level of

engagement. Computational tools will understand an individual's strengths, weaknesses, challenges and motivational style as might a human tutor. Technologies available to produce such personalized instruction include user-models, intelligent environments, gaming environments, and data mining."

## **2. Assessing Student Learning**

"We believe that by 2030, assessment of students' knowledge, skills, and other attributes will be seamless and ubiquitous. Assessment will be available every time a student learns and will move beyond the current model of "Teach / Stop / Test." Seamless refers to the removal of false boundaries between learning and assessment, and ubiquitous refers to the constant nature of assessment that will feed back results and implications into learning, anywhere and anytime."

## **3. Supporting Social Learning**

"Socially embedded and social driven learning is pervasive. We no longer consider individual learners as learning in isolation. Currently students do work together in classrooms, but only during fixed time periods and with restricted team activities. Future social learning will continue beyond the school day, will involve continuous input from team members and will be available wherever students are located. Technology will sustain continuous learning by active students in a way that enable students to communicate where they are located and to value learning."

## **4. Diminishing Boundaries**

"One long term goal is to re-examine, cross, mitigate and/or eliminate many of the artificial and non-productive boundaries that have been established within educational institutions, including place of study (home, work, institutions), education level (school, college, university and professional development), personal ability (special and typical students) and type of learning (formal and informal). Education by 2030 has the potential to be seamless, ubiquitous and pervasive across place of study, educational level and type of learning."

## **5. Developing alternative teaching modes**

"Education should prepare students to be citizens in the high-technology world of the 21st century where reasoning, disciplined thinking and teamwork are vital. Students will need to solve complex problems in innovative ways and think clearly about vast amounts of knowledge. They will work across disciplinary domains in collaboration and use inquiry reasoning."

## **6. Enhancing the Role of Stakeholders**

"Teachers will continue to be of primary importance in schools and will play new and different roles in connection with technological tools. As technology becomes more pervasive in education, stakeholders (teachers, students, parents, administrators and employers) will more effectively and consistently utilize it as part of instruction and in some cases integrate it fully into their teaching and learning. Stakeholders will trust educational technology to do what it claims to do and be assured that students have absolute privacy."

## **7. Addressing Policy Change**

“We expect global education based on customized teaching will be effective in the year 2030. A knowledge society at a global scale and magnitude requires people to learn rapidly and to quickly form new learning communities. In this context, education should be a civil right for all people. It is naive to think that traditional policy reforms will result in the large-scale changes needed. Rather, broadly based, systemic changes should be thought of as social movements. If the society is to embrace the scope and scale of needed changes, such social movements must be launched and sustained over protracted periods of time.”

Starting with the stakeholders, the following figure sets out these GROE Challenges/Visions (in the circles) and associates with each the technologies that could be used to address/support it and thus form part of a roadmap for each of these areas.

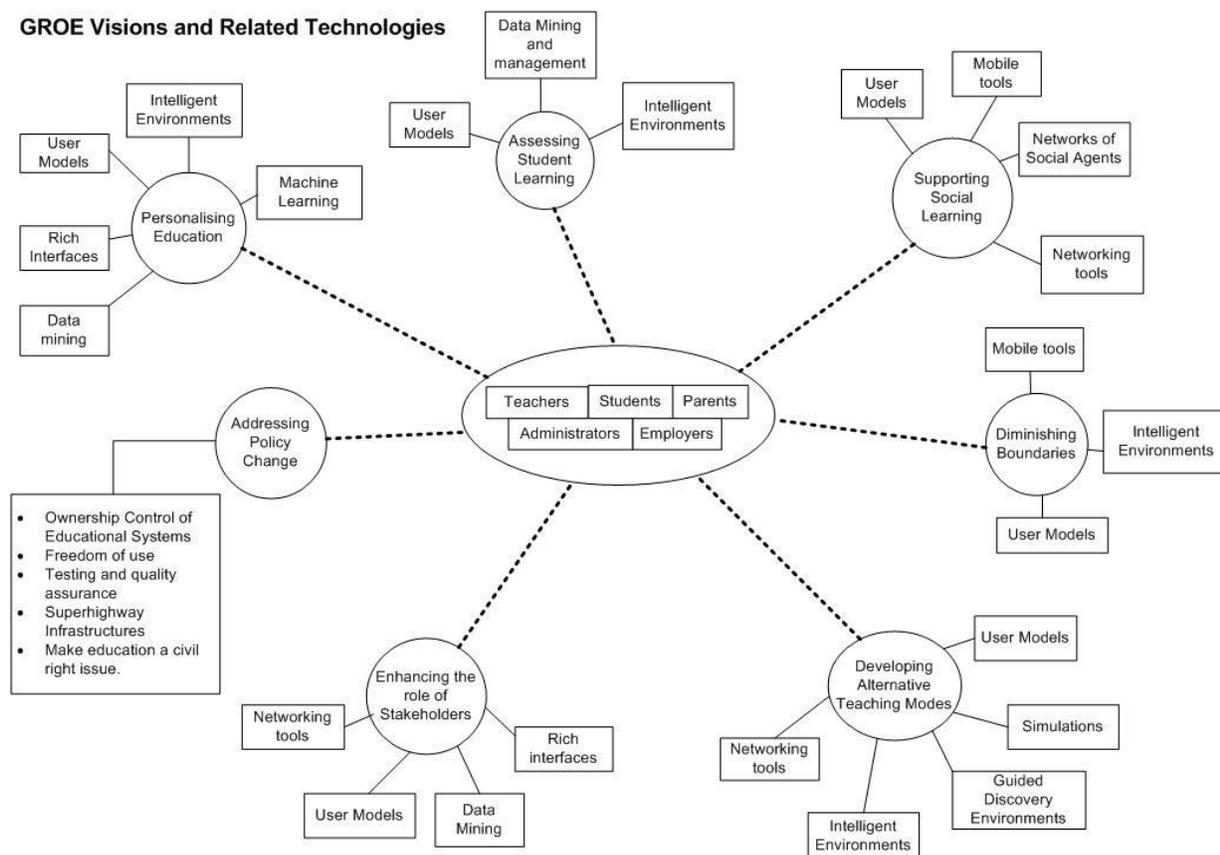


Figure 28: GROE Visions and related technologies

However, a number of technologies can be used to support more than one challenge, so these are consolidated. Having thus identified key technologies to be further developed, the next step was to set out the research that could usefully be undertaken to support the further development and adaptation of these technologies.

Each vision or challenge could be the subject of a roadmap that would guide a group of stakeholders, who shared that vision, to bring it about, or who or wanted to address the challenge collaboratively.

The next Figure sets out each technology and the research related to each area that would enhance it and take it forward.

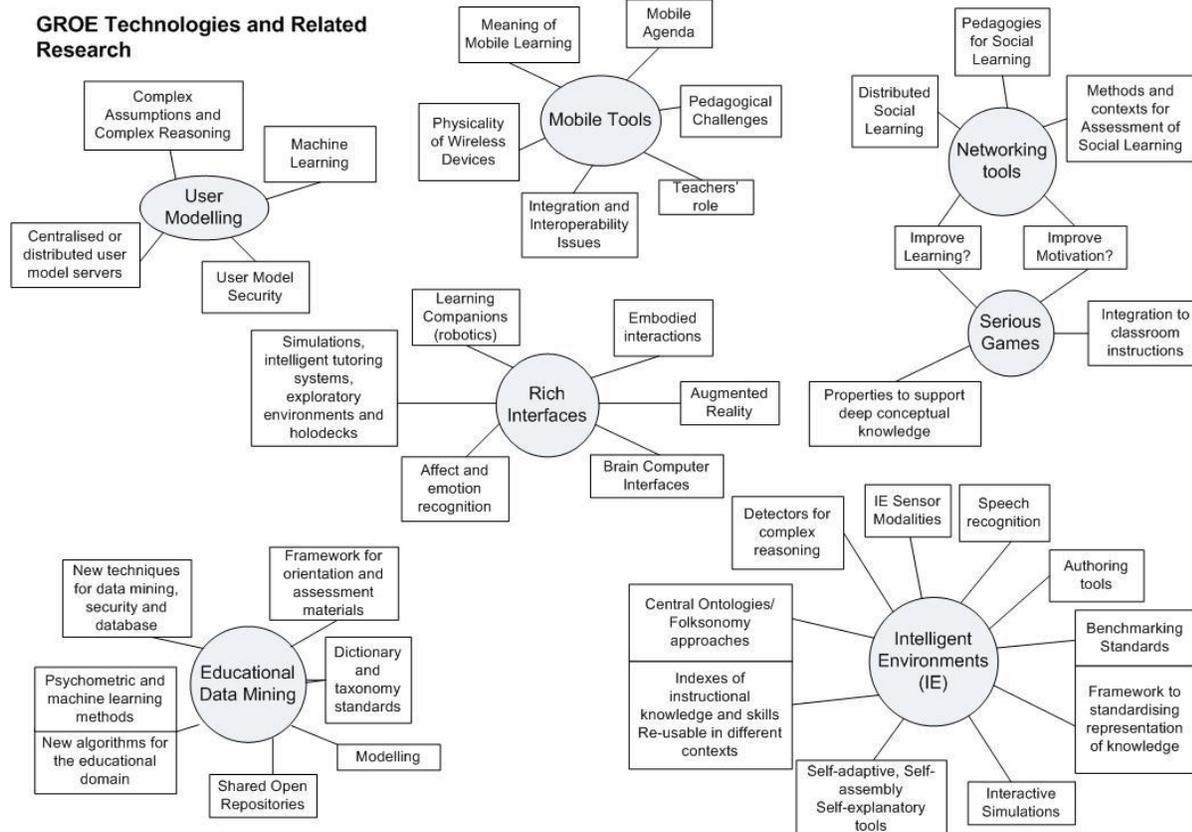


Figure 29: GROE technologies and related research

These in turn could be used to help create and guide a research roadmap, and the results from this used to further the 'vision' and 'challenge' roadmaps.

This would then address the further R&D question of how each technology, having been developed through the research input, should then be further adapted to meet the specific requirements of each vision or challenge.

## 2.2 Roadmaps developed within EU projects Indirectly related to TEL

### 2.2.1 E-SKILLS: European e-Skills Exchange Mechanisms

The aim of the project is to study and recommend European exchange mechanisms of e-skills training resources (priority on e-learning courses) for the workforce, and the networking of training and research centres in Europe, with a view to contribute to a better understanding and addressing of future e-skills needs. The project developed proposals for the development of exchanges mechanisms of e-skills training resources and the networking of training and research centres.

#### Methodology and Process

The project developed a methodological framework which included desk research and field research activities. The process was divided in two phases.

After a preparatory phase where a detailed work plan and analytical framework were developed a first phase started which included:

- Desk research on relevant information. Analysis of this information was carried out focusing on state of the play in Europe, identification of issues, difficulties and opportunities as well as trends and developments. The information collected was entered in a digital library hosted in the project's website.
- Field research including interviews with 50 experts from areas such as governments, enterprises and ICT companies.

In phase 2 more desk and field research activities were carried out focusing on the identification and documentation of best practices. A pilot was developed based on the results of the research. The pilot comprised two areas: an e-Skills resource pool built on the European e-Skills and Career portal and a Self-regulatory mechanism for collaboration, collaboration, exchange, networking and partnership of relevant stakeholders built on experience from the Learnovation Stakeholders Roundtable<sup>5</sup> initiative and on the Kaleidoscope Stakeholders' Club. With the research and pilot detailed proposals for exchange mechanisms were developed as well as conclusions and concrete recommendations.

All the analyses carried out on the activities explained above focused on the following dimensions of study:

- The demand and supply of e-skills
- The relationship between e-skills and e-learning
- The distribution/acquisition models of e-skills

- The role of stakeholders' partnerships and networking

### **Outcomes (drivers, trends, visions/ desired futures and scenarios)**

A study on STATE-OF-PLAY TRENDS AND DEVELOPMENTS IN EUROPE and a best practice report.

Both provide key input to design and develop the prototype of the European exchange mechanism for e-learning resources for e-Skills. This study has led to the identification of the following challenges to be faced when planning the design and development of a networking and brokerage mechanism for e-learning resources (source: Synthesis Report State-Of-Play Trends and Developments In Europe):

- Strategic dimension: the exchange mechanism on e-Skills should not overlap with already existing initiatives but complement and systematise them. Vendor centric and neutral interests (at global, European and local levels) should be integrated to ensure a revenue for everyone as well as their commitment and involvement. In addition, the platform shall provide facilities for the networking and cooperation among all interested stakeholders.
- Distribution, localisation and adaptation dimension: the exchange mechanism shall have a European dimension compatible with national frameworks. English is selected as the "official ICT language".
- Sustainability dimension: Public funding (at EU and national level) would be necessary for the start-up phase of the platform, though most experts agree that in the long term alternative sources of funding shall be retrieved. If the strategic dimension is well addressed in the start-up phase, cases like the one of CSU show that investment (not necessarily in financial terms but also in terms of time and resources) can also come from the private actors involved (vendors, publishers, etc.).
- Technological dimension: the open source industry as well as web 2.0 and 3.0 solutions shall be considered for exchange mechanisms leading to a community based approach.
- Security dimension: though the challenges linked to IPR were unanimously recognised, no solution was given. Again, an in-depth analysis on the strategies adopted for copyright protection, IPR protection and privacy protection of the users in the above mentioned systems shall be carried out in the next phase of project development to evaluate the adaptation of such strategies into the e-skills context.
- Quality dimension: the e-skills Steering Committee Group recommended users' ratings of the resources to contribute to the quality of learning resources distributed through the exchange mechanisms.
- Usability: user-friendliness and user involvement emerge as key aspects to ensure the sustainability of the platform in the long term.

## 2.2.2 CReATE ICT Innovations in Creative Industries

The CReATE - ICT Innovations in Creative Industries project aimed to link European players from research, business and the public sector and to develop a joint research agenda for promoting ICT-based innovations in Creative Industries.

### Methodology and Process

(Source: Strategic Cluster Development: Applying Strategic Policy Intelligence to create a Joint Research Agenda, 2008)

The CReATE project developed a methodological framework (see figure below), which affected the decision-making process and contributed to the sustainable success of the whole project. The framework enabled the coordinated linkage of regional and trans-regional activities. It included:

- the regional analysis and identification of regional research priority areas in the field of ICT for Creative Industries,
- the trans-regional ('inter-cluster') matching of these research priority areas and based on this, the drafting of a Joint Research Agenda
- the advanced regional feedback to and support of the Joint Research Agenda, based on the commitment of the relevant regional stakeholders
- the common development of the cross-regional ('inter-cluster') Joint Research Agenda
- the regional and cross-regional validation and project development

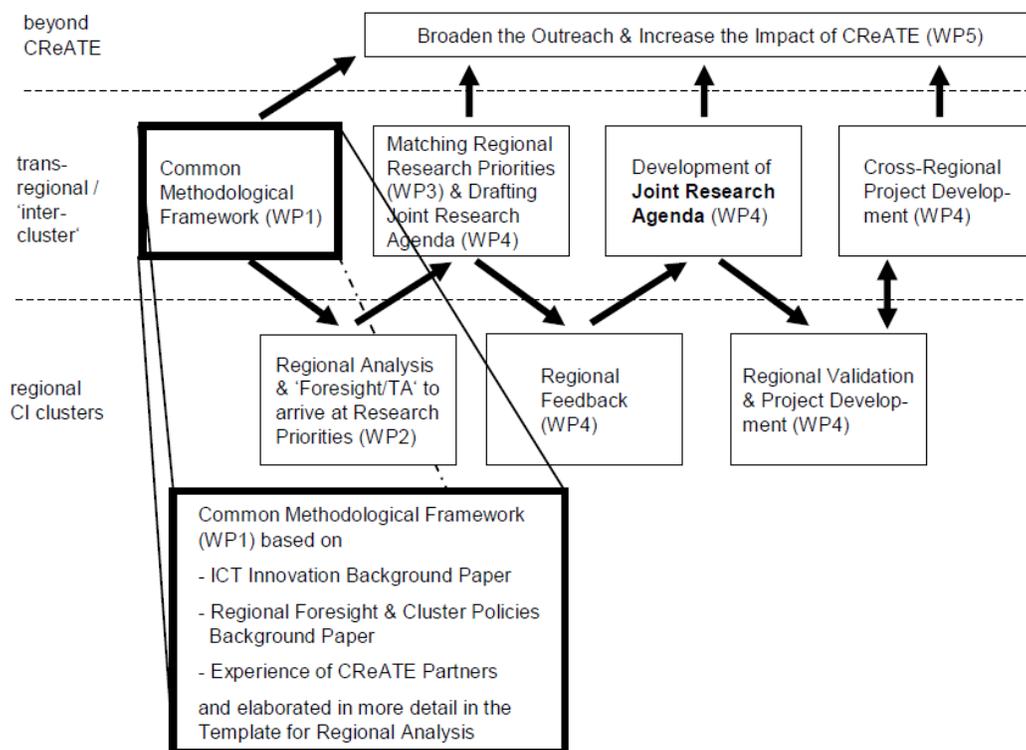


Figure 30: CReATE Project: Common Methodological Framework

Following the methodological framework the CReATE methodology suggested the following 5 steps:

*Step 1* - Build the relevant regional knowledge base on ICT for Creative Industries: in this step a Strategic Policy Intelligence and management (SPI) tool called Innovation Audit is used to map relevant stakeholder groups including their respective competences and to produce an outline of the regional, cluster-relevant strengths and weaknesses. The Innovation Audit uses methods and tools such as desk research, compilation of data and interviews with cluster stakeholders. The results of the mapping process are presented as a cluster map showing the specialisation of the cluster, the major actors (and competencies) and their interrelatedness along the value chain.

*Step 2* - Identify regional research priority areas in the field of ICT for Creative Industries: uses a forward-looking activity that is tailored to regional characteristics and focused on future market and technological developments. The forward-looking activity includes a Cluster Foresight SPI tool which involves five sub-phases.

- Phase one included a SWOT and a Trends & Drivers / STEEPV study.
- Phase two was the First Regional Cluster Stakeholder workshop.
- In phase three extended SWOT and STEEPV data were collected.
- Phase four was the Second Regional Cluster Stakeholder workshop.
- In phase five a compilation of regional cluster-related research priority areas was made.

*Step 3* – Matching regional research priorities: regions are matched and integrated into a cross-regional, cross-cluster Joint Research Area. The trans-regional matching of the identified regional assets, needs and research priority areas reveals the opportunities of cross-regional, cross-cluster collaboration and cross-fertilisation. The outcomes of this step were discussed in the International CReATE conference in Torino.

*Step 4* - Developing a Joint Research Agenda: based on outcomes from the international conference and input from stakeholders.

*Step 5* - Cross-regional, cross-cluster project development: formulation of cross-cluster and cross-regional project ideas and discussion of their feasibility.

### **Outcomes (drivers, trends, visions/ desired futures and scenarios)**

(Source: Joint Research Agenda for ICT Innovations in Creative Industries, 2010)

The project developed a Joint Research Agenda which listed the core topics for applied research with relevance to Creative Industries. The topics provide strategic direction to boost Creative Industries in Europe now and in the future.

The topics are grouped under Research Priorities as follows:

Research Priority 1: Visual and interactive experience:

- Virtual environments
- 3D visual animation
- Real-time visualisation and interaction
- High resolution display environments
- Haptic computing
- User-friendly immersive environments
- User-centred design of continuous interfaces

Research Priority 2: Tools of productivity & intelligent automation

- Semantic software for automated recognition, assembling and indexing
- Interactive artificial intelligence
- Enhanced procedural generation tools for digital content and prototyping

Research Priority 3: Digital distribution

- Encryption
- Data compression & decompression
- New business models
- Cross-platform distribution

Research Priority 4: Mobility & interoperability

- Data streaming systems
- Web security for online data exchange
- Interoperability of mobile & other devices
- Location based / personalised mobile services
- Augmented Reality solutions

Research Priority 5: User-producer-interaction in development

- Collaborative production & user-generated content
- Web technology for online collaboration
- Interactive testing environments

In addition to the Core Research Topics the project also presented concrete areas where existing support policies and programmes needed to be adapted to the requirements of the

Creative Industries as well as where new support schemes are to be established. The areas are:

- **Research & skills:** How can research be fostered at the intersection of creativity and technology?
- **Access to funding:** How can funding and support schemes be more accessible for creative researchers and businesses?
- **Business interaction:** Which actions are needed to improve interaction between researchers and entrepreneurs or companies?
- **Clustering opportunities:** How can clustering activities strengthen the performance of Creative Industries?

### 2.2.3 The e-IRG Roadmap

The e-Infrastructure Reflection Group (e-IRG) is an inter-governmental policy body comprising government-appointed delegates from thirty-one member states, as well as representatives from the European Commission. The e-IRG mission is to pave the way towards a general-purpose European e-Infrastructure. In 2010 the e-IRG developed a roadmap on sustainable European e-Infrastructure services. This roadmap details the ways in which Europe can benefit from the opportunities introduced by changes to e-Infrastructure user communities, technologies, and services.

#### **Methodology and Process**

The e-IRG Roadmap was constructed using a synthesis of data from several channels including meetings of e-IRG delegates. e-IRG delegates were appointed for their knowledge and expertise in the provision of large-scale e-Infrastructure services and related policy issues. e-IRG meetings aim to reflect on and balance different inputs, including those received from expert consultations, open e-IRG workshops, e-IRG Task Forces on specific issues, and contacts with projects that represent e-Infrastructure users or service providers.

#### **Outcomes (drivers, trends, visions/ desired futures and scenarios)**

(Source: e-IRG Roadmap 2010)

The e-IRG Roadmap presents their visions for Infrastructure and Trends in five areas:

- a. The role of e-Infrastructure in ICT innovation: innovation in scientific network infrastructures has primary effects on innovation in the general networking market and in generic application services and specific ICT applications.
- b. A move to service orientation: e-Infrastructure as a service instead of technology or product. This move needs to be accelerated to support the increasingly diverse community of users.
- c. Paradigm shifts: many of the technologies that underpin e-Infrastructure are on the brink of fundamental change which may cause some surprises in the development of the

leading-edge software systems typical to research e-Infrastructure. Changes are occurring in the following areas:

- I. The data deluge: data will become an active component in the research process.
  - II. The thread of a “Software Crisis”: caused by the technical challenge of harnessing the very large number of processing units used in supercomputing applications. Policy changes may be required to address this challenge.
  - III. Knowledge resources related to paradigm shifts: leveraging knowledge from other ICT projects which focus on areas such as the network of the future, high performance computing (HPC) and HPC software.
- d. From e-Infrastructure components to e-Infrastructure service components: sustainable models are needed for the provision of the following four key services:
- I. Networking Services: it is important to develop usage policies that a) strike a balance between optimal allocation of and accounting for on-demand lightpath-networking resources, and b) provide room for bottom-up activities that feed the innovation ecosystem. New governance principles and methods should manage and finance the mixed use (by heterogeneous communities) of network infrastructures.
  - II. High performance computing services: will have an impact on European competitiveness. They will help to train university students who will be using them in the future when they become affordable by all kinds of enterprises.
  - III. Commodity computing services: will soon encompass solutions offered by grid and data grid computing, cloud computing, and cluster and cycle-scavenging systems. It will improve efficiency of the research process and will become the most common point of first contact with e-Infrastructure for many researchers. The key challenge is the creation of transparency by setting standard requirements and agreeing on methods for accurately comparing the actual cost of different solutions. The technical interoperability of different computing solutions also needs to be improved. Once interoperability has been achieved, standardisation will allow inter-operability to be measured or codified. Levels of interoperability can be effectively reached by:
    - Monitoring of the development of de facto standards to ensure that the investment in formal standardisation efforts is justified by their impact.
    - Pursuit of formal standardisation processes, with an emphasis on those standards organisations seen as relevant by stakeholders
    - Testing and development of third-party interoperability.
    - Development of policy actions aimed at clearly distinguishing the roles of software, solution and service providers.
  - IV. Data-related services: there has been an explosion in the volume and complexity of human knowledge available through the Internet. Current data management

practices should be augmented by services focusing on metadata, quality and interoperability. The rapid growth in data-intensive research will require facilities that combine data and computation.

- e. Organisational Developments: practices of research institutes will change dramatically driven by increasingly global and competitive research marketplace. This increasing competition will create pressures to use computing resources. The common e-Infrastructure will provide an organisational interface sympathetic to the issues of research applications and offer researchers a role in governance of the service avoiding the risks of two extremes: ICT resources either managed completely “in-house”, or completely outsourced to external providers.

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“Public Version of the Roadmap for TEPL”, PROLEARN Deliverable D12.15, February 2008

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“Report on Qualitative Factors and Quantitative Indicators of Digital Literacy”, Deliverable e-START Digital Literacy Network, 27 March 2009

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“Strategic Cluster Development: Applying Strategic Policy Intelligence to create a Joint Research Agenda”, Background paper for the CReATE project, Deliverable Create 1.2, 25 October 2008

T. Koskinen et al. “Time2Learn: European Roadmap for Professional Training”, ISBN 84-9788-223-7

“Understanding Change, Adapting to Change, Shaping the Future: Change Drivers, Trends & Core Tensions for European Learning Systems & Educational Policies”, LEONIE Deliverable, 2005

## 2.3 Analysis of other initiatives

A large number of studies on educational futures, in the context of economic, social and technological change, have been funded by a range of different international organisations and government bodies. These help map out the bigger picture of TEL futures and provide groundwork for TEL-Map cluster roadmapping activities. In order to explore the wide range of knowledge contained in the education sector and the TEL community, around 40 research reports, academic papers and project websites were drawn from the Web and literature review. For further reference, the full set of links to sources is available at the delicious website: <http://www.delicious.com/liyuan/telmapscenarios>.

Several of these studies were examined in depth, selected on the following criteria:

- 5) conducted over the past 10 years
- 6) considered a medium to long term future timescale, not less than 10 years
- 7) represented a number of different sector, national and international perspectives
- 8) provided areas of shared concern and attention on educational futures.

This section draws out the methodologies and processes that were employed and the challenges, drivers and trends that were identified by the selected studies. It also presents the various visions/desired futures and scenarios developed for schools, higher education and lifelong learning, drawn from a range of different sources, including, not-for-profit and international organisations, government and industry.

### 2.3.1 The Schooling for Tomorrow Project (SFT), OECD, 2005

The OECD's Schooling for Tomorrow Project was launched in 2005 to explore possible schooling around 15 to 20 years in the future to promote long-term approaches in decision-making. The project set out to develop useful frameworks and tools for various stakeholders to think about alternative futures for education in different situations in many countries to help clarify the future directions and find the right pathway.

#### Methodology and process

The project reflected on different methodological approaches that could be used for futures thinking in education. Scenario development was selected as the main approach to the Schooling for Tomorrow Project and the chosen scenarios have been described as “internally consistent and coherent descriptions of hypothetical futures, reflecting specific perspectives on past, present, and future developments” (OECD, 2005). The project developed a five-dimensional framework for scenario-building so that participants can look at similar issues in different futures, e.g. “attitudes, expectations, and political support”, “goals and functions of education systems”, “organisations and structures”, “geo-political aspects” and “the teaching force”. The same dimension in each scenario facilitates comparisons of different futures

created by different stakeholders. A trends analysis tool has been developed to help participants to identify trends and drivers that have significant impact on future schooling in order to improve the robustness and realism of scenarios.

The project was divided into three phases:

- Phase one: developed trends analysis tool and frameworks for scenario-building, and created a set of six scenarios for future schooling;
- Phase two: used the six scenarios in several countries and school systems to explore how futures thinking could inform concrete challenges for educational leadership and policy-making.
- Phase three: focused on futures thinking in action by guiding different stakeholders to collaborate on its applications to educational reform and innovation.

In this process, the project involved people with both a marginal and central stake in the issue to be examined, e.g. people with experience, knowledge, influence and added value. This is a key criterion for the success of the Schooling for Tomorrow Project.

### **Outcomes (drivers, trends, visions/ desired futures and scenarios)**

The SFT Project developed a resource on the major trends and driving forces that are most likely to shape schooling in the future. Some examples of trends identified by the project were:

- **Fewer Children:** This trend considers the rapid changes in the number of children being born, with births falling dramatically, and how education systems might need to shift their centres of gravity towards adult learners.
- **Inequality:** There is a trend in increased global inequality. Education can stimulate social mobility but it also reproduces inequalities by reinforcing the advantages of the already advantaged.
- **The Global Economy:** Economic globalisation means that national economies and enterprises are increasingly subject to international forces and the meaning of conventional national boundaries may become less important to education.
- **Shorter Working Hours:** The changing nature of jobs and production mean people do not need to work as long as before to acquire a given level of welfare. On the one hand, there is more time for learning, on the other hand, individuals seek to “re-skill” themselves in changing job markets.
- **The Expanding World Wide Web:** The rapid technological development and important social adoption and change will continuously improve the possibilities for networking, distance learning and self-learning.
- **Less Social Interaction:** This trend considers how people are less engaged in social activities, clubs, societies and teams and may lead to more individualistic life-styles.

Based on the societal and educational trends analysis above, six scenarios were developed by the Schooling for Tomorrow Project:

- Scenario 1: “Back to the Future Bureaucratic Systems”: In this scenario, schools remain in powerful bureaucratic systems and resist fundamental transformation.
- Scenario 2: “Schools as Focused Learning Organisations”: In this scenario, education is focused on knowledge-building and lifelong learning. Schools function as the basis of experiment and innovation to help students develop academic competence as well as others talents.
- Scenario 3: “Schools as Core Social Centres”: This scenario is built on increasing community development and social integration. School is a shared responsibility of the entire community, and it draws on expertise, interest and experience from various sources.
- Scenario 4: “The Extended Market Model”: In this scenario, education takes on market characteristics. Choice becomes prominent due to government authorities encouraging diversification and a reduction of their own involvement in schooling.
- Scenario 5: “Learning in Networks”: In this scenario, school systems are replaced by universal networking through the widespread access to powerful new learning media.
- Scenario 6: “System Meltdown”: This future elaborates a “worst case” scenario – the school system breaks down due to a shortage of teachers.

The Schooling for Tomorrow Project developed a wealth of insights into futures thinking in education to shape the future of schooling and learning. The Starterpack: Tools for Futures Thinking in Action illustrates both the approach to scenario development and the elements that have proven effective in developing futures thinking initiatives for education is available at [http://www.oecd.org/pages/0,3417,en\\_36702145\\_38983996\\_1\\_1\\_1\\_1\\_1,00.html](http://www.oecd.org/pages/0,3417,en_36702145_38983996_1_1_1_1_1,00.html).

### **2.3.2 The Future of Learning: Preparing for Changing (FOL) JRC-IPTS, EU, 2010**

JRC-IPTS on behalf of DG Education and Culture launched a foresight study on “The Future of Learning: New Ways to Learn New Skills for Future Jobs” in 2009. The project developed a descriptive vision of the future of learning in 2020-2030, based on existing trends and drivers. A normative vision was then developed to outline future learning strategies and opportunities for needs of different learners.

#### **Methodology and process**

The project used a series of extensive stakeholder consultation meetings, workshops and online consultations to gather data and ideas from different stakeholder groups, including experts and practitioners, teachers and policy makers. A Group Concept Mapping methodology (GCM) was used to develop a series of “maps” visualising the key future changes to learning strategies and the corresponding responses of the education and training systems. In this process, participants were involved at three stages, i.e. gathering, clustering and rating insights on major changes. Nine personas (a stereotypical character) were then developed through a series of stakeholder consultations with experts, teachers and policy makers, both online and face to face, it involved four phases:

- Phase one (Preparation): A network of experts and stakeholders interested in the research was set up on different online platforms, e.g. on LinkedIn, Facebook and YouTube.
- Phase two (Experimentation): A discussion site was set up on the project website.
- Phase three (Piloting): A survey was set up, asking participants to express their agreement or disagreement.
- Phase four (Implementation): A series of quantitative surveys was developed and grouped answers into different theme.

### **Outcomes (drivers, trends, visions/ desired futures and scenarios)**

The main trends and drivers that affect the future of learning have been identified as:

- Demographic Trends: Ageing and De-greening
- Globalisation
- Immigration
- Labour Market Trends
- The Impact of Technology on Education and Training

The study has identified six major challenges for the future of learning that education and training institutions have to deal with:

- Multicultural integration to address immigration and demographic change;
- Reducing early school leaving to combat unemployment and to promote a better educated workforce for competitiveness and economic growth;
- Fostering talent to develop a ‘smart’ economy based on knowledge and innovation and to let people develop themselves as reflective and responsible persons.
- Promoting a rapid and more fluent transition from school to work in order to reduce the barriers between the worlds of work and education;
- Facilitating re-entrance to the labour market, especially to tackle long-term unemployment; and
- Focusing on permanent re-skilling to enable all citizens to keep their competences updated and quickly respond and adjust to possibly fast changing work environments.

Each of these challenges was illustrated by the use of a “persona”, a stereotypical character, outlining the main problem and illustrating the key issues involved for future learning strategies, as illustrated in the following figure.

	<b>Inclusion</b> Getting everyone involved	<b>Participation</b> Keeping everyone involved	<b>Engagement</b> Fostering everybody's talents
Education	<b>Multiculturality</b>  Chanta, 8, feels lost in a foreign country	<b>Early School Leaving</b>  Bruno, 14, skips school	<b>Fostering Talent</b>  Emma, 16, needs new challenges
Employment	<b>Labour Market Re-integration</b>  Sven, 42, full-time father, looking for a job	<b>Re-skilling</b>  Martina, 59, needs to enter a new job field	<b>Transition from Higher Education</b>  Joshua, 23, relevant degrees, but lack of key skills

Figure 31: Key personas and the challenges they illustrate (JIRC-IPTS, 2010)

The report presents an overall vision for learning in the future in Europe as personalisation, collaboration and informalisation (informal learning), which includes two overarching visions:

- A vision for the future of initial education and training. In the future, learner-centred, decentralised, and tailor-made learning strategies will prevail, which will (need to) be accompanied by corresponding pedagogies and teaching strategies as well as flexible curricula, modified assessment and validation mechanisms and closer collaboration with other societal players, including tertiary education providers and prospective future employers.
- A vision for the future of lifelong learning. In the future, people are likely to change their professions more frequently throughout their life and they are remaining longer within the workforce due to demographic changes and higher life expectancy. Professional careers will become more flexible and dynamic and all citizens, no matter how highly qualified, will need to pro- actively design and promote their careers by seizing relevant training opportunities. ICT will play an important role in facilitating lifelong learning opportunities, as, in the future, a range of sophisticated and adaptive learning tools and programmes will be available which will make it easy for people to upgrade their skills and drive their professional careers.

The central learning paradigm is thus characterised by lifelong and life-wide learning and shaped by the ubiquity of Information and Communication Technologies (ICT) (Figure 30).

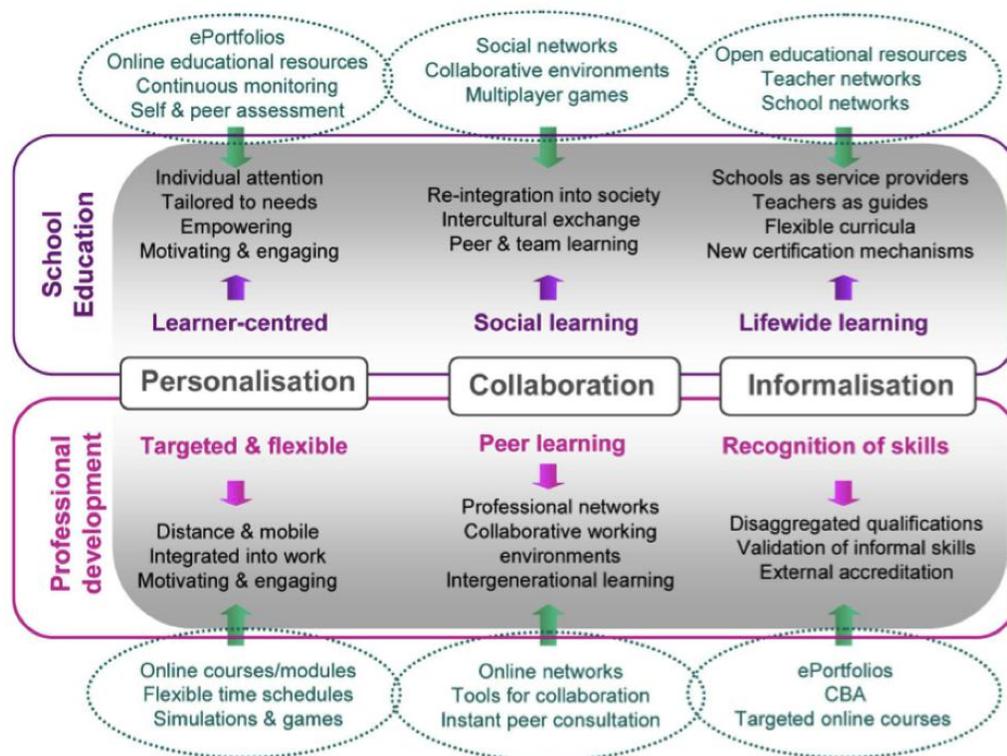


Figure 32: Overview of future Lifelong Learning strategies (JRC-IPTS, 2010)

### 2.3.3 The Beyond Current Horizons Scenarios (FutureLab, 2009)

The Beyond Current Horizons (BCH) programme was commissioned by the DCSF Technology Futures Unit to explore the potential futures for education. The project was not to provide a single picture of an ideal or dystopian future but to open up the possibility of exploring potential socio-technical change in ways that allow educators to take informed and thoughtful decisions about which of these emergent developments they wish to embrace, to challenge or to overcome. In so doing, the project developed a set of challenging long-term scenarios for the future of education in the context of social and technological change 2025.

#### Methodology and process

The programme adopted three interconnected approaches to address the problematic challenge of future research: understanding probable futures, exploring a range of possible futures and examining people’s preferable futures.

This tripartite structure developed a series of activities that would elicit three potential futures: 1) a programme of review commissioning from the academic community to generate evidence of existing broad trends 2) a scenario process to explore potentially radically divergent developments, and 3) a public engagement programme to access individuals’ and groups’ aspirations for the future.

Scenarios were developed in outline with researchers and thinkers, practitioners and stakeholders from the fields of education, economics, demographics, computer science and representatives of key government agencies. They were then refined and revised by the BCH team.

### **Outcomes (drivers, trends, visions/ desired futures and scenarios)**

The Beyond Current Horizons (BCH) Expert Advisory Group (EAG) recommended a coordinated set of five research challenges to help build an evidence base of probable futures and mapping key uncertainties. These challenges are:

- Challenge 1: Generations and Life Course. Trends in demographics, family structure, intergenerational relationships and aging to 2025 and beyond.
- Challenge 2: Identities, Citizenship, Communities. The development of cultural identity, citizenship and community in the context of globalising/localising forces.
- Challenge 3: Knowledge, Creativity and Communication. Trends in the creation, circulation and communication of knowledge.
- Challenge 4: Work and Employment. Trends in work and employment.
- Challenge 5: State/Market/Third Sector. Trends in relationships between state, private and third sector provision of public services.

Six scenarios were developed by participants in the programme as prompts for reflection about the divergent potential directions of education over the coming 20 years:

- “Informed choice”: a highly personalised education system structured around the individual collaborating lifelong with mentors and structuring education provision from diverse sources around their needs
- “Independent consumer”: a highly atomised education system in which individuals are able to choose from a complex menu of standardised provision from private, public and not for profit sectors
- “Discovery”: an education system that enables individuals to understand where they might most effectively contribute to particular social and economic associations, and to build reputations within those associations
- “Diagnosis”: an education system targeted at early identification of capacity and potential and the close alignment of individuals’ educational experiences with projected future economic roles
- “Integrated experience”: an education system embedded indistinguishably in society, economy and community in which learners learn through ongoing apprenticeship
- “Service and citizenship” – an education system targeted at developing social cohesion and competencies for social participation.

The Beyond Current Horizons research project developed a practical toolkit for long-term planning – Vision Mapper. This online resource is to support people to systematically think about the future to inform actions. The vision Mapper is available at [www.visionmapper.org.uk](http://www.visionmapper.org.uk).

### **2.3.4 Futures for Higher Education: the UUK Scenarios Project (Universities UK, 2010)**

Since October 2010, Universities UK (UUK) has facilitated a ‘futures project’ to look forward to what higher education might look like in 2040. This work was to help UUK and its members develop thinking about the factors facing higher education and how they might respond. The

contributions to the project have come from the vice-chancellors in the Longer Term Strategy Network, the UUK Policy team as well as a number of individual universities that have taken part in the programme.

### **Methodology and process**

Scenarios planning of the UUK future project were based on the structure of the influential Mont Fleur scenarios (developed as part of the democratisation process in South Africa in the early 1990s). The Mont Fleur exercise demonstrated the informal, indirect scenario approach to be an innovative and productive method for a society in conflict to approach the future. This approach is different from and complementary to negotiation. It has been considered as a promising tool for future attempts to reach public consensus. This scenarios planning approach has to be:

- Credible. The people who convene and lead the project must be broadly respected. They must be seen as advocates of the process and not of any particular position or outcome.
- Informal and reflective. The power of scenario work comes from its status as an exercise in reflection and imagination, which is not directly linked to action. Therefore, it is possible to follow on from constructing scenarios (what might happen) to creating a vision (what we want to happen), and then to planning action (what we will do), these processes must be carefully insulated from one another.
- Inclusive. The value of these projects is that they build the common ground among different perspectives and parties. It is therefore important to be as inclusive as possible.

The main phases of the UUK scenarios exercise were:

- Mapping the current drivers of change
- Defining possible future scenarios
- Filling out the scenarios in more detail, and providing some narrative commentary
- Specifying possible event timelines
- Modelling potential outcomes according to each scenario

### **Outcomes (drivers, trends, visions/ desired futures and scenarios)**

The UUK project generated a number of scenarios through to 2040, three example scenarios for the future of higher education are:

- Scenario 1: Flight of the Flamingos 'vision' scenario: 'Networks of universities at the heart of social and economic advance'
- Scenario 2: Icarus: 'Rapid expansion at the expense of a global reputation for excellence'
- Scenario 3: Lame Ostrich: 'Internecine struggles and marginalisation'

One of the outputs from the UUK project is a template and set of resources to help institutions to run their own long-term scenario planning workshop(s). A step by step guide for workshops is available at

<http://www.universitiesuk.ac.uk/PolicyAndResearch/PolicyAreas/Scenarios/Pages/Guide.aspx>

### 2.3.5 JISC Higher Education Scenarios Project (2008)

It is worth mentioning that JISC Higher Education scenarios project also created four scenarios for future higher education institutions in UK, based of current trends regarding changing roles, responsibilities and working practices in institutions, namely Boutique University, My-U, Mega-U and Scholarly Towers. The scenario quadrant diagram is shown below:

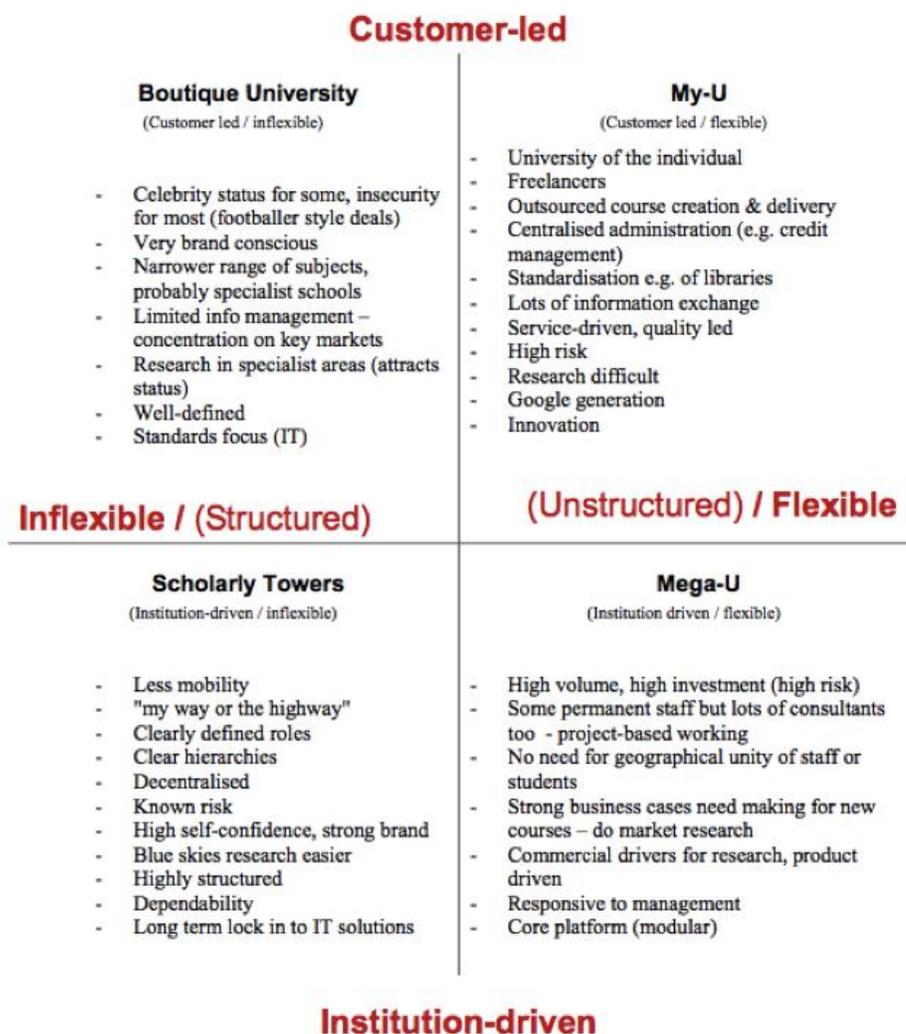


Figure 33: JOS, 2008

- Boutique University: This scenario describes an institution that is specialised and overtly reputation and brand-conscious.
- My-U: This scenario describes an institution that is highly flexible with a personalised customer focus.
- Mega-U: In this institution-driven world quality is negotiated with commerce and professional standards and agencies.

- Scholarly Towers: This scenario is highly structured and confident in its own identity, perhaps developed over a long history. It's built on the pillars of knowledge and research.

The JISC scenario planning toolkit is available at:

<http://www.jiscinfonet.ac.uk/tools/scenario-planning>

### **2.3.6 Implications of the selected future studies for the TEL-Map project**

The review of above selected future studies from OECD, EU and UK provided a wider context for the TEL-Map project TEL futures search activities. The methodologies, processes and outcomes that were adopted and produced by those projects offered valuable insights for designing and implementing Future Search Methodology in the TEL-Map project.

For example, the “Schooling for Tomorrow” project designed its “futures thinking in action” approach by involving various stakeholders, who with experience, knowledge, influence and added value. The lessons learnt from the project confirmed that to convince people of the potential benefits of futures thinking takes time but it is time well spent.

The SFT project also suggested that it was necessary for future search projects to gain a deep understanding of the stakeholders' needs and help them see how the process can help them achieve their goal in order to increase the chances of projects' success.

The BCH project has developed a set of principles to address the ethical challenges of engaging in long term futures research in education. These are: 1) the objective of educational futures work is to challenge assumptions rather than produce “predictions”; 2) the future is not defined by its technologies; 3) education has a range of responsibilities; 4) thinking about the future always involves values and politics. These principles are also useful for guiding the process of TEL-Map project roadmapping and other TEL focused future research projects in education.

Furthermore, the “Future of Learning: Preparing for Changing” project developed an overall vision for future learning in Europe based on existing trends and drivers and different learning strategies for various learners. This was achieved through collecting the views from different stakeholder groups, including experts, practitioners, teachers and policy makers.

The FoL project offers valuable insights into current trends and the possible developments for future learning in Europe in education and training. Which will help TEL-Map project to identify and understand major changes, shared interests, challenges and strategies in order to create transformative roadmaps for the future.

Finally, the UUK Scenarios and JISC higher education scenarios both focus on future higher education in the UK by using scenario planning to encourage imaginative and innovative thinking. It is interesting to examine the similarities and differences between scenarios developed by those projects and the TEL-Map UK HE cluster to refine the activities and outcomes through modified future search method adopted by TEL-Map.

### 2.3.7 Other related future work and studies

#### 2020 Forecast: Creating the Future of Learning

<http://futureofed.org/2020forecast/>

KnowledgeWorks foundation is to develop innovative high school models throughout the United States. From 2006, KnowledgeWorks worked with forecasting experts to study how to transform America education system from a world of schooling to a world of learning future. The *2020 Forecast: Creating the Future of Learning* created a vision for the future learning as customized, connected, amplified, authentic, relevant, and resilient and identify ways of taking action in the present that will help realise this vision.

The project developed “Creating a New World of Learning: A Toolkit for Change Makers” to guide various stakeholders to think about, prepare for, and shape the future. The toolkit is available at <http://futureofed.org/resources/>.

#### OECD, University Futures: Four scenarios for Higher Education, 2006

[http://www.oecd.org/document/8/0,3746,en\\_2649\\_35845581\\_37031944\\_1\\_1\\_1\\_1,00.html](http://www.oecd.org/document/8/0,3746,en_2649_35845581_37031944_1_1_1_1,00.html)

The key driving forces of changed listed, and examples of relevant questions to ask as a result of each scenarios. Four scenarios are created, namely:

1. Open Networking
2. Serving Local Communities
3. New Public Responsibility
4. Higher Education, Inc.

#### iTEC, Designing the future classroom, 2010

<http://itec.eun.org/web/guest/scenario-library>

Starting in September 2010, iTEC is a four year, large-scale project, co-funded by the European Commission to look at the potential classroom of the future. The project brought together policy makers, researchers, technology suppliers, other technology-enhanced learning experts and innovative teachers to develop engaging scenarios for learning in the future classroom that can be validated in a large-scale pilot and be subsequently taken to scale.

All published scenarios developed by the iTEC project are available in the scenario library at <http://itec.eun.org/web/guest/scenario-library>

#### Microsoft, Scenario planning and the future of education, 2006

<http://www.microsoft.com/education/highered/whitepapers/scenario/ScenarioPlanning.aspx>

In 2006, Microsoft developed a vision for the future of education that reflects the impact technology can have on policy and practice. They developed four scenarios for future education, namely:

1. Proud Power
2. Freelance Planet
3. Frontier Friction
4. Continental drift

**Daniel W. Rasmus, The Future of Learning,**

<http://temp.danielwrasmuscom.officelive.com/FutureofEducation.aspx>

Four scenarios are used to drive strategic dialog with clients around the future of learning.

These are:

1. Corporate Lifeline
2. Time Out
3. Subprime Learning
4. Open Learning

More future study programmes, projects and reports are available at De.li.cious website at <http://delicious.com/liyuan/telmapscenarios+telmapscenarios?&page=2> and tag “telmapscenairs”.

## 2.4 STELLAR research vision

The STELLAR vision is still in flow with delivery of the final vision documents expected for end of May. This final vision document will use the idea of Grand Challenges, i.e. bounded, achievable, timely problem statements that provide ample opportunity for concerted, collaborative research at the interface of computer, cognitive, social, and educational sciences.

The vision development process in STELLAR is embedded in a process together with capacity building. Several instruments are used to build a new vision for the research field of technology-enhanced learning.

Figure 34 illustrates this vision building process and its interdependencies with the STELLAR capacity building instruments. STELLAR is to deliver a research framework and establish a common body of knowledge on the basis of which a mid-term research agenda and new vision for the field is being elaborated.

The three Grand Challenge Themes (GCTs) form the macro structure of the overarching framework foundational to the vision building. These three lead themes are 'connecting', 'contextualising', and 'orchestrating'. Adding a fourth theme on 'knowledge building' is in discussion.

Adding a fourth theme on 'knowledge building' is in discussion.

These broad lead themes are refined by the 11 Core Research Areas (CRA) that emerged from the Delphi study conducted among more than 500 participants. Where statements about the future were judged to be probable but not desired, the Delphi study was able to identify certain Areas of Tension (AoT). These indicate the existence of conflicting goals. For example, ensuring privacy and enabling personalisation form an area of tension: more and better personalisation can quite easily lead to a loss of privacy and more and better privacy can quite easily be a blocker to personalisation.

Several instruments contribute to the elaboration of a common body of knowledge. A dictionary seeks to create a common vocabulary for TEL and a reader aims at bundling together the most significant seminal articles and papers with a commentary to support particularly next generation researchers in developing a shared frame of reference. Trend scouting activities support this process.

From two main channels, Grand Challenges are being elaborated so as to set a specific research agenda: both the Alpine Rendezvous as well as the Delphi study through its additional focus on project proposals aim at producing a list of problem statements and outline solutions.

At the time of writing this deliverable, there are more than 40 proposals for such Grand Challenge problems and a short listing and ranking exercise has taken place.

## 2.4.1 Methodology

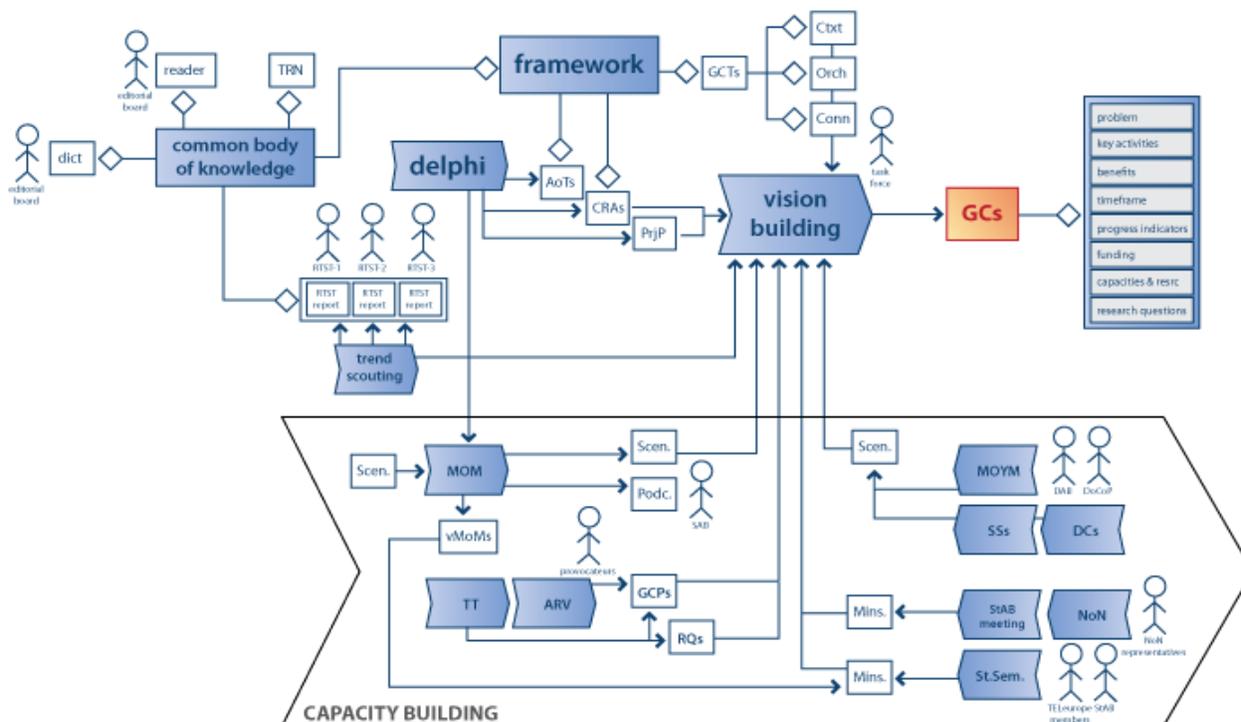


Figure 34: STELLAR Grand Challenge Process (own graphic).

## 2.4.2 Grand Challenges for the Future

As the Grand Challenges proposed by STELLAR are currently under revision and the final version will only be available at the end of May, we will look more closely at these in the forthcoming TEL-Map deliverable D3.2.

The Grand Challenge Problems were rated by researchers and a number of external stakeholders. In STELLAR’s final vision and strategy statement, a set of the Grand Challenge Problems is presented and others are referred to. The rating of the Problems informed the ones that were chosen. These related to: neuroscience and education; improving practices of formal education; computer supported collaboration in teacher training and professional development; personalised learning, digital literacies; assessment and learning; the connection between informal and formal learning; early years and technology.

STELLAR’s vision and strategy is currently still in preparation, and we will look more closely at these in the forthcoming TEL-Map deliverable D3.2.

## 2.5 NMC Horizon “The Future of Education” Event

On January 24-26, one hundred distinguished thought leaders from around the globe have convened in Austin/Texas on invitation of the New Media Consortium (NMC) to predict the Future of Education. Within this three-day retreat, thought leaders around the globe reflected and exchanged ideas around technology use in learning and connected emerging trends and meta-trends, notions of renewal and transformation, and required action.

For the TEL-Map and STELLAR projects, Paul Lefrere and Fridolin Wild participated in this prestigious think tank.

A wide lens was aimed at the world around education, and that lens had a uniquely global focus. What interested the group — which represented 20 countries from six continents — was:

- What trends are truly international?
- Which are impacting learning and education worldwide, from the most advanced countries to the poorest?



Figure 35: First part of the Meta-Trends under development in the Workshop

### 2.5.1 Meta-Trends Identified

From these discussions, 28 important meta-trends were identified. The ten most significant are listed here and will be the focus of the upcoming *NMC Horizon Project 10th Anniversary Report*:

1. The world of work is increasingly global and increasingly collaborative. As more and more companies move to the global marketplace, it is common for work teams to span continents and time zones. Not only are teams geographically diverse, they are also culturally diverse.
2. People expect to work, learn, socialize, and play whenever and wherever they want to. Increasingly, people own more than one device, using a computer, smartphone, tablet, and e-reader. People now expect a seamless experience across all their devices.
3. The Internet is becoming a global mobile network — and already is at its edges.

- Mobithinking reports there are now more than 6 billion active cell phone accounts. 1.2 billion have mobile broadband as well, and 85% of new devices can access the mobile web.
4. The technologies we use are increasingly cloud-based and delivered over utility networks, facilitating the rapid growth of online videos and rich media. Our current expectation is that the network has almost infinite capacity and is nearly free of cost. One hour of video footage is uploaded every second to YouTube; over 250 million photos are sent to Facebook every day.
  5. Openness — concepts like open content, open data, and open resources, along with notions of transparency and easy access to data and information — is moving from a trend to a value for much of the world. As authoritative sources lose their importance, there is need for more curation and other forms of validation to generate meaning in information and media.
  6. Legal notions of ownership and privacy lag behind the practices common in society. In an age where so much of our information, records, and digital content are in the cloud, and often clouds in other legal jurisdictions, the very concept of ownership is blurry.
  7. Real challenges of access, efficiency, and scale are redefining what we mean by quality and success. Access to learning in any form is a challenge in too many parts of the world, and efficiency in learning systems and institutions is increasingly an expectation of governments — but the need for solutions that scale often trumps them both. Innovations in these areas are increasingly coming from unexpected parts of the world, including India, China, and central Africa.
  8. The Internet is constantly challenging us to rethink learning and education, while refining our notion of literacy. Institutions must consider the unique value that each adds to a world in which information is everywhere. In such a world, sense-making and the ability to assess the credibility of information and media are paramount.
  9. There is a rise in informal learning as individual needs are redefining schools, universities, and training. Traditional authority is increasingly being challenged, not only politically and socially, but also in academia — and worldwide. As a result, credibility, validity, and control are all notions that are no longer givens when so much learning takes place outside school systems.
  10. Business models across the education ecosystem are changing. Libraries are deeply reimagining their missions; colleges and universities are struggling to reduce costs across the board. The educational ecosystem is shifting, and nowhere more so than in the world of publishing, where efforts to reimagine the book are having profound success, with implications that will touch every aspect of the learning enterprise.

These meta-trends are the first of much yet to come in the next year, being reported throughout the Horizon Project's 10th Anniversary.

The NMC Communiques can be found at:

<http://www.nmc.org/news/download-communicue-horizon-project-retreat>  
[Download the full Communiqué in pdf from the Horizon Project Retreat](#)

To be part of the discussions, follow #NMChz.

### 3. Role of TEL in Europe 2020 Strategy

Europe 2020 is the EC's new strategy following the Lisbon strategy of 2010. It has five working areas and a set of defined goals. The working areas are **employment, innovation, education, environment** and **social inclusion**. Most of the targets set in each of these areas are relevant for TEL-policy and -- the other way round -- TEL is able to provide a system-level perspective in which the work towards achieving the global goals in each of these areas is no longer hostage to optimisation of local goals. In the following we elaborate this relation in brief.

With respect to **employment**, the extension of a content-rich approach to include a complementary action-rich approach, in which learners have the opportunity to encounter multiple ways of putting knowledge into use in a work-related or business context, will make them more attractive to employers. From a TEL point of view, this implies greater use of professional learning such as provided with serious games, simulations and social learning analytics (what-if opportunities), to take knowledge out of the classroom and into the social space, connecting just-in-time learning with labour market demands.

Lifelong learning has to be increasingly TEL-enabled to empower people to continually refresh their personal knowledge base at increasingly lower marginal cost. TEL has the potential to create a flexible interplay between working and learning by providing personalised tracking, profiling, and benchmarking (for example, to enable workers to assess when they need to update their knowledge to remain competitive in the market place).

With respect to **innovation**, TEL can concurrently help to develop new, open models of sharing and appropriation of new knowledge, while at the same time TEL can be used to model the emergence of learning opportunities in new professional networks including cross-disciplinary ones. TEL can support visualising and managing the implications of change brought about by these networks, which in turn will encourage investment by employers into continually refreshing the knowledge of their staff.

In **education**, with movements such as open access, open educational resources, and in general a seismic shift in the publishing industry, TEL can play a key role in helping to identify possible futures and mapping a personalised path for education and training to realise the potential of each learner. This will encourage people to think constructively about the future and will facilitate the broad uptake of new practices and policies. This will make learning opportunities more apparent to individual learners.

With respect to **environment**, the key drivers are preventing climate change and saving energy. As well as technical change, this relies heavily on cultural and behavioural change across the whole population, which in turn will also requires a deeper understanding of both the issues and the actions that need to be taken. Here again, TEL can play a significant role.

## EU 2020 Strategy Goals

- **Employment**
  - 75% of the 20-64 year-olds to be employed
- **Innovation / R&D**
  - 3% of the EU's GDP to be invested in R&D
- **Education**
  - Reducing school drop-out rates below 10%
  - at least 40% of 30-34-year-olds completing third level education
- **Environment / Climate change / Energy**
  - greenhouse gas emissions 20% (or even 30%, if the conditions are right) lower than 1990
  - 20% of energy from renewables
  - 20% increase in energy efficiency
- **Social Inclusion / Poverty**
  - at least 20 million fewer people in or at risk of poverty and social exclusion



## 4. TEL-Map ‘Capturing the Voice’ initial results

In parallel with the analysis of stakeholder views, TEL-Map has also been attending events and organizing other events which have generated future scenarios and related insights. This section summarises the work that has been carried out and presents the initial results.

### Capturing the Voice

The TEL-Map Capturing the Voice of Methodology is described in D2.3. The main idea (stated on page 6) is to use directed conversations about building roadmaps<sup>5</sup> around topics of interest, and using these roadmaps as ways of connecting with potential collaborators. What we are aiming for is a kind of “semantic match-up service” that can assist TEL-stakeholders in finding partners who can have productive conversations that may lead to performing useful actions together.

The next three sections are ‘Capturing the Voice’ work undertaken by TEL-Map.

### 4.1 Co-located event with EDMEDIA

In the words of the USA’s Association for the Advancement of Computing in Education (AACE), the annual EdMedia World Conference on Educational Media and Technology is “the premiere international conference in the field, spans all disciplines and levels of education and annually attracts more than 1,500 leaders in the field from over 70 countries.” It “serves as a multi-disciplinary forum for the discussion and exchange of information on the research, development, and applications on all topics related to multimedia, hypermedia and telecommunications/distance education”. EdMedia is a world conference both in terms of its mix of participants and in the sense that it alternates between the USA and non-US locations. In 2011 it was based in Lisbon, which meant that it had a high proportion of participants from Europe. Accordingly we decided to run a co-located TEL-Map event the day before EdMedia. The initial agenda for the event, as well as our subsequent modifications and adaptations of it, are described in the CTV report.

Before finalizing our agenda for our Lisbon event, we contacted the head of AACE, Gary Marks, who discussed our directed-conversation approach with his Executive Committee. He liked our proposal. We invited him to participate in our event and also made a lunch appointment with him for the day after our event, to review our findings. All of this went according to plan. He was especially interested in our methodology, which he saw prospectively adoptable by EdMedia and AACE, for example to help them to identify themes for future conferences, in advance of competing conferences. To that end, he welcomed our participation in future editions of

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<sup>5</sup> Note that we are allowing all sorts of different definitions and interpretations of what is meant by a roadmap. For example, as described in Section 5.4, a roadmap can be built around a PhD-process.

EdMedia. We did not take this up for the next edition (June 2012, Denver) because the review had directed us to focus on European audiences for the moment. In formulating our post-project sustainability plan, we shall explore the business case and TEL community justification for a self-financing relationship with EdMedia and/or other international conferences.

The workshop took place on 27 June, 13.30 – 18.00. The day before the workshop we rehearsed at the hosting hotel with the equipment that was made available by hotel management. Due to the elongated structure of room and the limited options for projection, we realized that it would be very difficult to carry out the workshop as we had planned. Instead we came up with a more participator-driven format. This is what we ended up actually doing at the event:

- We *asked* the participants for post-it descriptions of their “favorite vision” for the future of TEL.
- We *collected* their responses and *grouped/clustered* them into different themes.
- We *invited* the participants to a free-form conversation on the most popular theme(s) of their own choice.<sup>6</sup>
- We *documented* as much of this discourse as possible.

The themes and issues that emerged from the grouping of the responses were described and clustered as different kinds of *Challenges*, namely:

- Survival Challenges
- Economic Challenges
- Inclusion/Equality Challenges
- Content Challenges
- Methodological Challenges
- Assessment Challenges
- Miscellaneous Challenges

The participants came up with raw (thought) material that would have enabled a whole set of interesting conversations. Due to our time limitations we had to confine ourselves to discussing one of these themes. Since many of the participants were professionally involved with issues related to assessment, it was natural for them to select this as the focus area for further discourse.<sup>7</sup> Here are the assessment challenges that were listed on the post-its:

- Analytics for evidence of learning ⇨ processes / practices to identify and provide compelling evidence for student learning – particularly when assessment is changed using technology.
- Evaluation tools for measuring real value / benefits against real costs.
- More sophisticated rating of quality of resources => support to find information that matters.

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<sup>6</sup> In fact, as seen from the text, the participants invited themselves.

<sup>7</sup> However, many of the survival challenges and the economic challenges that had been listed came up during the closing session on “TEL and the crisis.”

- By 2015 we have accepted online EU modular credit system no matter how “old” the degree.
- Life-Long Learning Qualifications / Re-qualifications.
- Decoupling learning from traditional institutional frameworks. This requires analytics and competence measurement at the personal and organizational levels.
- The Assessment Dilemma is solved: Society has found other ways to sort people.
- Assessment for learning. TEL => changing the manner in which learning is assessed.

This shows an emerging focus on graduate capabilities or graduate outcomes rather than on teacher/university inputs.

More details can be found in the CTV report.

## 4.2 TEL Think Tank at EC-TEL

The TEL ThinkTank workshop was co-organized by the STELLAR, GALA, and TEL-Map projects. It was held on 21 September 2011 in Palermo, Sicily, on the day before the start of the EC-TEL 2011 conference. An overview of this event has been presented in D2.3, section 4.3, and a detailed account is given in the CTV report. For the convenience of the reader we include a brief account here.

The workshop applied a special type of mental modeling technique that we call “Stress-testing the Voices,” and which was mentioned above in the introduction. It consists of subjecting various topics of interest to “what-if” types of questions, such as, for example, “what if the quest for relevance and personalization continues to diminish common public awareness”, how will that affect the topic in question? This technique, which we call “Stress-testing the Voices,” was applied in the workshop. The overall idea was to subject your favorite TEL topics/issues to your own selection of relevant “what-if” questions, i.e., questions that capture the various *tensions* (= dimensions of importance/influence) that affect the respective topic/issue.

Asking “what-if” types of questions is related to the hypothetical stress-testing method of the TEL-Map Observatory described in D1.2, Appendix 2. As described there, and elaborated further in the CTV report, focusing on “what-if” questions can be used to estimate the impact on an issue of a set of changes along the directions of importance for the issue under consideration.

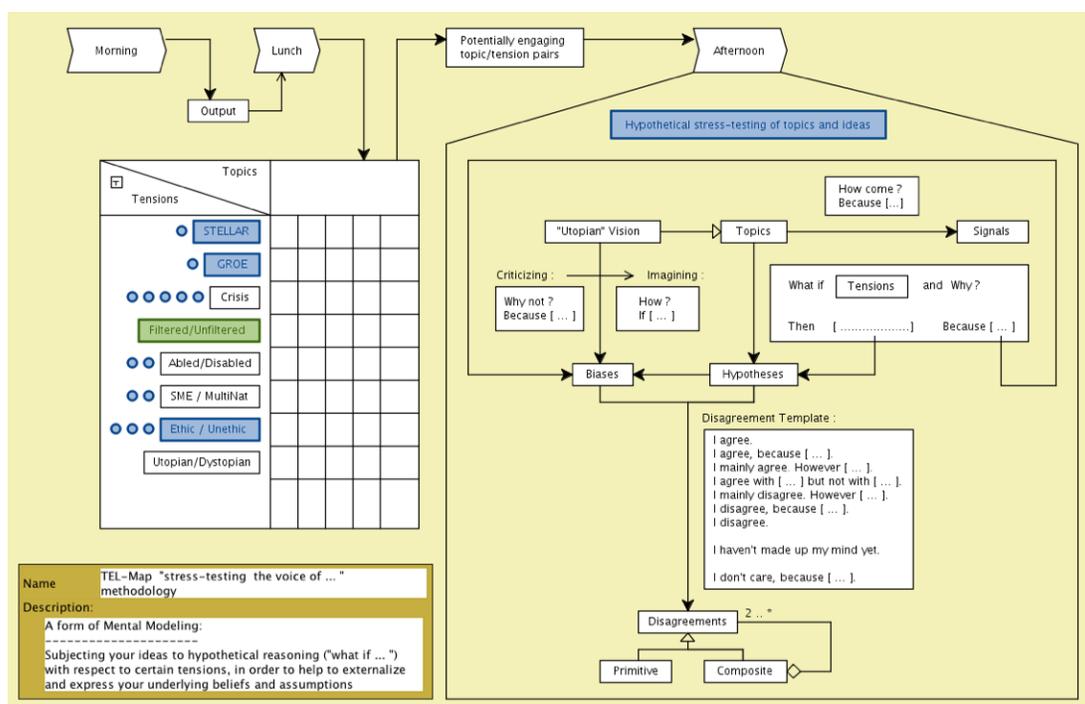


Figure 42. The overall context map of the TEL-Map @ the EC-TEL-ThinkTank workshop

The TEL ThinkTank workshop was co-organized by the STELLAR, GALA, and TEL-Map projects and included participation of the London Knowledge Lab. Before noon, representatives of these groups presented their different perspectives on issues of importance for TEL. Based on these presentations and discussions, the TEL-Map modeling team, during the lunch break, compiled a list of topics that had raised interest among the participants.

After lunch, we then presented these topics – along with a set of tensions that we had already prepared, and which we thought were relevant to the topics under consideration. These included tensions identified by STELLAR (in its Delphi Study) and tensions derived from the GROE (Global Resources for Online Education) Roadmap, identified by the TEL-Map modeling team. It also included contextual tensions of various types, such as the tension between relevance and serendipity discussed by Pariser (2011).<sup>8</sup>

A detailed discussion of the topics, tensions and outcomes of the EC-TEL-ThinkTank workshop can be found in the CTV report. As an example, the STELLAR tensions (as identified by the STELLAR Delphi study) were the following:

- Data tracking for personalised learning versus data privacy.
- Digital divide despite technology spread.
- Ubiquitous learning opportunities versus focused and critical processing of information.
- Established practices versus continuous innovation in the classroom.

<sup>8</sup> Pariser, E., (2011) *The Filter Bubble: What the Internet is Hiding from You*, Penguin Books, ISBN 978-0-670-92038-9.

- Individual learning paths versus standardised learning paths.

**Outcomes:**

The results were collected on post-it notes that we grouped into different themes.<sup>9</sup> The themes that emerged are shown in the left part of Figure 43.

They were: Personal Learning Environments, Game-Based Learning, User Models, Intelligent Tutors, Learning Analytics, Quality in TEL, Workplace-Integrated Learning, and Teaching and Learning (mathematics).

The participants were then encouraged to cluster around these themes, discuss around them, and then report back to the others in a closing plenary. The outcomes of the workshop are fully documented in the CTV report. For the convenience of the reader, we include a sample here

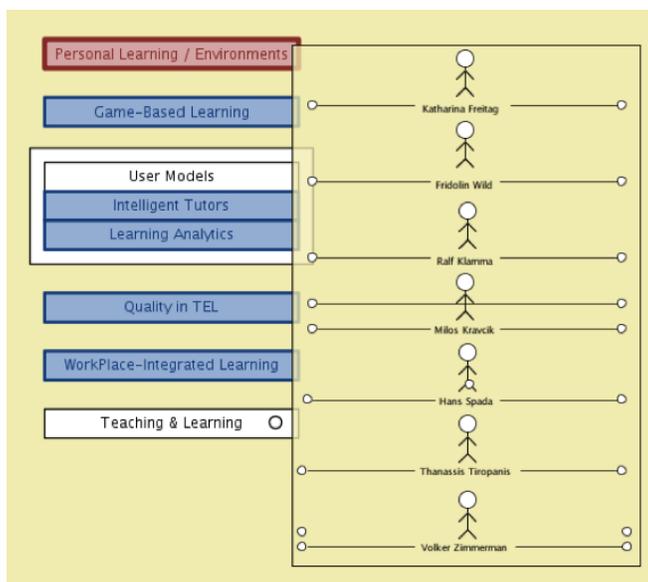


Figure 43. Entering the discourse map on Personal Learning Environments.

Figure 43 (which is a screenshot of a Conzilla map) also shows the entrance to the discourse map on Personal Learning Environments. This map is shown in Figure 44, together with one of the many interesting ideas that were expressed in this discussion group.

<sup>9</sup> just as we did at the TEL-Map@EdMedia event described above in section 3.1.

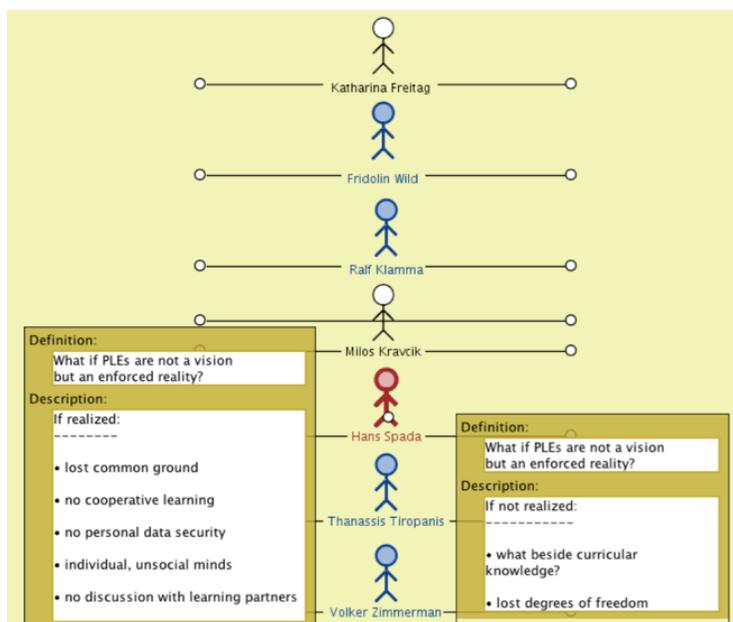


Figure 44. Hans Spada’s idea of PLEs as an enforced reality

As mentioned above, a detailed report on the outcomes of the workshop can be found in the CTV report.

### 4.3 JTEL Summer School

From the perspective of TEL-Map, the overall aim of the TEL-Map@JTEL-SS activities is to lay the groundwork for recruiting a group of CM3s (Community Modeling and Mapping Managers, see D2.1) that will be interested in taking an active part in the modeling activities and help to sustain them beyond the funding period of the TEL-Map project. A promising start of such a group has been achieved in collaboration with STELLAR through the IJTEL-YRSI-nr2 on state-of-the-art of TEL.<sup>10</sup>

Our earlier positive experiences with the JTEL Summer school Students is the main reason why we have chosen to build on this activity for the bottom-up approach to engaging with TEL stakeholders.<sup>11</sup> As described below, we expect that some of this year’s students (2012) will form the backbone of our CM3 modeling group. Then we aim to target the summer school alumni in order to expand this group further.

As described in the TEL-map DoW (and explained at the first review), by engaging PhD-students and young TEL researchers as Community Modeling and Mapping Managers (CM3s), we plan to engage with mapping and modeling activities of relevance to the TEL CoP in a way that is sustainable beyond the funding period of the TEL-Map project. One of the main benefits of such a sustainable activity would be the possibility of measuring long-term impact by encouraging people to semantically connect relevant information over time.

<sup>10</sup> <http://www.inderscience.com/browse/callpaper.php?callID=1766>

<sup>11</sup> as described in deliverable D2.1.

Here is how we introduce the activity to the CM3s:

As a PhD-student of TEL (a.k.a. “a young TEL researcher”), by semantically describing your own research and relating it to what is going on within the project(s) that are funding you, there are several things to be gained, including:

- Increased awareness about how your own research is situated within the activities of the TEL Community of Practice. This will be helpful for writing the SOTA chapter of your thesis and will lower the risk of “re-inventing the wheel” without being aware of it.
- Increased understanding about how to frame your own research-questions - that often arise within the local practice of the projects that fund you – in such a way that the corresponding “answers” can contribute to the general practice of the wider TEL community. This is the essence of *practice research* (Goldkühl, 2011), which provides a useful framework for describing your research methodology.

We prepared two models that captured how to situate the work of a TEL researcher within the activities of the TEL community, with a focus on the activities of the R&D projects that s/he is involved in. These models in fact describe the student/researcher activities within the TEL community in terms of the framework of practice research (Goldkühl, 2011).

In order to get the students started in describing their activities in terms of the framework of practice research, we gave them a simplified version of the semantic triples model in the form of a questionnaire. It had the form of a structured template and it was used as a basis for our discussions with the students during the week.

### 4.3.1 The Description template

#### Part A: Describe your PhD Research:

- **Contexts:** In what TEL areas are you working? (domain, sub-domain, fields, topics, themes, etc.)
- **Stakeholders:** To which stakeholder(s)/community/ies does your PhD-work contribute? Who cares, who benefits and why?
- **Concepts:**
  - *Questions:* What are your research questions?
  - *Hypothesis:* What are your hypotheses?
  - *Arguments/Ideas:* What are the main arguments/ideas that support your hypothesis?
- **Theories:** Can you briefly describe your research theoretical grounding (main theories, frameworks, models, etc.)?
- **Problems/Issues:** What are the gaps in the TEL field that you are trying to address?
- **Methods:** What are your research methodologies (approach, techniques)?

- **Results:** What is the core innovation? What findings, outcomes or artifacts have you produced so far? Which ones do you foresee in your research?
- **Case studies/use-cases/scenarios:** Are you developing any case studies, use-cases, or scenarios? Please provide links if available.
- **Tools:** Are you developing any kind of tools? This includes methodologies, models, software, etc.
- **Technology:** What kind of TEL or other technologies are you missing?

### Part B: Positioning your work within the TEL domain

- **Projects:** What TEL R&D projects are you involved in (if any)?
- **Goals:** What is the project trying to achieve?
- **Obstacles:** What are the challenges or barriers that could prevent the project from reaching its goals?
- **Impact:** What is the expected impact of the project? For each type of impact, specify which stakeholders that are important.

### 4.3.2 Activities during the week of the JTEL Summer School 2011

During the first day of the summer school (Monday) we had a ninety-minute plenary where the framework of practice research was presented and related to the models. The students were then given the question-template and encouraged to work on them during the week in dialogue with us.

After our initial plenary session on Monday, the follow-up discussions were carried out on a daily basis until Thursday – most often during the daily ‘rehab’ sessions in the late afternoons.<sup>12</sup> On Thursday afternoon we collected the information from the students (on paper) and spent the evening transcribing and structuring the results in the form of a Conzilla model, which was presented and discussed with the students during our closing session on Friday.

As often happens during such an intense week of human interaction, it turned out to be difficult to get the time needed to cover all the issues that we had planned to raise. Nevertheless, it was a valuable experience and the information that we extracted has been very helpful in developing the technical support we need for capturing an evolving discourse and allowing new (UIR-based) semantic terms to be created from free-text descriptions as the need arises (see below).

### Outcomes

The outcomes of the TEL-Map @ JTEL-SS 2011 activities are presented in detail in the CTV report. They form a baseline for the planned activities at JTEL-SS 2012. In fact, the results from last year have informed the design of the TEL-Map Confolio, which has been updated with an annotation profile called TEL-researcher, which is (partially) displayed in Figure 45, and which consists of the following fields:

<sup>12</sup> See the JTEL-SS 2011 program at [\[LINK\]](#)

- **Contexts:** *Where*, i.e., within what *areas* of TEL are you working?
- **Enablers:** *What projects* and/or *institutions* are funding your work?
- **Problems:** *Which problems/questions/issues* are you addressing?
- **Goals:** *What* are you trying to achieve with respect to these problems/questions/issues?
- **Purpose:** *Why* is it important to reach these goals?
- **Stakeholders:** *Who* will benefit if you reach these goals?
- **Expected Impact:** *Why* will they benefit, and *why* will this be important?
- **Challenges:** *What* are the *obstacles* that are preventing you to reach these goals?
- **Actions:** *How* (by what processes), are you planning *to meet* these challenges?
- **Theories:** *Which theories* are you using or planning to use?
- **Methods:** *Which methods* are you using or planning to use?
- **Experiments:** *How* (case-studies/use-cases/...) are you *gathering* empirical data?
- **Tools:** *Which tools* are you using in your experiments?
- **Technologies:** *Which TEL-related technologies* are you using?
- **Assumptions:** *What assumptions* are you making?
- **Hypotheses:** *What conclusions* are you able to draw under these assumptions?
- **Outcomes:** *What results* have you achieved so far?

All fields have a free-text part, and some fields (notably Context, Stakeholder, Theory, and Method) also have a controlled vocabulary part. In this way we can capture the gradual emergence of meaning (“emergent semantics”) in the form of controlled annotation from free text, using a linked data approach. The more structured of the responses from the 2011 summer school have been turned into controlled vocabularies, as shown in Figure 39.

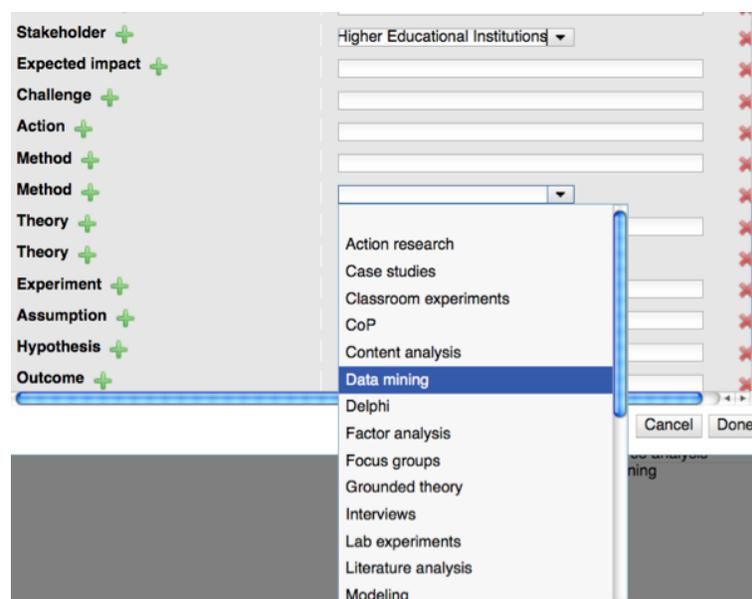


Figure 45. Choosing “Data mining” as the controlled value of the “Method” field.

This reflects the present state of the emerging vocabulary, which is based on the responses from the students at JTESS-2011. We expect new terms to emerge from the work of the JTESS-2012 students. In fact, we plan to investigate their level of satisfaction with the present labels in different ways. By comparing their free-text answers in response to ‘single’ fields, i.e., fields that are only free text, as well as with respect to ‘double’ fields (which provide a controlled vocabulary alternative) where none of the available alternatives have been used, we expect to be able to sharpen and evolve the controlled vocabulary further.

There is an important point to be made here. The controlled vocabularies are not ‘ontologically engineered’ but represent the answers of the students - almost exactly as they gave them in 2011.<sup>13</sup> Hence, they will serve as a point of departure for the students of 2012. Moreover, since many of the students from last year (2011) are coming back this year, we can build on the exercise from last year and carry it out electronically. In fact, we expect terms to be substantially clarified and sharpened during this process. Also a dictionary of terms will be introduced. These updates and improvements will be reflected in an updated template for “TEL Researcher” with more controlled vocabularies appearing gradually.

The fundamentally important feature is the fact that we always provide two things: (i) a free-text field as an alternative to its ‘controlled twin, and (ii) a blank space as an alternative choice in the drop-down menu of a controlled vocabulary.’ In the next update we also plan to provide a space for evaluating the precision of a URI-based term. By explicitly stating the perceived fit of a term provided by the system, the user provides information that can be used to highlight different levels of acceptance of the controlled terms, and hence to focus attention on the areas where acceptance is low. Also, areas that are in need of new and better terms can be identified by searching for all ‘blanks that have been given in response to a controlled alternative. This makes it possible to run an iterative and bottom-up driven vocabularization process, that represents gradually emerging understanding within the community. See the CTV report for a more detailed account of this process.

## 4.4 China workshop

The workshop was co-located with the International Open Forum of e-Learning and Standardization during the 24th ISO/IEC JTC1 SC36 working meetings in Shanghai, China. It was a good opportunity to capture a wider international range of voices on TEL futures.

Nine questions, prepared as poster frameworks, were designed to facilitate the discussion and delegates were encouraged to work with colleagues from their own country or region to share their visions for the future and how they see this vision being achieved.

In practice, participants in the workshop broke into two approximately equal groups, one the Chinese Group and the other (the rest) the International Group. All were attendees at the ISO e-Learning Standards Forum.

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<sup>13</sup> i.e., with only slight changes in a few cases.

#### 4.4.1 Outputs from the Chinese Group



Figure 40: Ms Jing Dong, from the Chinese Ministry of Education and Prof. Zhiting Zhu, East China Normal University and Chair of Chinese E-Learning Standards Committee, sharing their views on Future TEL with the group.

(When reading these notes it's important to keep in mind the context of some ideas and views):

The outcomes from the Chinese group's workshop were as follows:

The **most interesting development in TEL** was identified as.

- "One to One learning"

Others were:

- mobile learning
- Web.2.0 and the internet
- HCI
- Multimedia
- learning environment infrastructure.

The two **main drivers for TEL** identified were:

- national policy and strategies
- market forces

Other drivers included:

- increasing government investment in technology innovation
- educational needs and teachers and learners' increased awareness

- competitions between countries
- learning opportunities for all.

The **most important lesson learned from the past** was:

- competency building

Others, included:

- data exchanging standards
- ICT training for adults; involving all stakeholders in promoting TEL
- affordability and leadership
- develop open platform and content; etc.

The **most desired technology innovation** was considered as

- making tools more “simple and easy to use”.

Others were:

- access to technology anywhere for anyone
- seamless integration of technologies into teaching and learning environment
- smart technology in classrooms
- simple and cheap mobile learning for all and learners owned personalised technology

The **top concern for using technology in education** was:

- “Meet different needs of learners”.

Other suggestions were:

- connect with various learning communities
- know when and how to use technologies to enhance learning
- use technology to assist learning but not to replace human contacts completely
- technology enabled personalised learning

The **most important factor to deliver the desired future** was.

- Open learning culture

Others were:

- encouraging innovation and no hierarchy organisation structure
- bridging formal and informal learning.

The **main proposed action** was:

- Developing effective mechanisms to support implementation of ICT in education

Other actions included:

- encourage new technology innovation
- build an enabling policy environment at various levels
- find the right path and have strategic plans for ICT in education
- increase decision makers' awareness and capacity;
- cultivate a culture of tolerant and openness.

The **main emerging developments to support TEL** were identified as:

- government investment as well as investment by all sectors involved

Others included:

- new technologies and new culture, e.g. cloud computing and social networking
- Internet and Mobile devices, e.g. iPhone and iPad, and advanced personalized technologies
- Industry alliance and collaboration
- the reform of economic and policy and the change of the culture in China.

The **main problems and obstacles to be addressed** was:

- assessment and evaluation

Other concerns were:

- ineffective investment mechanism and inequality
- uncertainty about TEL, having great visions but failure to implement
- lack of support from local governments
- increasing digital divide between different regions and the rich and the poor, therefore, disadvantaged groups are unable to benefit from advanced technology
- the issues around interconnection and interworking.

#### 4.4.2 Outputs from the International Group



Figure 41: Chair of ISO/IEC JTC1 SC36 Bruce Peoples draws his model of Advanced Augmented Cognitive Cognition Systems

The Interesting observations started from a more technical angle, noticing the value of:

- Mobile learning & ePortfolios
- Linked data
- the influence of past LMS standards like SCORM
- a focus on new technologies like Surface technologies, promising to make Virtual Interaction spaces as common as mobile phones.

This last observation was clearly inspired by the keynote given by the ISO/IEC JTC1 SC36 chair, Bruce Peoples at the Open Forum the same morning as the workshop. Peoples highlighted the promises of Advanced Augmented Cognitive Cognition Systems with the future ability to detect cognitive dissonance, which would make learning more enjoyable and enable control of mobile devices 'through the power of the mind'.

The Main drivers for this scenario were, among others:

- common APIs to all devices
- current development within social media (Twitter, Facebook, etc.)
- increased collaboration possibilities across cultures, institutions and organisations, however, with concerns related to laws on privacy & accessibility.

The **significant lessons learnt** were:

- the importance of Interoperability
- the emergence of Open business models
- global Collaboration

The group identified the following **Desirable innovations**:

- adaptive systems (reasoners)
- mobility
- context metadata
- technology to encourage informal learning (find right person, find right community).

For **future visions related to people using technology** the group identified as important trends, the recognition of Openness leading to mutual benefits in learning:

- how to learn
- formation of diverse User Communities
- the experience of Technology more fully embedded into educational practices

Related to **culture and organisational structures** the group pointed towards:

- the potential impact of User Communities
- but asked:
- what implications new Laws might have on these.

The group was terse when it came to **Priority actions**:

- the Advanced Augmented Cognitive Cognition Systems scenario should be built.

Furthermore the **standards** context of the workshop was not un-noticed:

- Tools must comply with standards.

Of **Emerging Developments** the group noted:

## Scenarios for TEL Futures

- Cloud computing
- Growing awareness about standards

**Problems and Obstacles** were identified as:

- Inflexibility of traditional organisations
- Competition among schools/districts

The **main obstacle to research and innovation** was defined by the question:

- How do systems learn?

Artificial Intelligence didn't deliver on its promises. Although the technology-optimist camp starts from a different point this time, the question remains the same:

- How will systems and users interact? - and within what contexts?

The Chinese group started more from a context angle, stressing the importance of organisational change, while the International group had a stronger technology focus.

Seen together, the scenarios we build will have to deal with the tensions between disruptive technology enablers being balanced by the inertia of educational institutions.

## 4.5 Online Educa Panel

Technology Enhanced Learning is facing the challenge of ever faster technological change combined with evolving expectations about what form education should take in the future. As a result innovators, researchers, policies and practitioners need to keep track of emerging signs of change in order to anticipate upcoming trends and opportunities. However, it is not a trivial task to recognise the first weak signals of what will become major changes. Potential filters that may lead to early warning signs are frequently missed. Typical filters in organisational communication processes include epistemic blind spots (surveillance filters), group think (dominant mental model filter) and information that is not distributed (power filters). When it comes to driving new policies and processes, not only is it important to bring a comprehensive set of stakeholders to the table, but also to guide communication between all stakeholders in productive ways.

The Online Educa Panel took place on December 2<sup>nd</sup>, 2011 in Berlin.

The topics addressed (incl. presenters) were as follows:

- Vana Kamtsiou (Brunel University, UK) – Introduction of roadmapping
- Ralf Klammer (RWTH Aachen, GER) – The virtual campfire (web video)
- David Griffiths (University of Bolton, UK) – The role of publishers
- Paul Lefrere (KMI, UK) – Responsibilities in tomorrow's education system
- Lieve Van den Brande (European Commission, BE) – Synergies between different DGs and realisation of impact on real world education

The panel attracted an audience of approx. 18 persons.

The method during the panel followed a simple structure: max 7 min input from a panel member followed by 10 min debate. The objective of the panel was not to create a consensus in the audience, rather, to discuss suggested future developments or create alternative future scenarios. To stimulate the discussion, each round of debate was initiated with a brief indication of agreement with and desirability of the presented scenario. A concrete outline of a scenario presented during the panel can be found in D4.2 a (p. 29).

A most lively debate followed the presentation by D. Griffiths, who could show how major publishing companies create an infrastructure (patents on automatic assessment technologies, learning platforms, network of authors) through which education could be delivered outside the universities once they were able to issue accredited degrees. This stream of discussion turned quickly to the underlying question of what is meant by 'education' and in what ways universities are already adopting a more industrialised view of education.

## 5. TEL-Map cluster formation, scenarios and roadmapping

Every cluster works in a different way, as different stakeholders have different habits. Each of the cluster leaders reports in this section, how the cluster is composed and how the clusters are used to feed into scenario building and identification of drivers. Initial results are reported.

Once the cluster reports are in here (March 14), Paul will write the summary.

Cluster leaders to expand as needed upon the outlines given in their cluster descriptions  
Each cluster section reports on the following:

1) The work carried out to **create clusters**: cluster composition and general roadmapping approach including:

- Online portal platform activities, which will continue to be developed to support collaborative scenario building and roadmapping.
- The development of roadmapping methods and the integration of
- Face-to-face and online working.

2) The work carried out in the cluster so far and **initial results**

3) The **future action plans** for each cluster are to be reported in Section 6

Background literature to clusters (but to geographically focused):

[http://www.clusterobservatory.eu/system/modules/com.gridnine.opencms.modules.eco/provider\\_s/getpdf.jsp?uid=47ea16e8-b7b9-49b5-8e09-5aa609b2003b](http://www.clusterobservatory.eu/system/modules/com.gridnine.opencms.modules.eco/provider_s/getpdf.jsp?uid=47ea16e8-b7b9-49b5-8e09-5aa609b2003b)

### 5.1 Cluster: Higher Education

The UK HE Cluster forms the early proof-of-concept of the TEL-Map invited cluster process.

#### 5.1.1 Online activities

There was a plan set out for the ten weeks working online leading up to the face-to-face meeting:

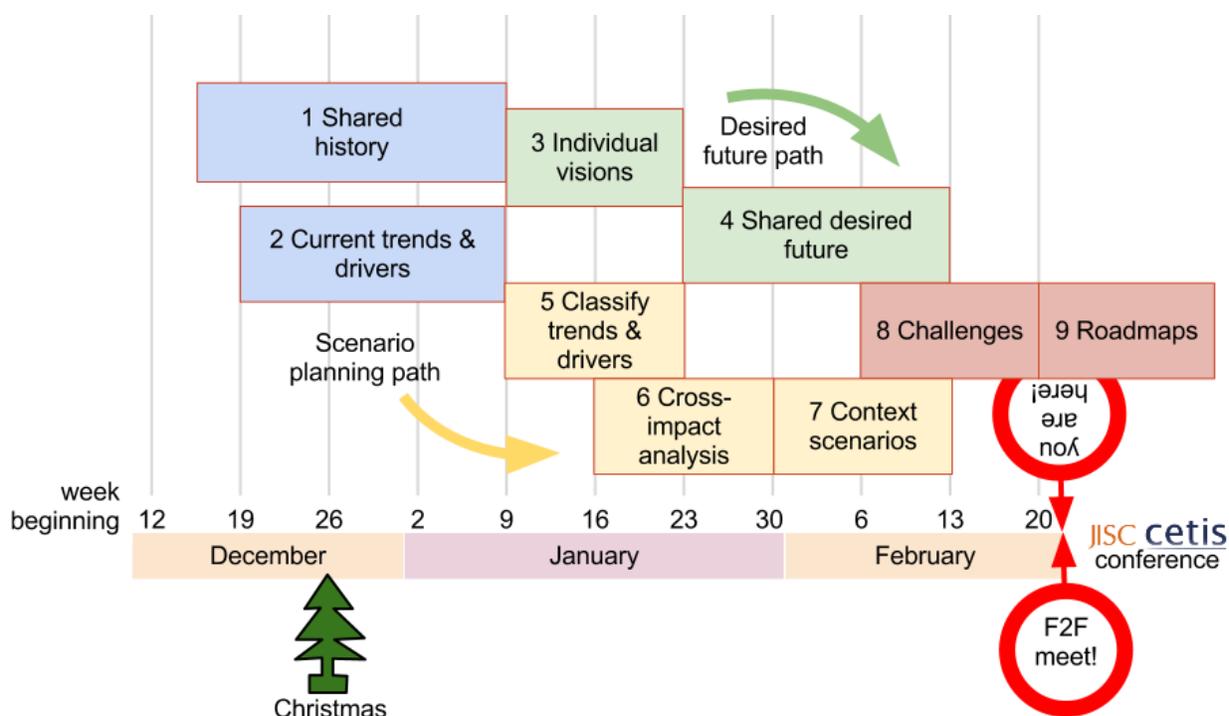


Figure 42: Online Tasks Prior to the First F2F meeting of the UK HE Cluster

This proved to be optimistic, particularly given that it crossed the Christmas and New Year break, and very little online activity took place. However it is also possible that people are reluctant to engage in this kind of activity without first meeting face to face. The learning from this is that for future roadmapping work, we face-to-face should come first with, at best, only light online work requested first.

A face-to-face meeting of the UK HE Cluster was held in February in Nottingham, immediately preceding the JISC-CETIS Conference.

### 5.1.2 The process and outcomes from the face to face Meeting of the HE cluster

The process quite closely followed the online map above, except that Task 2, Current Trends and Drivers, was not carried out in parallel so that all could engage in it. This meant that we did not carry out all the tasks, getting as far as the Shared Desired Future and the Context Scenarios, and both of these required further work to complete them.

The key tasks covered here, are the development of the Shared Desired Future and the Context Scenarios.

### 5.1.3 Desired Future Scenarios (“the Happy Student”)

The group generated a desired future which was finally summarised under the heading ‘the Happy Student’

The following figure summarises this part of their process.

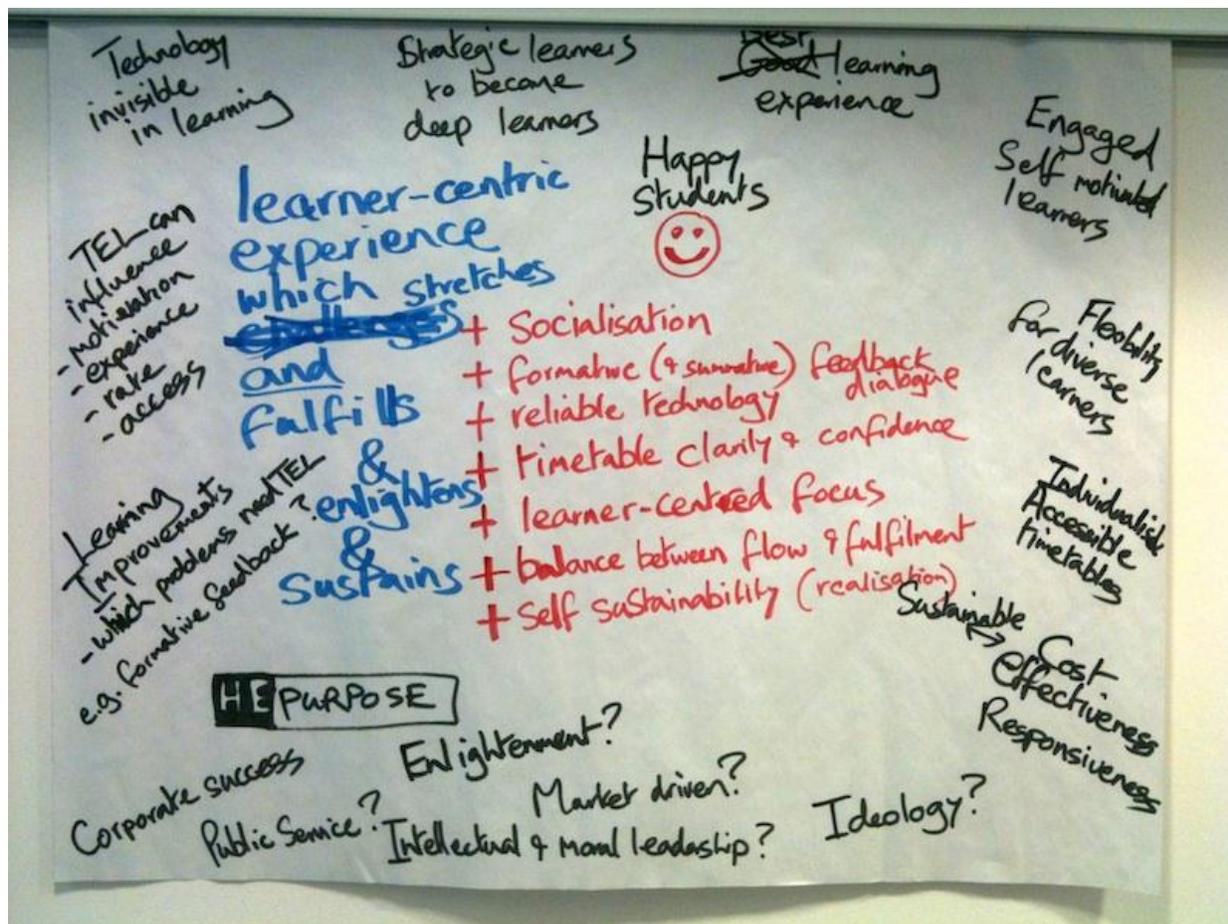


Figure 43: UK HE Desired Future

The text black around the edges reflects the assumptions participants brainstormed to scope their desired future. These framing themes, in no particular order, were:

- Technology invisible in Learning
- Strategic learners to become deep learners
- Best learning experience
- Engaged, self-motivated learners
- Flexibility for diverse learners
- Individualised, accessible timetables
- Sustainable ↔ Cost effectiveness and responsiveness
- TEL can influence:
  - (student) motivation
  - (student) experience
  - rate (of progress)
  - access (to resources)

Of course, more could be added.

Questions were raised about the underlying purposes of HE, answers to which would help

frame more detailed desired future scenarios. These were:

- (Is it to bring about) Enlightenment?
- (Is it to support business and) Corporate success?
- (Is it to provide a) Public service?
- (Is it to provide) Intellectual and moral leadership?
- (Is it to support an) Ideology?
- (Should it be) Market driven?

Here again, more could be added.

They then went on to consider some key factors and processes that can conducive to the 'Happy Student' which technology could support (in the diagram, these are the central ones in red). These were:

- Socialisation (institutional and peer)
- Formative and summative feedback and dialogue
- Reliable technology (!)
- Timetables with clarity and (in which students could have) confidence
- Learner-centred focus
- Balance between flow (of activities) and (resulting) fulfilment
- Self-sustainability (not just economically, but also full) realisation (of students' potential)

While their scope included education and student learning, the systems that surround learning, which can impact on the student experience, are also included. Together, these offer a variety of initial areas to explore that people are already working on, but would benefit from collaboration, particularly regarding the role of technology support.

Finally, much thought went into the short text (in blue) which tries to capture the essence of the desired future, which was given the title 'the Happy Student'.

This provides a good foundation on which to build, as many people are already working on a variety of aspects that go to make up this desired future. These range from student retention (the not unhappy student), the student experience (enhancing student happiness), student satisfaction (happy with the 'service' provided as a value proposition), to the student fully engaged at all levels (maximum student happiness).

### **Student Retention - map of cause and effect**

A shorter follow-on TEL-Map workshop 'Thwarted or Embedded: Mapping Cause and Effect' was held at the JISC-CETIS Conference in Nottingham which some of those at the first UK HE cluster workshop were also able to attend.

This workshop focused on Student Retention, one of the themes associated with the shared desired future of 'happy student' developed above. The task was to map out causative factors and their inter-relationships, which can then be used to help plan appropriate actions.

This diagram reflects and was built up during the discussion.

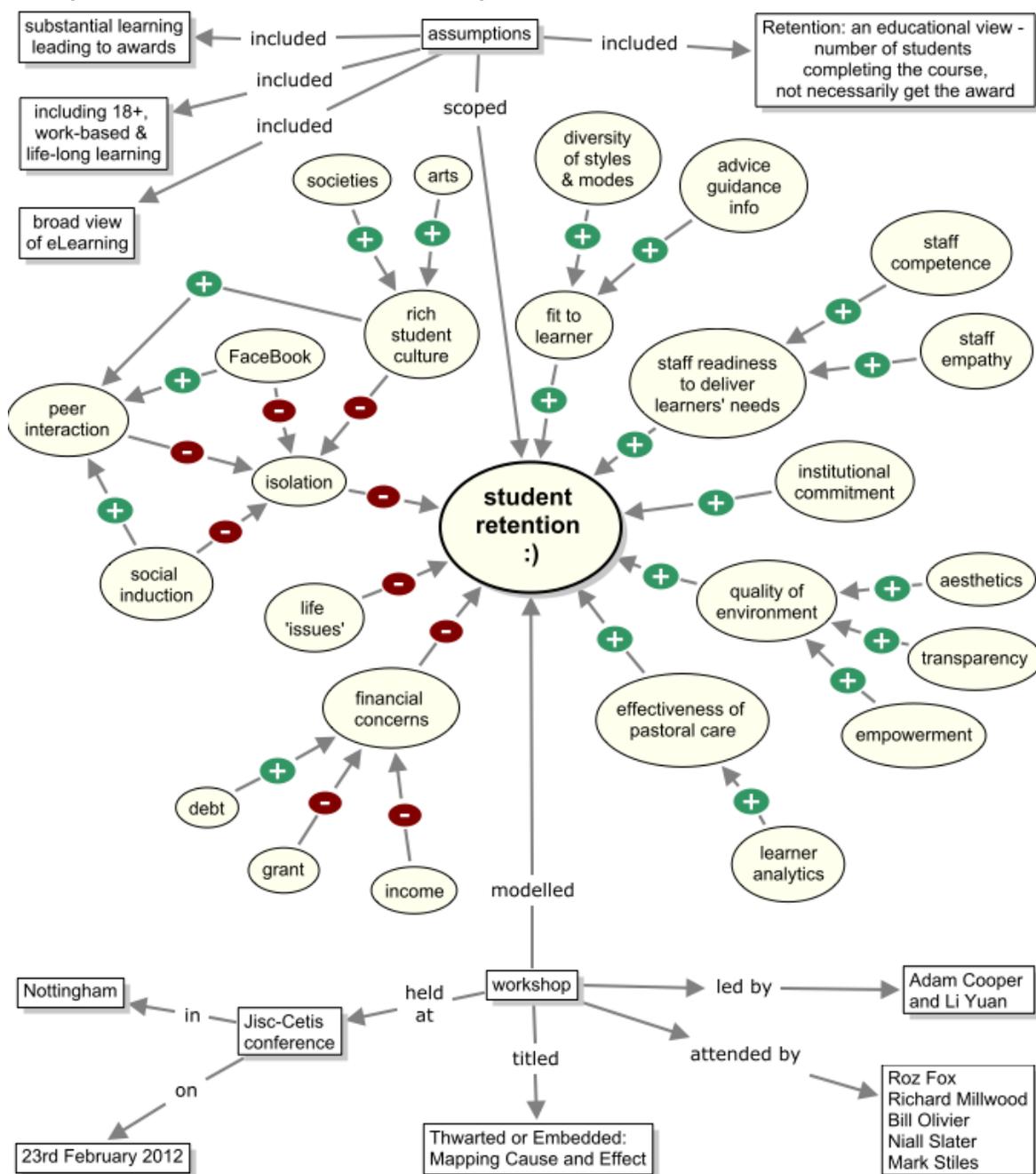


Diagram 44: Interplay of Factors Enhancing or Reducing Student Retention

*Note: The '+' and '-' signs should not be read as 'good' and 'bad', but taken to indicate the nature of the impact of the source factor on the destination. Thus for example, 'debt' increases (+) 'financial concerns', while 'financial concerns' can act to reduce (-) 'student retention'.*

### 5.1.4 Future Context Scenarios

This process involved brainstorming trends and driving forces that are impacting on TEL in HE. These were then rated for impact and then for confidence in their direction or persistence. The driving forces, which the group judged to have highest impact but lowest confidence, were

identified and then clustered into two ‘axes of uncertainty’. These two axes then formed four quadrants of a ‘field of uncertainty’ about how relevant aspects of the wider context might develop in the future.

Taking the extreme points of this matrix, four scenarios are then to be developed and against which the preliminary roadmap for the desired future will then tested and adapted as needed, potentially creating branching points. Which branch to be taken will depend on the future course of events, but signs and signals to look out for can then be identified. These are then passed to the TEL-Map Observatory so that alerts back to the roadmapping cluster can then be generated.

The group identified some 80 trends and drivers impacting on the theme of the Future of TEL in UK HE.

The group next rated them for Impact/Importance, each person having a total of 10 votes to cast. The top results are shown in the table below.

The group then rated these in terms of their confidence in whether they saw a single outcome vs. a range of possible outcomes, or its continued vs. discontinued presence as a key driver over the next 5 years. Given the large number of factors, only those they rated with an impact factor of 4 or above were considered.

Not surprisingly, Cuts in Public Spending was rated both as having the highest impact and the highest level of confidence in its persistence over the next 5 years. Remaining high impact factors received confidence levels between 50-75%. The group decided that of these, only Cuts in Public Spending should form part of the backdrop of every scenario, the rest having sufficient uncertainty to be candidates for consolidation into the main scenario axes of uncertainty.

<b>Trend or Driver</b>	<b>Impact</b>	<b>Confidence (Out of 90)</b>
Cuts in Public Spending	9	79
Social Media	5	63
Analytics	5	57
Rise of the student as client - more expected, less money = more technology?	5	61
Better broadband	4	54
Key Information Sets - driving HE to report for league tables	4	57
HE differentiators more rapidly evolving (e.g. largest enrolment, new model of delivery etc.)	4	50

Trend or Driver	Impact	Confidence (Out of 90)
Increasingly sophisticated Smartphones	3	not rated
Increasingly sophisticated Tablets	3	not rated
Increasing provision of Online Courses	3	not rated
Digital literacies and learning literacies becoming more important	3	not rated
P2P learning, flipped classroom - education = (learning - information) i.e. meta, learning, reflection, dialogue, etc.	3	not rated
OERu, P2Pu	2	not rated
Growing unevenness between UK HE providers in terms of financial security	2	not rated
Increasingly HE will develop to respond to perceived & real demands from employers, students, government	2	not rated
Openness in OER, data, course design	2	not rated
Government's Science, Technology, Engineering and Mathematics (STEM) agenda	2	not rated
Reduction, restructure and consolidation of Higher Education Academy and other agencies role	2	not rated
Changing nature of subject knowledge through ICTs	2	not rated

Interestingly, the first four of the trends and drivers rated 3 for impact, all look non-controversial and would have received fairly high confidence votes, and thus be candidates for the set of trends and drivers forming the common backdrop to all four of the uncertainty scenarios.

### Two Axes of Uncertainty

The next task was to consolidate the high impact, high uncertainty trends and drivers into two overarching but mutually independent axes. This is usually the most difficult task in scenario planning and this was the case here also. The drivers considered, reordered here into socio-political and technical, were:

Socio-political	Key Information Sets (KIS) - driving HE to report for league tables
	HE differentiators more rapidly evolving (e.g. seeking largest enrolments, new models of delivery etc.)
	Rise of the student as client: more expected, but less money →

	more technology?
Technological	Analytics (Learning)
	Social Media
	Better broadband

The first two could potentially drive universities into greater competitive differentiation, targeting different kinds of students, with different pricing, different topics, and approaches, including varying degrees of online learning. The last two are expected technology developments that will facilitate the increased use of TEL. The rise of the student as client, while a probable development, was seen as having uncertain impacts on TEL: it could force cost cutting and increased use of TEL or could mean that for the fees being charged, students could demand increased face-to-face contact. But it seemed to bridge the social and technical aspects.

Two types of Analytics were identified, ‘learning analytics’ applied to information gathered in the learning process, and ‘institutional analytics’ applied to the management information generated in the administration of the university. Given the focus on the future of TEL, it was decided to interpret analytics here as learning analytics. As this arises more easily when using TEL, it was seen as a technology development with the potential to accelerate the use of TEL if it became embedded in a systematic improvement process.

The two axes arrived at then were:

**1. Mono-cultural Universities --- Hetero-cultural Universities**

*Reflecting the Convergence – Differentiation uncertainty*

Could universities, under competitive pressures, start to become highly differentiated? Or conversely, could the financial constraints and the optimum use of technology – whatever that proves to be – drive universities towards a common model?

**2. The Face-to-face University --- The Online University**

*Reflecting the uncertainty regarding the extent of online provision*

Could the demands of students, employers and government drive universities to maintain and even increase face-to-face contact (perhaps an unwitting consequence of contact hours league tables driven by the KIS – KEY Information Sets)? Or could the economic benefits and steadily improving convenience, quality and cost advantages of TEL increasingly move towards online as the predominant form of provision?

**The Four Context Scenario Quadrant**

The two axes are then placed at right angles to create a quadrant generating four possible futures. The extremes of each axis are then used in pairs, together with their related and the common trends and drivers drivers as a scaffold on which to build a scenario of a projected future.

## TEL-Map UK HE Scenarios

Aim: jointly creating a better future for technology enhanced learning

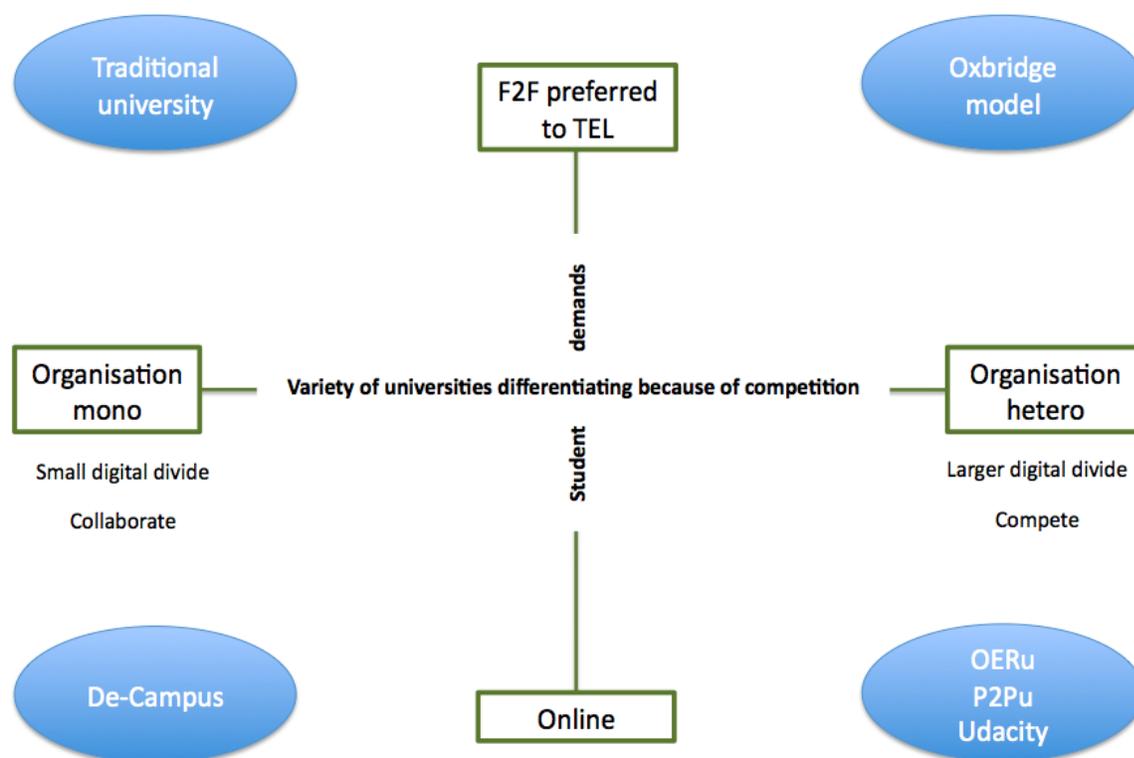


Figure 45: UK HE context scenario matrix

The resulting four scenarios are not seen as predictions but as plausible possibilities that could arise and are internally consistent. It is hoped that, by interpolating between them, they cover a wide range of future possibilities in a tractable form. The four scenarios can be seen as the corner points of a net to catch a wide field of possibilities.

The Quadrants are typically given names and characterized by their drivers. Provisionally, these were:

1. **Traditional University:** *Mono-cultural Universities; F2F Preferred*

Employers and students recognise the value of F2F, as for example the best way of communicating essential tacit knowledge. Most universities continue as they have done, with Learning Technologies used primarily to augment existing practices and classroom technologies, such as videos and simulations used in lectures and seminars, with eTextbooks coming to replace paper ones, etc.

2. **Oxbridge Model:** *Hetero-cultural; F2F Preferred*

Universities become more diverse, with a much wider range of course offerings and modes of delivery, although these primarily remain F2F, augmented by technology. The ideal is seen as the Oxbridge model, with high levels of personal contact between staff and students. However

the high cost of this type of provision encourages variations, perhaps with large lectures and teaching assistants providing supporting tutorials.

**3. De-Campus: Mono-cultural Universities; Mainly Online**

Coupled with increasingly powerful, ubiquitous and cheaper technologies and communications, the same economics pressures drive the majority of universities towards the same online approaches to course delivery. More and more students attend courses offered online, causing the overhead of maintaining campus-based facilities to become prohibitive, causing undergraduate teaching to ‘de-camp’.

**4. OERu, P2Pu, Udacity: Hetero-cultural; Mainly Online**

The same drivers as the De-Campus scenario, increasingly move provision online but with competition driving progressively enhanced online facilities and support and innovation creating a wide variety of provision. This ranges from, at one end, largely independent study using OERs to provide essentially free courses with paid-for external examinations and degrees awarded when students feel ready – the OERu model - although peer learning, provided either by the university/consortium, or by the students themselves, becomes common. At the other extreme, some universities make full use of the development of interactive social technologies to provide close personal support for students, but with a much higher price tag.

This was as far as the one-day workshop went; however, in a follow-on workshop, Scenario 4, OERu, P2Pu , Udacity, was developed further, with the extremes of the trends and drivers that characterise this scenario spelled out.

**The Open Higher Education Scenario**

An illustrative scenario for the bottom right quadrant of the scenario diagram, developed by Bill Olivier, Richard Millwood and Li Yuan at the JISC-Cetis Conference 2012 in the TEL-Map session: ‘Emerging Reality: New Models of Learning Organisations’.

**Drivers**

This scenario identifies a future higher education scene where a much greater diversity of HE solutions exist including several which respond to the following drivers:

PESTLE	Content
<b>Political</b>	<b>HE diversity is evolving</b>
	There is a growing need to capture a market share as economic conditions become tougher for HE institutions, which are thus increasingly developing unique selling points to differentiate from each other.
<b>Technological</b>	<b>Adoption of Data-driven Learning Analytics</b>
	Institutions are employing data to analyse learner behaviour in order to be responsive in the content they use, their operation and to inform strategic thinking. Learner management is enhanced as understanding of learning patterns is increased.

<b>Social</b>	<b>Social Media will soon be embedded in learning</b>
	Particularly Facebook and Twitter have come to dominate both informal social activity and are reported in traditional news media leading to widespread awareness and acceptance. This is no longer ‘bleeding edge’ but will become commonplace in education contexts. In order to remain relevant and real to students, institutions will embed social media in their learning practice
<b>Economic</b>	<b>Students are seen as customers, expecting more for their money</b>
	Students are now purchasing an education service and taking on debt to do it. This creates an expectation of delivery and a desire for a lower price, so this will increase the use of TEL.
<b>Technological</b>	<b>Ubiquitous broadband is becoming widely available</b>
	Higher bandwidths lead to new applications, qualitatively different to those available at lower levels. Higher levels of communication make new learning activities possible and more interactive, using students’ own devices (Smart phones, Tablets).

The leaders in this field include the OERu (Open Educational Resources University), P2Pu (Peer to Peer University), Udacity (a new Stanford spin-off learning provider...) and the experiments being tested by MIT to deliver courses without staff intervention. Their common feature is the radical use of learning models that rely on low cost content and peer learning support, with expert support called on as needed.

Students are attracted to these modes of learning due to:

1. the convenience they offer (study as and when; sit examinations when ready);
2. the savings on price;
3. the predictability and consistency of quality;
4. the fit to their social media concept of managing their life;
5. the rapid, automated formative feedback;
6. the flexibility in pattern of learning;
7. the transparency and control offered to them over their learning pathway.

New institutions modelled on these understandings are light on the trappings of traditional university and thus able to undercut the market, a disruptive innovation.

“A disruptive innovation has a couple key elements or enablers that are particularly salient to the future of higher education. The first is a technology enabler. This allows the innovation, which starts in a simple application and competes first against nonconsumption—by serving people who were not able to be served or were not desirable to serve—to be “upwardly scalable” and improve year over year without replicating the cost structure of the old products and services it gradually replaces. Online learning appears to be this technology enabler for higher education.”

In Christensen's terms, students who choose this form of HE would have not been served by a university with a culture (arts, sports, societies) and resources (classrooms, restaurants, parking, library) they did not feel they could benefit from, but would be asked to pay for. Steadily improving OERs and social media, and their increasing integration, provide the required content and peer interactivity respectively. Continued improvement and ubiquity of Internet service provision further increases convenience and accessibility. Initially the flexibility offered fits better with the lives of students who have disabilities, cannot afford to stop working, cannot leave their family commitments or simply live too far from a university which offers the course they are interested in. As more and more people find online university courses affordable & practical, the model evolves and more students see its benefits including those who would have attended traditional university. The providers, while starting with 'nonconsumers' and making strong use of learning analytics, continue to steadily improve their offering and gradually take an increasing percentage of the 'overserved' students.

Thus, this form 'Open Higher Education' disrupts, and in time, comes to replace current higher education providers.

## 5.2 Cluster: Schools

### 5.2.1 Start-up workshop summary

The start-up workshop for the TEL-Map Schools or Creative Classroom Roadmapping cluster was held, in conjunction with, and on the day following the VISIR startup workshop, both held in Bologna on the 9-10 May 2012.

The TEL-Map EU Schools Cluster workshop focused on two key areas:

1. Developing the basis for a shared desired future vision around the common focus of the Creative Classroom and the Changed School.
2. Begin to map out the wider context in which the interrelated set of tasks of realising the Creative Classroom may have to be carried out.

After an initial brainstorming of some 80 Driving Forces, smaller groups worked on an initial framing of their view of the future Creative Classroom, setting out its main features together with some illustrative scenes. Much valuable work was done, and the results were posted to a shared Google Doc. Still in groups, participants reviewed each other's work. In parallel, the key features of each contributory initial vision were written on to post-its and these were pooled and interactively themed by participants from all groups. The results of this activity have now been transcribed and posted. Further elaboration of the contributions, with comparison and merging where appropriate, is now needed. A multi-level synthesis can then be attempted, as far as possible maintaining the individual illustrative scenarios, but where necessary identifying the emergence of contrary visions.

In the afternoon, the group returned to the collection of Driving Forces going through each voting on their impact on the task of realising the Creative Classroom and their Certainty as the nature of that impact.

### 5.2.2 Participants

The EU School Cluster is the second invited cluster focussing on a broad range of European interests drawing from 14 member states (Austria, Belgium, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Netherlands, Norway, Spain, United Kingdom).



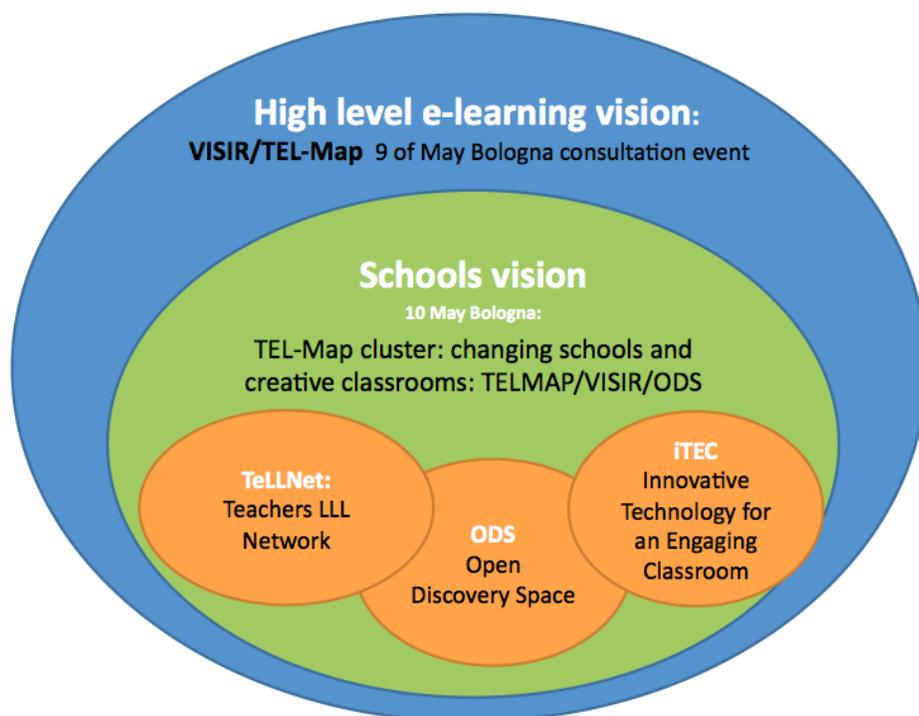
(Photo: Fabrizio Giorgini)

### 5.2.3 Focus & concertation

The focus we proposed was 'The Creative Classroom' and we took three steps to improve concertation:

1. We co-located the meeting with the VISIR project, participating in their seminar on the day before and inviting their members to our meeting.
2. We invited participation from a range of stakeholders and significant EU funded projects. The list of stakeholder categories included:
  - industry leader
  - EU policy maker
  - government
  - innovator
  - researcher
  - leading-edge practitioner
  - sector funder
  - school leader
  - technology expert
3. The activities linked their goals, activities and visions, reminding them that our methodology was intended to help them roadmap their **shared** desired future.

The key projects are shown in the following diagram:



Participant organisations included: IPTS, EDEN, Association for Teacher Education in Europe, STELLAR, EUN. Many more are included in the wider group who are invited to collaborate online and may attend future meetings.

While the VISIR Project is working on policy roadmapping at the high, **macro** level (but rooted in collecting 100 **micro**-level exemplars of the innovative classroom), the TEL-Map Project is working at the **meso** level (bringing together an ecosystem of interdependent stakeholders to generate a shared desired future from their existing goals, create their own roadmap, and then use it to coordinate their efforts to bring about their desired future, in this case the Creative Classroom and Changed School).

### 5.2.4 Online activities

The cluster's activities were supported by a GoogleDoc workspace using a spreadsheet with multiple tabs to represent each activity, and in the case of Initial Visions, each group's work. The spreadsheet format allowed a combination of synchronous and asynchronous activity and database-like accumulation of data together with formulae to reorder and calculate aggregate outcomes.

The cluster was invited to make introductions online and to record their future perspectives in the GoogleDoc workspace under these headings:

1. Your / your organisation's TEL Future Focus & Vision
2. Your / your organisation's TEL future Issues

Almost all of the participants completed this before the meeting.

### 5.2.5 The process and outcomes from the face-to-face meeting of the EU School Cluster

The cluster met face-to-face in Bologna, Italy on May 11th 2012. The agenda for the meeting was as follows:

08:30	Registration	
09:00	<b>Introduction</b>	Introduce the TEL-Map project and the workshop.
09:20	<b>Forces</b>	Brainstorm trends, drivers, signals that may influence the future of TEL
10:10	<b>Initial Visions</b>	Develop perspectives of a teacher, student, parent, civic leader, employer for the future by completing the template 'Future vision perspectives'.
11:10	Coffee break	
11:25	<b>Shared desired futures</b>	Synthesise the futures to define one or more that the whole group can agree on
12:25	<b>Opportunities</b>	Brainstorm opportunities for development in pedagogy, practice or technology of the shared desired future
13:00	Lunch	
14:00	<b>Impact and Certainty</b>	Classify the forces to find those with greatest impact and least certainty by rating each for impact and certainty using a 2x2 matrix: low - high
14:40	<b>Two axes of uncertainty</b>	Group the high-impact, low-certainty forces to create two axes of uncertainty and a four-quadrant matrix.
15:15	Coffee break	
15:30	<b>Context scenarios</b>	Describe the four scenarios found in each quadrant between the axes
16:30	<b>Next steps</b>	Sum up the key outcomes from the day and agree follow-up activities.
17:00	Informal discussion	Networking, feedback and dialogue

This agenda followed closely the tasks devised for the UK HE Cluster with some revisions focussing on a better process for developing a Shared Desired Future through group work on Initial Visions.

### 5.2.6 Desired Future Scenarios ‘Community School’

This process asked participants to work in groups round tables and used the following template to develop initial visions:

TEL-Map EU Schools cluster GoogleDoc workspace ☆		
File Edit View Insert Format Data Tools Help All changes saved		
A	B	C
1	<b>Initial Visions</b>	<b>TABLE 1</b>
2	<b>Imagine you are in the future, in a changed school, observing a creative class room with learning &amp; teaching in the way you really like to see it.</b>	<b>Instructions</b> Your aim is to develop a brief description of a desired future as a group round your table in rows 3 and 4. In order to inform, enrich and communicate your description, you may find it easier to work from one or more illustrations to the description of the desired future. In every case there is no need to find the title before you have described your ideas - this may come better at the end.
3	<b>Initial Vision title</b>	Table 1's title
4	<b>Description</b>	table 1's description
5	Enrich your description with illustration from relevant perspectives such as those of teacher, student, parent, civic leader, employer etc. (or any other perspective that may be relevant).  (Replicate rows 6-8 if you want to produce more than one illustration of the desired future.)	
6	<b>Illustration title</b>	
7	<b>Perspective/s taken</b>	Whose viewpoint is this described from? (what is the impact for which stakeholder?)
8	<b>Description</b>	What are you doing and how is technology helping? Consider any genre or media to describe this that you find creative.

All the visions were displayed together on another tab of the spreadsheet, using a formula, and then projected onto a screen, allowing the participants to see and read the progress made by other tables.

Titles of table’s initial vision:

Table 2	Table 3	Table 4	Table 5	Table 6	Table 7
Seamless learning	Beyond the schools	Whose agenda?	ISP SOLVER (Individualization, Socialization, Professionalization) - Shared, Open, Learning, Values, Environments and Recognition	Local expanding to global school (add "open")	Learning to be a change maker

### 5.2.7 Key features

The groups at table were asked to identify the key features of their initial vision and to write them on post-it notes and share on the wall. These were discussed, moved around to cluster around common issues.



(Photo: Fabrizio Giorgini)

### 5.2.8 Clustering of key features

This is the outcome of the key feature clustering:

Theme 1	Theme 2	Theme 3	Theme 4	Theme 5
<b>Collaboration beyond the school's boundaries</b>	<b>Personalised LLL spaces</b>	<b>Schools as trusted open classroom connected to community</b>	<b>Open sharable practices &amp; resources</b>	<b>Adaptive community based curricula and assessment methods (wiki example)</b>
<b>Table 2</b>				
Collaborative peer-to-peer learning		Connected school	Teachers and students to become content producers	Tools for integrated formative assessment
School Management Supporting active Networking & Collaboration across stakeholders		Seamless learning	Usable, hassle free, ready to use technologies to provide for seamless learning	Assessment geared to new competencies
				Peer Assessment
				Empower teachers to design assessment & curricula
<b>Table 3</b>				
Collaborative learning beyond the classroom with variety of stakeholders	Life profiled-based (personalized) learning used to negotiate learning	"Phase – not- age" focused schools	Distributed learning	
	Negotiating learning		User-generated	

	between teacher and learner		learning material	
<b>Table 4</b>				
	Ability to configure the learning space as the needs emerge	Agreed by parents, teachers, students. Mix of pedagogical approaches	Digital and non-digital resources are used as and when appropriate (teachers and students choose)	Empower the learner allowing pupils to follow their own interests and passions
	Learning embedded in spaces: environments represent means to solve problems & understanding (no boundaries between disciplines)	A team of teachers is responsible for a class of students	No top down directives related to what resources are used and when	Adaptable curriculum to children needs
	Teachers, parents and students develop the learning agenda for individual pupil connected to their needs			
<b>Table 5</b>				
	Increased learning variation in terms of personalised learning paths/portfolios. Increased learning awareness of: purpose of education strategies, ways of demonstrating knowledge as skills	High quality learning and education should be public good and free for the public.  I want the best education and I wanted free		Kids be able to demonstrate of learning and skills acquired need to be demonstrated not only to teachers, but to peers, parents, employers  Contextualize education to everyday life
	Increase creativity in the disciplines having open learning objectives	Schools to be open to the society, parents, teachers, local community. The school as a physical place to be open for the other activities as a space available to the local community		Variety of assessment methods: Including new forms of assessment such as portfolios/blogs to demonstrate knowledge
	Gamification of things that we don't want to do as a motivator factor	Making learning seamless, breaking down the boundaries between school, parents, teachers, employers etc. via use of TEL. Transfer the same model to school, libraries, school employees, companies		
	Increasing balance between individualization, socialization, professionalization. What's education for?			

	Creativity versus productivity Who are the clients?			
<b>Table 6</b>				
Social cohesion: schools are central to building & sustaining shared values & social cohesion participatory citizenship		Creating autonomous human beings, having self-efficacy who can participate globally & locally with environment awareness	Variety of “good quality resources”	Multiple pathways to standards (core standards in the heart of curriculum)
		Schools as equalizers/openers		
		Teachers’ profession highly valued		
<b>Table 7</b>				
	Working with real world Problems, creating solutions and implementing them			
Students feel: - engaged & useful - working collaboratively - ownership of the school - connected to their community				
School a social network lab for learning how to work in the larger social network				
Teaching and learning about social values – yours & others				

### 5.2.9 Importance and Certainty

In the afternoon, the group returned to the forces, going through each voting on their impact using electronic ‘clickers’ linked to a Powerpoint presentation of the forces. The outcome is recorded in the GoogleDoc workspace for participants to reflect on after the workshop and in preparation for the next processes ‘Two axes of uncertainty’ and ‘Context scenarios’ which will be picked up at our next meeting.

### 5.2.10 Next steps

The meeting closed with a discussion of next steps. We proposed another face-to-face meeting to complete these activities, timed to link with their own projects forward-looking events. We agreed to complete a brainstorm of opportunities that participants could identify and these would be posted on the online space.

After the meeting follow-up emails have reminded participants to continue the work and indeed some have begun to participate online.

### 5.2.11 Issues to be developed further

The findings from the workshop will be presented at an EC-TEL workshop to industry partners, where we will work with the vendors in defining the state-of-the-art and finding the gaps which may need addressing in order to achieve the clusters’s visions.

The project team have further issues which include:

- Clarifying and enriching the Vision of the Creative (and Connected) Classroom
- Clarifying your (organisation's &/or project's) part in realising this Vision
- Who (else) needs to do what to realise the Vision?
- What are the collective Co-Dependencies?
- What are already met within the cluster?
- Who else is needed?

## 5.3 Cluster: Research

The conception in project M14 of the TEL-Map research cluster, and its gradual realisation thereafter, will facilitate action planning for roadmapping associated with TEL-sector project goals as related to, for example, the STELLAR Grand Challenges. While STELLAR is not the only relevant initiative in defining a vision for TEL, the research focus of its large membership makes it one of the most important ones from a research perspective.

Some challenges in technology-enhanced learning are too big for an individual researcher to tackle, even too big for a local team. As a service for the TEL community, STELLAR has been the catalyst in elaborating a set of Grand Challenges for the next 5 to 10 years in the three Themes orchestration, social networking, and contextualisation that we are currently facing in research on the TEL horizon. STELLAR has facilitated the collection of about 40 Grand Challenge proposals for adoption as priorities by the research community and currently is in the process of aligning, enhancing, and short-listing them.

TEL Grand Challenges are by definition concise statements about problems that look as if they would take significant effort to solve but whose solution would bring major benefits to society. They are timely, i.e., within reach and relevant within the European education area and its learning market. The challenges have to be measurable and ideally can be achieved in incremental steps that produce useful outputs along the way. They are 'grand', not 'petit': with our present state of knowledge they seem as if they will need concerted and coordinated efforts to be achieved.

Challenges need to express what capacities and resources they require. To map a road to their achievement, action planning is required.

Moreover, research challenges need to be popularised by complementing them with a tangible vision, encapsulated in scenarios for TEL sectors. The work of the research cluster will focus on building scenarios and will evaluate their likelihood with the cluster members.

Therefore, the cluster will have to review the inputs resulting from initiatives such as STELLAR (available with the end of the STELLAR project at the end of May, 2012). It will have to interface publicly with upcoming big TEL conferences such as ICALT and ECTEL to engage relevant research stakeholders in roadmapping and scenario building in order to raise awareness and endorsement for the future vision.

A split strategy to complement outreach of the big presence events with online activity can be reached through activating the members of TELeurope.eu to provide quantitative feedback at scale. TELeurope.eu is a research and development community platform focusing on TEL. It currently has more than 2.000 active, international members.

Activities envisioned and their proposed timeline leading to the research cluster contribution to D3.2 at the end of October include:

- Internal review report of STELLAR Grand Challenges and other goal setting activities of other relevant projects (success criterion: internal deliverable passes internal review).

- Panel discussion “Smoothing the path to #TEL2020” at the 12th IEEE International Conference on Advanced Learning Technologies (ICALT’12) on July 4-6, 2012 in Rome, Italy. This panel discussion will focus on recognising or reducing differences in perspective, developing shared goals and roadmaps (Success criterium: panel accepted by ICALT organisation committee).
- Pre-conference meeting, workshop, or panel discussion at the Seventh European Conference on Technology Enhanced Learning (EC-TEL), 18-21 September 2012, Saarbrücken, Germany (Success criterium: activity proposal accepted by organisation committee).
- Quantitative survey of the TELeurope.eu members (indicator of success: more than 5% return rate of the survey).

## 5.4 Cluster: Emerging researchers

The emerging researchers cluster is an example of the bottom-up approach that makes use of a version of the Capturing The Voices methodology. In contrast to the ‘invited’ approach, the ‘emergent’ approach does not prescribe who should be brought together (into the same room), but only provides means for ad-hoc and opportunistic collaboration. Such collaborations could for example take the form of “breakout sessions” of the “birds-of-a-feather” type, where the common (and complementary) aspects that unite the potential participants have been discovered by (linked) data mining of the underlying semantic networks that are maintained in the TEL-Map Confolio.

As described above in section 4.3 – as well as in the updated Dow:

From the perspective of TEL-Map, the overall aim of these summer school activities is to lay the groundwork for recruiting a group of Community Modeling and Mapping Managers (CM3s) that will be interested in taking an active part in the modeling activities and help to sustain them beyond the funding period of the TEL-Map project. A promising start of such a group has been achieved in collaboration with STELLAR through the IJTEL-YRSI-nr2 on state-of-the-art of TEL.

### 5.4.1 Prior modeling activities with the JTEL Summer School Students

On several prior occasions (specifically 2006, 2007, and 2009) modeling themes were created with the students through a series of Flashmeetings before the Summer School.<sup>14</sup> The themes were organized around areas of interest for the students in relation to their research. Through these meetings, the possibility of a “semantic match-up service” emerged, for students in fact followed the “birds of a feather flock together” pattern of behaviour at such events and sought out students with similar or complementary interests. In TEL-Map “bottom-up” terms, they grouped themselves semantically by clustering around the themes of their choice. These thematic clusters were then made visible in the supporting Confolio, where each area was given its own Confolio folder with links to the personal Confolios of each student that had expressed an interest in this area.<sup>15</sup> In this way, the students could semantically browse their peers, with respect to their declared research interests, and after the summer school they could continue to browse each other’s Confolio folder, thereby were able to track each other’s research as it developed, and keep in touch, fostering the formation and continuation of a self-sustained group.

Communicative modeling activities around these themes then were carried out in both formal and informal sessions during the face-to-face week of the summer school. Since 2009 we have

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<sup>14</sup> For more information, see (Maillet et al., 2007) as well as the Conzilla map at <http://www.conzilla.org/projects/roadmapping/presentation/CM#adf08f109f5144ae1>

<sup>15</sup> It is important to stress that this semantic linking was performed *manually*, in contrast to the semantic linking activities of this year, which will be performed by machine-based matching.

also been running a series of late night sessions on *provocative modeling*, which tries to highlight some of the overall social, economic, and political patterns and processes that influence society and our lives within it.

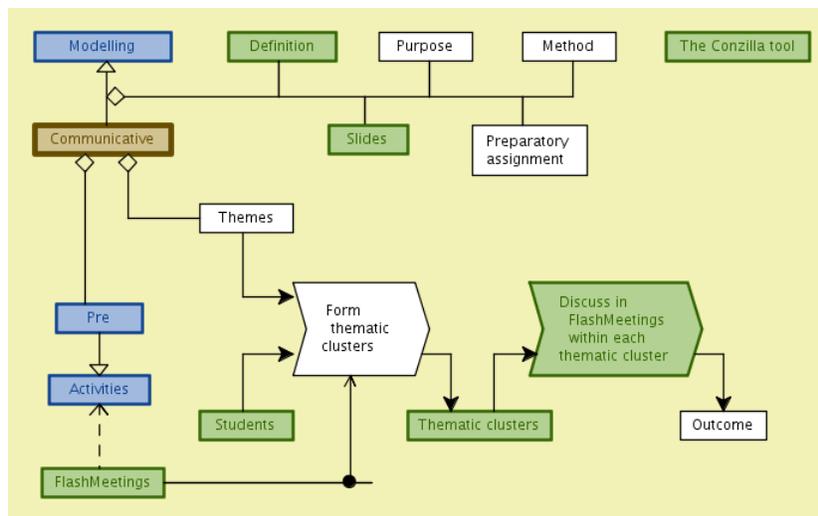


Figure 46. Model of pre-activities for Communicative Modeling at the JTEL Summer Schools

These modeling activities have served to illustrate the power and scope of modeling techniques – especially dynamic ones (like process modeling).<sup>16</sup> It has also helped students within the Doctoral Consortium of TEL to get feedback on their research activities as well as to find common themes for joint publications, thereby acting as a way to facilitate the kind of semantic match-up services that we aim to provide in the TEL-Map project.

These earlier positive experiences with the JTEL summer school students is the main reason why we have chosen to build on this activity for the bottom-up approach to engaging with TEL stakeholders. As described below, we expect that some of this year’s students (2012) will form the backbone of our CM3 modeling group. Then we aim to target the summer school alumni in order to expand this group further.

Our earlier positive experiences with the JTEL summer school students (Maillet et al, 2007) is the main reason why we have chosen to build on this activity for the bottom-up approach to engaging with TEL stakeholders. As described below, we expect that some of this year’s students (2012) will form the backbone of our CM3 modeling group. Then we aim to target the summer school alumni in order to expand this group further.

### 5.4.2 2011: Situating your own research within the TEL Community

This activity has been described above in section 4.3 (and in more detail in the CTV report). The main purpose was to enable the PhD-students in TEL to situate their own research within the TEL community and ground their research on a sound methodological basis, thereby enabling them to improve the SOTA (State-Of-The-Art) and the methodology chapters of their theses.

<sup>16</sup> Most of these modeling techniques are discussed in (Naeve, 2011).

The underlying challenge is that PhD students in TEL are often financed by various projects and are expected to perform their research while working within these projects. In such a situation it is often difficult to integrate the research aspects with the project-related work that finances it.

### 5.4.3 Activity in 2012: Roadmapping your PhD

This year's workshop at the summer school will build on the modeling activities from last year, the results of which have been integrated into the TEL-Map Confolio.<sup>17</sup> In fact, while last year's students worked on paper, this year's participants will be given their own personal Confolios, where they can describe their research with a mixture of free text and controlled vocabularies (as described in section 4.3 above, This will allow them to ask machine-processable questions such as e.g., "Who is working within the same (or similar) sub-areas of TEL as me, but using different theories and/or methods?" Such questions will enable students to find interesting discussion partners and potential co-authors of joint research papers.

After the summer school we will continue these modeling activities within the TEL-Map project ([www.telmap.org](http://www.telmap.org)) via a series of online modeling sessions that will aim at enriching the models in various ways. This will include the creation of an in-TEL-ligence network for collective gathering and assessment of events and developments that influence the future of the TEL community.

In this way the students will have an opportunity to collaboratively build and share the current state of the art in TEL, describe where the innovation points are occurring, and reflect on how their own PhD work fits within this landscape. From a more strategic perspective, being part of such a modeling group will allow the students to position themselves within the TEL community and demonstrate why their research is innovative and where their expertise lies, while at the same time raising their visibility within the TEL-Community as well as in the eyes of the European Commission.

### 5.4.4 The Asynchronous Public Service network at KTH

The recently formed (Jan 2011) ECE-school<sup>18</sup> at KTH is working to create a national (and international) network for *Asynchronous Public Service*.<sup>19</sup> Life Long Learning brings about new challenges for both educational institutions (such as schools and universities) and knowledge-brokering companies and organizations within the public service sector. Educational institutions need to find methods and techniques to integrate the old forms of 'over-structured,' traditional, and solitary learning that goes on within their own domains, with the new forms of 'under-structured,' self-organized, and social learning that are emerging in online environments such as Facebook, YouTube, LinkedIn, etc.

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<sup>17</sup> <http://telmap.confolio.org>

<sup>18</sup> The school of Education and Communication in Engineering Sciences. ([www.ece.kth.se/en](http://www.ece.kth.se/en))

<sup>19</sup> Naeve, A (2008), *Collaborative Survival through Open Research and Asynchronous Public Service*, Keynote at the First World Summit of the Knowledge Society, Athens, Greece, 24 Sept. 2008, [www.slideshare.net/EagleBear/ambjorn-keynote-wsks2008](http://www.slideshare.net/EagleBear/ambjorn-keynote-wsks2008)

Public service focused companies and organizations need to find methods and techniques for *connecting the news of today with the news of yesterday* and create a more process-oriented context in contrast to the increasingly event-driven news- and information flow of mainstream media.

Meeting these challenges requires a new form of Strategic Knowledge Infrastructure (SKI) that can support the sense-making, pattern-seeking and filtering processes that accompany the ongoing transformation of databases into knowledge bases – and connect isolated 'knowledge portals' into a conceptual and inter-searchable knowledge network that can highlight knowledge resources of high quality and clearly specified terms-of-use. Such a SKI would enable the situation/specialization of knowledge ,by presenting it in context and, at the same time, it would enable its abstraction/generalization - by disregarding the particulars of a series of concrete situations and 'abstracting out' their underlying common patterns.

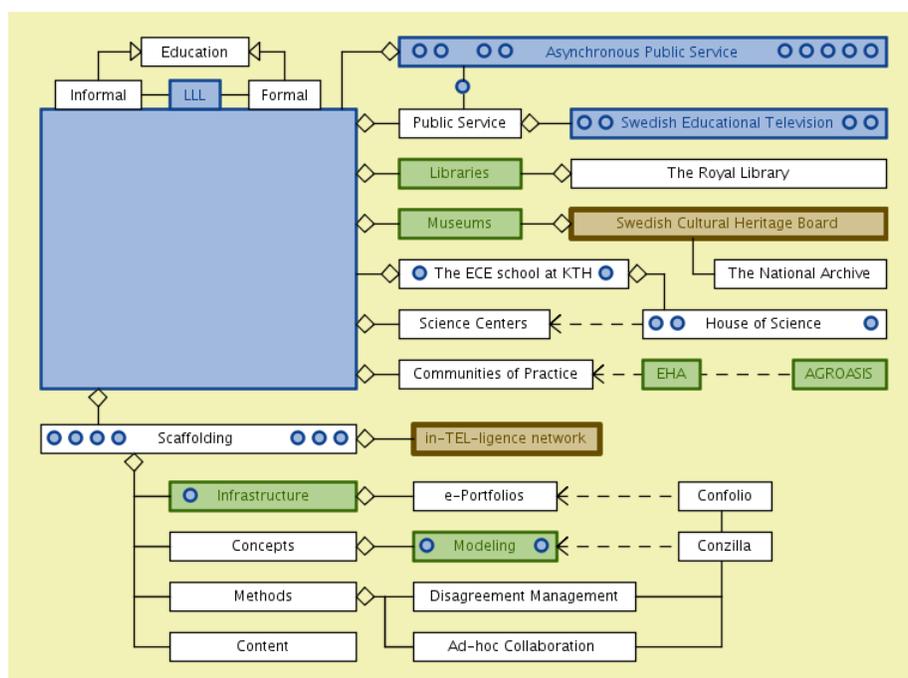


Figure 47. The Asynchronous Public Service network hosted by KTH.<sup>20</sup>

### 5.4.5 The in-TEL-ligence network

Some of the planned APS activities consist of collective processing of information that could be strategically relevant to the participating stakeholders.<sup>21</sup> More precisely the participants of the APS network will create in-TEL-ligence<sup>22</sup> by *gathering*, *filtering*, and *sense-making* of relevant information as well as by *action-planning* on the basis of that sense-making. The gathering process will be carried out by *scouts*, the filtering process by *gate-keepers*, the sense-making

<sup>20</sup> <http://conzilla.org/users/amb/projects/ASP/layout/contextmap#-1e56c11f133b8ca2786>

<sup>21</sup> Specifically related to emerging competence needs in order to “stay in business” and available learning resources to satisfy them.

<sup>22</sup> intelligence for TEL.

process by *analysts*, and the action-planning process by *strategists*. A novel feature here is that any participator in the network, i.e., any holder of a personal Confolio, can sign up for any one of these roles, and they can decide what levels of visibility they want their results to have, i.e., who should be allowed to see the output of their activities. However, whenever the results are made visible to another stakeholder, the latter can always see who is the source of this information. No anonymous contributions are allowed. In our experience, these features are important in encouraging the commitment of participants to collaborating.

In fact, collaborations can be expected to start by open sharing of information on general ideas and trends within TEL. However, as more concrete options for collaboration are emerging, the sharing of information can be expected to become more restrictive, and focus on the people with whom you are building your business case. This is in line with the principles for *opportunistic collaboration* described in (Naeve, 2010).

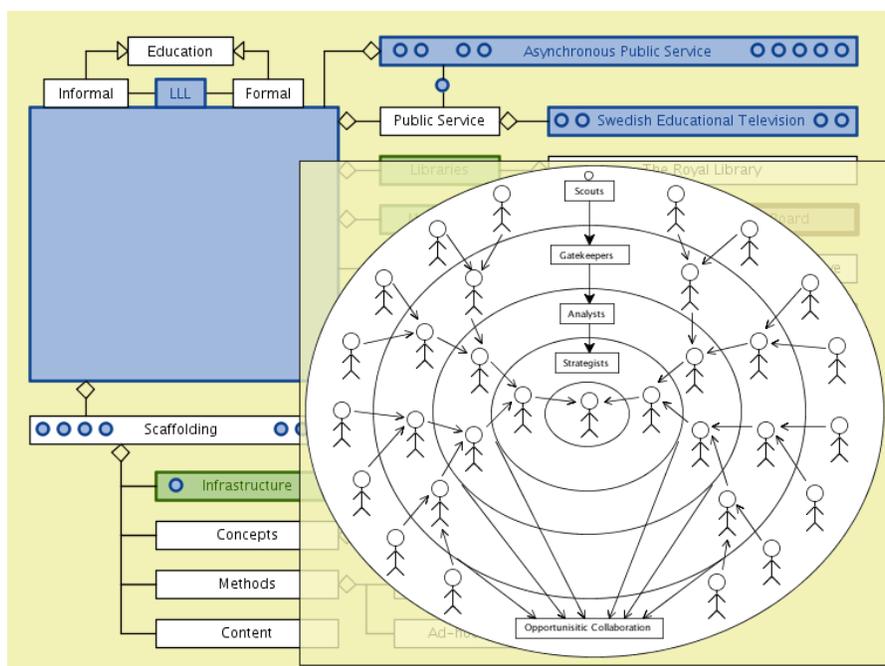


Figure 48. Entering the context map for the in-TEL-ligence network

An important feature of the in-TEL-ligence network is that questions can be formulated - both individually and collaboratively - By providing support for what could be called *Collaborative Question Forging*: people could work together and learn to ask for information, which is not deducible (yet) because the relevant ‘pieces’ are not semantically linked in a machine-processable way. Such questions would indicate the need to introduce the corresponding machine-processable semantic links. In this way, the collaborative QF activity could drive the direction and development of awareness within the community.<sup>23</sup>

<sup>23</sup> Focusing on formulating questions is important even when there is no formal semantics involved. In fact, by creating a question-formulating activity with corresponding voting possibilities (similar to for example Ubuntu brainstorm) one could have a continuous voting activity around what are the most important questions within different domains.

### 5.4.6 Working through IJTEL<sup>24</sup>

Two years ago (June 2010), shortly before the JTEL Summer School in Ohrid, Ambjörn Naeve and Fridolin Wild<sup>25</sup> came up with the idea of a Young Researcher's Special issue which would be edited by an invited group of young researchers/PhD-students. During the week in Ohrid, a team of guest editors was formed,<sup>26</sup> and the theme of the special issue was decided to be “*Ground-breaking Fresh Ideas In Technology Enhanced Learning.*”

#### **YRSI-I: Ground-Breaking Fresh Ideas for TEL**

This issue, which was published in late 2011 (see Figure 49), presented not only some ground-breaking ideas, but also a ground-breaking process for creating a research journal.

From the participants of the IJTEL summer school 2010, guest editors for this special issue were recruited. With supervision by the regular editors, these young researchers managed the process of the special issue in a self-directed way from the drafting of the call for papers (and reviewers) up to the final publication of the submitted manuscripts. Particularly new was, that a training process for inexperienced reviewers was established: every submitted manuscripts was subjected to review both by experienced and inexperienced reviewers with a chance for the latter to learn from their more capable peer.

A proposal clinic was offered as part of the submission process with the possibility to obtain feedback on a submitted abstract.

The call for papers set the focus on the submission of visionary ideas, stating that JTEL wants to “encourage a debate on innovative ideas, visions, and the future of TEL research, driven by young researchers in the many fields that make up this interdisciplinary research area” (from the call for papers, distributed in 2010).

Furthermore, submissions by early-career researchers were encouraged by clearly stating that the special issue addresses “all junior researchers (post-graduate students, PhD students, post-docs) working in research related to technology-enhanced learning in both academia and industry” (ditto).

The innovative format was created in order to allow doctoral candidates to publish their research proposals, which typically are created at the beginning of their doctoral programme, thus offering them an opportunity to stake a claim.

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<sup>24</sup> The International Journal of Technology Enhanced Learning.

<sup>25</sup> The editor-in-chief respectively the managing editor of IJTEL.

<sup>26</sup> The YRSI-I team consisted of of Peter Kraker, Moshe Leiba, Luis P. Prieto, Ana Loureiro, Olga Pustalova, and Maria Perifanou.

**Volume 3 - Issue 6 - 2011**

**Special Issue on Ground-Breaking Fresh Ideas in Technology Enhanced Learning**  
*Guest Editors:* Peter Kraker, Moshe Leiba, Luis P. Prieto, Ana Loureiro, Olga Pustovalova and Maria Perifanou

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- » 2010 Vol.2 No. 4
- » 2010 Vol.2 No. 3
- » 2010 Vol.2 No. 1/2
- » 2009 Vol.1 No. 4
- » 2009 Vol.1 No. 3

Figure 49. The first young researcher special issue (Vol 3, Issue 6, 2011).

<http://www.teleurope.eu/pg/groups/19112/ijtel-young-researcher-special-issue>  
 CfP for YRSI-1: <http://www.inderscience.com/browse/callpaper.php?callID=1528>

### 5.4.7 YRSI-II: State of the art for TEL

The success with YRSI-I has inspired us to repeat the venture and initiate another round of YRSI. At the summer school of last year (2011) in Chania, a new theme was decided and a new team of guest-editors was formed.<sup>27</sup> While the theme of YRSI-I was the future of TEL, the theme of YRSI-II will be the present. Here is an excerpt from the CfP for YRSI-II.<sup>28</sup>

This special issue is directed to all young researchers such as post-graduate students, PhD. students and post-docs working in topics related to TEL both in academia and industry, and from different disciplines of the community (technologists, educationists, psychologists, etc.).

The purpose of this special issue is manifold: (a) to provide a better overview on TEL research lines; (b) to investigate and expand current TEL research themes; (c) to promote international and multidisciplinary collaboration and exchange of ideas among young researchers; (d) to encourage young researchers to formalise their research questions, topics, and methodologies.

Young researchers are invited to submit articles with reviews of the state-of-the-art research in any TEL-related area. Each focal area covered in this special issue shall provide an authoritative, timely, accessible, and critical overview on recent developments that are pertinent for TEL. The reviews should not only summarise existing literature, but analyse, synthesise, and interpret the state of the art in a novel framework for thought. For example this can be done:

<sup>27</sup> The YRSI-II team consists of Peter Kraker, Moshe Leiba, Martina Rau, Derick Leony, Israel Gutiérrez Rojas, Dirk Börner, Antigoni Parmaxi, and Wolfgang Reinhardt. See

<sup>28</sup> For the full text, see [www.inderscience.com/browse/callpaper.php?callID=1766](http://www.inderscience.com/browse/callpaper.php?callID=1766)

- by identifying different theories and/or approaches (e.g. culturalist vs. connectivist vs. constructivist);
- by classifying different research waves (see e.g. Lesk 1995);
- by elaborating different dimensions (see e.g. Sire et al. 2011);
- by developing a taxonomy;
- or by elaborating tensions, disagreements, etc. between the different works of the past.

It is furthermore expected that reviews are written from an interdisciplinary point of view. This means that every article is expected to provide references from at least three disciplines: education, psychology and technology. Furthermore, articles are required to include a section on research challenges that emerge from the state-of-the-art. These challenges must be substantiated by a concrete scenario. Articles that do not follow these basic guidelines will not be considered for publication.

Possible subjects include, but are not restricted to, the following:

- Effective learning strategies, models and methodologies
- Deployment of ICTs in educational practice
- Web 2.0 and TEL
- Semantic web and TEL
- Computer-supported collaborative learning
- TEL and knowledge management
- Emotional and motivational aspects of TEL
- Adaptive and personalised hypermedia for TEL
- Ubiquitous and pervasive technologies for TEL
- Intelligent Tutoring Systems and automated feedback
- TEL practices in different educational/learning contexts
- Policies for the promotion of TEL in education
- Educational Games
- 3D Virtual Environments
- Augmented Reality in TEL
- Connecting learners through TEL
- Orchestrating TEL
- Interoperability in TEL
- Learning analytics and educational data mining
- Formative assessment and feedback
- Ambient displays and wearable devices
- Visualization techniques for learning
- Awareness and reflection in TEL

All articles submitted for this special issue of the International Journal of Technology Enhanced Learning (IJTEL) will be subject to a one-stage review process. Authors should submit a full article which will be subjected to a double blind peer review before publication. Articles must not exceed 15 pages, and in alignment with common standards for literature reviews, they are expected to include 50 or more references.

#### **5.4.8 Connecting YRSI-I and YRSI-II: Roadmapping your PhD**

From the combined results of YRSI-I and YRSI-II, students and researchers of TEL will be able to get a better overview of “where TEL is at” and “where it wants to be heading” – as seen from the emerging periphery of the TEL community.<sup>29</sup> This will provide a basis from which the students/researchers can (road)map out their own research process – as described above - in terms of goals, obstacles, milestones, etc.

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<sup>29</sup> or the “liminal proximity zone,” to speak in terms of Vygotsky

## 5.5 Cluster: Industry

The Industry Cluster involves invited decision makers and leading edge practitioners, all having a direct responsibility for the future of TEL in their organisation. They should have the necessary knowledge, authority and resources needed to realise any desired future for TEL that they agree on.

Some work has been carried out to recruit potential members of the cluster and collect initial data on technology trends and drivers that will be used as a basis for discussion before and during the first cluster event organised at EC-TEL 2012.

### 5.5.1 The work carried out to create cluster

Some partners have participated to large TEL fairs in Europe (e.g. Learntec in Germany, Learning Technologies in UK, E-Learn Expo in France, NKUL in Norway) and conferences (e.g. Interactive Technology in Education in Finland) with the aim of interviewing Learning Technology providers on technology trends and drivers (see below for the initial results) and recruiting experts for the Industry Cluster and, in particular, for the first Roadmapping workshop at EC-TEL 2012.

### 5.5.2 Roadmapping workshop at EC-TEL 2012

The first workshop will be organised at EC-TEL 2012 the 19th September and aims to bring about 20 industry experts working to lay down the foundations for, and an initial cut of the cluster's desired future/s, context scenarios, and - possibly - roadmap/s that will be further developed online using the dedicated space on the Learningfrontiers.eu portal.

Since the seventh European Conference on Technology Enhanced Learning is, for the first time, specifically appealing to Technology Enhanced Learning innovators, creative practitioners and other TEL industry representatives, this event will serve as an ideal opportunity to involve these people in activities of the TEL-Map roadmapping clusters.

This year's industry track will be extended to a 2 day-session focusing on emerging trends in information and learning technology. The TEL-Map project will play a major role here by involving all industry track speakers in the associated TEL-Map roadmapping workshop at EC-TEL. The workshop will also be open for registration via the EC-TEL website while TEL-Map will invite highly relevant experts in advance. This workshop will be part of a coherent TEL-Map event which starts already on the 18th September with a full day workshop involving the Schools and HE cluster. Industry participants will also be invited to this workshop in order to identify corresponding TEL opportunities and possible barriers together.

The overall goal is to address two constituencies: it offers industry practitioners an opportunity to deepen their understanding of the field in which they are working and gives researchers, teachers etc. the opportunity to learn about the most relevant problems to practitioners. This will not only examine and improve the transitions between research, practice and industry but also

ensure to develop more reliable roadmaps together by combining different expertise and views.

Regarding the industry workshop methodology, the main objective is to help define a shared agenda for progressing towards a mature, well-established and sustainable TEL in Europe. In addition, this workshop aims to develop understandings in the non-academic community of the role, purpose and progress of the field of TEL. This will be achieved by bringing industry experts (TEL developers, TEL providers) together and engage them in an intensive dialogue about their future vision concerning technology and its possible use in different learning scenarios (different customer groups).

The agenda of the workshop addresses amongst others the following aspects:

- TEL network development: How can we establish a sustainable TEL (industry) community and sustainable anchoring with other stakeholders (e.g. research, education) uncovering the benefits and threats (competition) of such a network?
- What are the technology need/gaps and TEL opportunities?
- What are the main barriers and how can these be identified, assessed, and faced in an efficient way?

The activities of this workshop will feed the state-of-the-art sections in the TEL-Map roadmapping portal, along with a shared agenda for the long-term future. Final schedule of the workshops will partially depend on the profile of the registered attendees. Activities are, for instance:

- Activity 1: Presentation of the results of the currently running technology trends survey (conducted among TEL providers at several large eLearning fairs in Europe); explain methodology and relevant terms; provide industry participants with scenarios developed by the Schools and HE cluster workshop
- Activity 2: Brainstorming TEL opportunities and ranking their importance as business opportunities
- Activity 3: form small groups of 4 people that chose to explore a specific TEL opportunity further
- Activity 4: Group work (filling in the template “Mapping technologies to TEL opportunities”; see figure)
- Activity 5: Reporting back (each small group 5 min.) and discussion within the whole group
- Activity 6: Help out identifying communication channels and specific actions to improve the synergy and actual, effective collaboration between participants

<b>Mapping technologies to TEL opportunities</b>		<b>Team:</b>	
Explain the technology Need		Which are the European/global TEL opportunities for professional learning?	
Why should we do this? What will be the impact on professional learning?		e.g There is a European/global opportunity for:	
What is the current technology maturity?		This will be delivered by:	
R&D related areas		Market/Technology intelligence gaps	
Key Actions			
Other Enablers			
Other Barriers			
Assumptions/preconditions			

*(Customised for TEL-Map from: the IfM centre for technology management: strategic Roadmapping templates)*

Main outcome will be an industry map (state-of-the-art) of Europe which will be generated from the survey data and the templates that will be filled in during the workshop.

### 5.5.3 Initial results

About 50 experts from small, medium, large organisations like Acapela, BitMedia, Bridge2think, Easygenerator, Mindleaders, Quick Lessons, Question Mark etc. have been contacted at attended large TEL fairs and most of them agreed to be interviewed or fill an online survey. The focus of short interviews and survey was on:

- Technologies saw as major trend for learning solutions
- Main drivers for learning
- Products sold today, in three and five years.

The responses from the interviewed to the questions posed were always going to be mixed in its nauce and opinion, depending upon the nature and market segment in which his/her company operates.

In analysing the results we can assert that, with respect to the technology trends, most of the

respondents believe that mobile is the major trend for learning. Some interviewed think iPad rather than iPhone is the game changer in the learning sector because devices like this make access to content possible literally anywhere; mobile learning has been more talked about than ever so far.

Cloud technologies and SaaS is rapidly growing in importance. It is thought that SaaS is only really started and huge growth will come in this area also affecting how we learn. However there are some concerns about the way people are putting information about themselves in lots of different online places.

Some attention has been placed on the use of technology for social learning and networking which is third in the list of major trends. For some, social networking provides a potential growth opportunity if built into content and platforms. Social networking tools appear great for research and informal learning. Some companies are worried about leakage using open source solutions like LinkedIn or Twitter and large corporates appear cautious in adopting these technologies.

As far as the major drivers are concerned, according to the majority of respondents, two drivers will cause above key trends to happen: economic issues (especially now in the economic downturn) and performance improvement. E-learning industry needs to be innovative and focused on delivering real outcomes for clients as well as finding ways to reduce the cost burden on individual clients. In the respect, Cloud and SaaS appears to have reached the acceptance of learning technologists and e-learning specialists although most of the solutions are yet not exploiting the Cloud technologies.

There is a need to plan, target and measure better what they expect in terms of outcomes from all learning. Learning technologies help to meet more-for-less expectations. In the economic downturn all companies are placing new pressure on the skill of their staff. Mobile technologies show they can produce positive results of time to competency and reduces the time taken up by training.

In terms of e-learning products, the majority of the respondents currently offer LMS/LCMS solutions. Other TEL providers propose authoring tools for the creation of learning contents compliant with IMS/SCORM standards. At the third place of the products list there is the production of contents, again IMS/SCORM standards-based. Others concentrate on providing professional services in the field of learning, content and talent management, supporting their customers in the design and implementation of learning solutions based on existing products (also open source).

Things changed when we asked what products the interviewed will sell in three years. The majority answered “mobile learning” which is perfectly in line with the evidenced first learning technology trend.

Also “contents production” passes from being online to be mobile. LMS/LCMS go down to the third place in the list of products sold in 3 years followed by consultancy services and online authoring tools.

Uncertainty reigns supreme when the question is about the products sold in 5 years: most of the respondents answered they don't know. Some because of the uncertainty of the market, some others because of new (an not known now) technology to come in the next years which can revolutionize the learning solutions. However, a part those that are convinced to continue to sell the same products as before, some believe they will sell more services than products. That confirms a future scenario where Cloud technology and SaaS (the second most voted trend) will have a relevant role in the next-generation learning products, even if its adoption appears slower than the mobile technology.

#### **5.5.4 Future action plans**

After the September EC-TEL workshop emerged Industry Cluster's desired future, context scenarios and roadmap will be published to the Learningfrontiers.eu portal and open to comment and additional cluster associate or full membership.

New trends and drivers, market analysis and weak signals linked to the Industry Cluster's goals and roadmap will be also published to the portal for members' analysis and comment. It's likely the emerging trends and new drivers will demand a review reformulation of the context scenarios with a consequent revision of the roadmap/s . The TEL-Map team aims to support clusters through these possible changes, although clusters may well reach the point where they manage their dynamic evolution themselves.

## 6. Scenario Support in the Portal

An important part of the TEL-Map roadmapping is the bottom-up emergent approach to cluster formation, which seeks to enable those with similar views of the future of TEL to find each other and, through dialogue, to form collaborating roadmapping clusters.

The TEL-Map Learning Frontiers portal is developing the facilities to support this kind of TEL community engagement. This section sets out the requirements for contributing, finding and associating scenarios so the TEL Stakeholders can find, track, contribute to or join existing clusters, based on their visions and other scenarios, or find others with cognate concerns and goals as a foundation for forming new clusters.

### 6.1 Requirements for Contributing Scenarios

A key challenge for, but also a potential strength of, the TEL community is the diversity of views, cultures, pedagogical approaches, and ways of using technologies. We therefore need a means of capturing this diversity: an online 'Capturing the Voice'.

To this end the portal needs to provide a visions/desired futures space where these can be contributed, commented on and cross-connected. Thus, within this space a user must be able to create a new text space to enter a name, a brief description and, if desired, further material to set out their future vision. To align with the disagreement management approach, others should be able to indicate whether they like/agree or dislike/disagree with the vision, with the option of giving a reason why. Finally, for each vision, a 'relates-to' space should be provided to enable users to link it with other visions. A similar, a 'conflicts-with' space should be provided.

Each contributed scenario should be taggable using the simple classification scheme set out next. The contributor's name and the date can be automatically created from log-on data.

### 6.2 Requirements for Finding Relevant Scenarios

The introduction set out a simple classification scheme for future scenarios to enable users to rapidly find scenarios relevant to their concerns and focus. It proposed the following:

- Timeline: at what future date is any given scenario placed
- Type: Desired, Context or Roadmap
- Sector: School, HE, Commercial Training, Informal Learning
- Date scenario created

Even within the relatively narrow and recent field of TEL, the number and range of future-oriented scenarios and roadmaps is becoming extensive and an easy way of locating and rapidly accessing relevant scenarios is required.

One possible way of doing this is to present a futures ‘timeline’ with the title of each scenario/vision set at their projected future date, grouped by sector and type set out at the side.

Clicking on/hovering over an entry should pop up info re source, date created, brief description and link to the source location for the vision and further information.

Sector & Type	Timeline
	2010 – 2020 – 2030 – 2040 – 2050 (← Scrollable →)
School: Desired Future	TEL-Map Schools
School: Future Context	Beyond Current Horizons
School: Roadmap	
HE: Desired Future	UK HE Cluster
HE: Future Context	UK HE Cluster
HE: Roadmap	etc.
Training: Desired Future	
Training: Future Context	
Training: Roadmap	
Informal: Desired Future	
Informal: Future Context	
Informal: Roadmap	

### 6.3 Requirements for Enabling Emergent Clusters

This is primarily done through the like/agree and dislike/disagree and the cross-linking ‘relates-to’ and ‘conflicts-with’ information. The first step is to capture this in a manageable data structure using person-id, scenario-id and the relations: proposes, likes, dislikes, relates-to and conflicts-with.

The next step would be set these out in a 2-D relational map. The ‘relates-to’ would be used to group scenarios and the ‘likes’ relations would be used to associate people with the cognate group of scenarios.