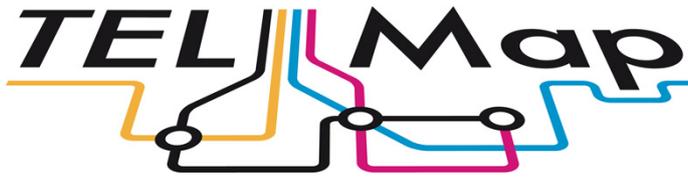


Coordination and support action



D4.2 a) Report on socio-economic developments most relevant to emerging new Learning paradigms (Interims Report)

European Commission Seventh Framework Project (IST-257822)

Deliverable D4.1

Report on socio-economic developments most relevant to emerging new Learning paradigms

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Exec Summary

This report is an interim summary of the work done to provide an “overview and analysis of the most relevant social, political and economic developments relevant to new Learning paradigms in the context of a new learning society” (task 4.2). The report shows how weak signals together with expert opinions and past road mapping efforts contribute to the identification and productive discussion of new paradigms.

Before methods and first outcomes are presented, the term ‘paradigm’ is discussed with reference to the works of Kuhn and Habermas who elaborated the importance of paradigms as orientation framework for scientific progress. The report also includes an overview of selected past road mapping and foresight efforts, whereby each example concludes with lessons learned from a methodological point of view and past signals and roadmaps against which our own work can be compared in the future.

The previous deliverables (D4.1 and D4.2) concentrated on extracting signal out of publications and interviews. This report extends the scope of data, including blog postings and online crowd voting. First results include: 10 candidate weak signals based on mining 7000 blog posts and 28 candidate weak signals based on the discussion of 4 scenarios.

To what degree some these indicators of change can be considered to represent drivers of true change or indicators of novel learning paradigms will be evaluated during future road mapping events and reported in the final version of D4.2.

1 Introduction

This report is an early deliverable on Task 4.2 – which is to provide an “**overview and analysis of the most relevant social, political and economic developments** relevant to **new Learning paradigms** in the context of a new learning society”. To do so, we will show how weak signals together with expert opinions and past road mapping efforts contribute to the identification and productive discussion of new paradigms.

The deliverable is structured as follows:

- First, a very brief wrap up of the terminology is necessary as road mapping, paradigms and – to a lesser degree – weak signals are becoming real buzz words used for different purposes and hence implying different meanings.
- Secondly, we look into past road mapping and foresight efforts with the aim to build upon existing insights as well as taking advantage of lessons learned while striving to implement a sound and pragmatic methodology.
- We then continue to demonstrate the progress made in the two main work streams of WP4: data mining and human sources analysis (crowd sourcing and expert interviewing via a Delphi study). This section will primarily focus on advances made on the level of tools used and procedures applied.
- Finally, we will present first findings of signals and how they can be interpreted in the context of new and changing paradigms.

2 The emergence of new paradigms based on weak signals and background categories

2.1 The role of paradigms for research and road mapping

One of the most widely known discussions of the role and significance of paradigms for the advancement of science is the work of T. Kuhn (1970) and K. Popper (1970, p.51). Kuhn and Popper speak of ‘normal science’ referring to a generally unquestioned way of interpreting and doing things at a given time¹. Paradigms represent widely accepted practices that have legitimising effects (ibid).

Kuhn never postulated a single, all-encompassing definition of the concept he coined, hence a ‘paradigm’ is understood to mean (1) a universally recognised model, or (2) a set of legitimate questions and principles to support our decision making and guide our actions.

¹ Casti provides an example, citing the inadequacies in Aristotelian physics, showing a completely different picture from what is known today. Nonetheless, Aristotle’s interpretations were rational insofar as they were consistent with the approved standards of his time (Casti, 1990, p.39).

Although Kuhn and Popper were more concerned with the correctness of scientific interpretations, their arguments can also be applied to interpretations in the context of foresight and road mapping. Scientific inquiry makes a distinction between ‘normal science’ and ‘extraordinary science’: the former happens within an established framework and the latter emerges due to anomalies and inconsistencies which cannot be solved or explained without changing fundamental, and often longstanding, assumptions in a particular research domain. A similar logic applies to road mapping TEL: if we think that the existing adoption and impact of TEL is not where it should be, then we need to change the paradigms that guide and inform the way we research, apply and evaluate TEL.

However, paradigms are not purely rational constructs – Habermas (1971, p.308-311) argues that paradigms are instruments ensuring that we can understand, control and change our environment. More specifically, depending on the paradigmatic lens we choose, we present problems and outcomes in different ways and debate issues differently. This ascertainment highlights the importance to think of paradigms in the context of debates or collaborative road mapping efforts rather than as independent, objective findings at the end of a scientific process. Paradigms are accepted or questioned over time by communities of inquiry.

Any change in learning and teaching could be purported as a ‘new learning paradigm’ or as the ‘next killer application’ in TEL; evidently, such claims need to be confirmed by those who are affected by the new paradigm, i.e. who would need to change their behaviours as a result of a new paradigm. This is also the reason why this interim deliverable discusses both: tools for detecting changes in TEL and processes for engaging experts and communities.

2.2 Weak signals and scenario discussions

Weak signals are imprecise early indicators of impending changes. Characteristics and definition have been discussed in D4.1 and for the readers convenience as short summary including a structured data record has been included as appendix 9.1. We register a vast amount of information on a daily basis but rarely attempt to explicitly connect them to our current activities, either because we feel they are not relevant or because we prefer to think that a possible impact is very unlikely. Psychology suggest that this behaviour comes with our self-affirmative tendencies (Sherman & Cohen, 2006).

While organising and participating in various debates and workshops related to the future of TEL and / or weak signals, it became evident that few pieces of information have a clear and stable meaning without being put in relation to other pieces of information. A simple example might be the tension between any sort of monitoring software on mobile phones – which have been around for many years now – and an increase of general privacy concerns. Monitoring can be related to convenience (e.g. carrier’s service improvements) as well as to risks these programs pose for private data.

Hence, sense making of weak signals requires us to discuss isolated bits of information in context – which is easier with the help of scenarios, providing the backdrop for a set of weak signals.

Upfront selection of information as well as context dependencies of interpretations are also known issues in strategic planning (Van der Heijden, 2005). Here the use of scenarios has been proven to be a useful in order to approach:

- ⤴ Changing existing mental models in a non-threatening, value-free context (e.g. a scenario evaluation workshop),
- ⤴ Developing an uncertainty accepting attitude,
- ⤴ Building up the flexibility to react faster to upcoming changes.

Shell, one of the first companies experimenting with different styles of scenario planning, found that a major benefit of scenarios was that strategic planning was transformed into an ongoing learning process. Decision makers were presented with different futures and had to think about how a given company action would pan out in different futures. However, the objective is not to establish a ranking of actions from better to worse, but to think about the role of unpredictable developments which are not under the company's control. Van der Heijden (2005, p. 18) described this by stating scenarios had taken people on a thinking track where forecast would never have taken it, i.e. forecast aims to produce answers based on probabilities whereas scenario planning made people ask crucial questions.

In conclusion, the quality of scenarios - just like weak signals – is not in predicting a more or less probable future, but in enabling qualitative causal thinking. That is causal thinking which is not based on statistical models projecting from current data, but rather on logical if-then chains of possible futures (ibid).

Acknowledging the relationship between scenarios and our capacity to pick up 'weak signals' was crucial to design a more supportive environment and fine-tune the preparations for our virtual and face to face - discussions.

As indicated in D1.1 (p.22) a difference needs to be made between context scenarios and desired scenarios. **Context scenarios** describe possible futures, derived from uncertainties in the PESTLE drivers. **Desired future scenarios**, are normative and can be further developed to inform coordinated actions. During our weak signal workshops we were concentrating on context scenarios. The following process, taken from Van der Heijden (2005) has been used as guideline to elaborate scenarios prior to the workshops²:

1. identify the specific domain/environment that is of interest (e.g. automation of learning designs),
2. build a model of driving forces (e.g. PESTLE developments outlined in a mind map),
3. identify and rank the elements that will inform the scenario (e.g. elements that are highlighted and seem to vary substantially in different futures),
4. describe instantiations of the system in different futures (e.g. the automation of learning designs is widely adopted or disappears),
5. conduct interviews, workshops and horizon scanning to flesh out, group ideas and refine the scenarios,
6. end with 'what conclusions can we draw from the exercise?'

² Foresight Guide (M. Jackson) at <http://www.shapingtomorrow.com/media-centre/pf-complete.pdf>

The following figure represents the outcome of steps 1 -3. This mindmap has also been used to guide the interviews (step 5). In this specific case of discussing possibilities to automate teaching processes, we used the first two branches (purpose of automation, open issue) to define the scope of the interview. Interviewees were a researcher and an industry representative who had extensive experience with uptake and development issues of learning designs.

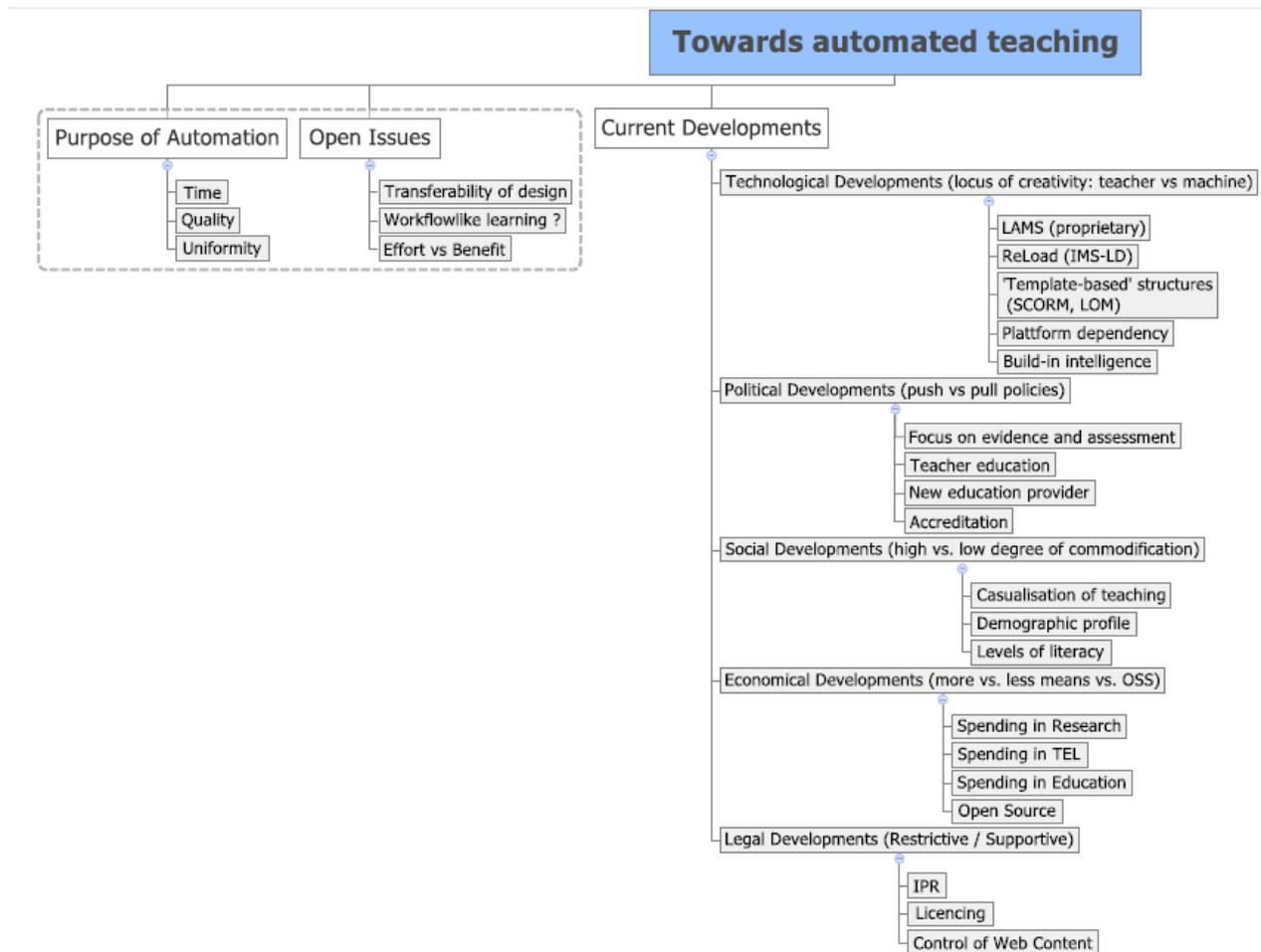


Figure 1: Mindmap as interview frame

During the interview additional details have been added to the mind map and cross-links have been highlighted. The actual text of the scenario as well as associated weak signals are included in section 6.2.2 (steps 3 and 4).

2.3 Refinement of tools and methods

Work in WP4 is organised around two main sources of information – recorded sources and human sources. Rationale for and implications of using these two categories are outlined in D4.1. However, based on our iterative approach to road mapping we are continuously refining our tools and methods. With regards to the human sources work stream such adaptations has been described in the previous section with the systematic use of scenarios to contextualise weak signals. The same need for refinement has been emerged in the recorded sources work stream.

During the work leading to D4.1, the role of text mining was seen as the identification of possible **weak signals from “recorded sources”**. **Recorded sources** were conference abstracts in D4.1 but are now also including TEL blog posts. An automated phase of processing, which is concerned with the frequency of occurrence of single words, was combined with a human phase of interpretation. These activities produce candidate weak signals that can be selected for active use in workshops or the planned Delphi process and deposited into the TELMap Portal (roadmapping screens) for commenting, discourse and as a resource to be mined by us and others in the future.

From this starting point, we added a number of **“measures of interest”** - metrics to indicate the likely significance of any changes in terminology – with a particular focus on Social Network Analysis (SNA) in D4.3. SNA allows us to calculate “betweenness centrality” measures for authors of scholarly works, for which robust co-authorship data is available, and from this we can infer that the ideas put forward by authors who are more central in the co-authorship network are likely to have more influence, hence be more likely to be an early sign of change in what the research community is attending to. This measure and the others that we implemented – **novelty and sentiment** – are understood as aids to human interpretation; although they are far from being robust measures (Figure 2).

The main attraction of using text mining and social network analysis is to discover facts that are not obvious. Since TELMap Project partners are well embedded in TEL discourse, our knowledge of the strong signals in TEL and the dominant themes in TEL discourse is good. Hence there is no *prima facie* benefit from applying text mining to discover dominant themes. However, this is different when we consider dominant themes expressed by different communities; this might add interesting insights to our aim of understanding emerging learning paradigms and forms of TEL. Hence, the introduction of a **differential analysis of dominant themes** helps to expose a more rich picture than the time-based analysis does by itself. Put differently, emerging signals are likely to blur if information sources are to varied, which is particularly important to avoid in a multi-disciplinary area such as TEL.

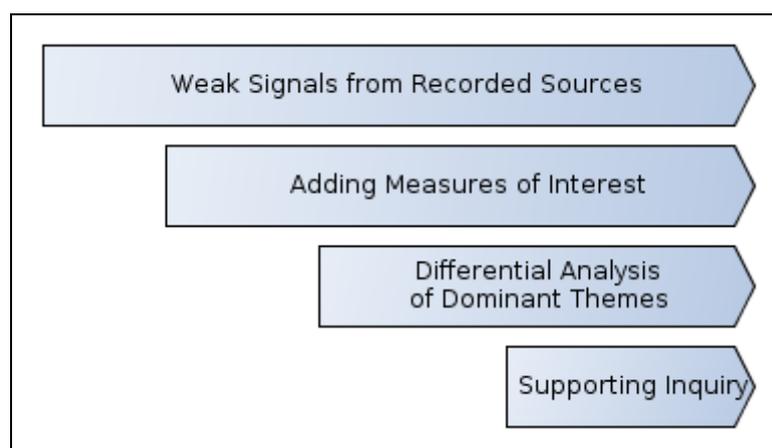


Figure2: Summary of the Developing Role of Text Mining

During several workshops and in particular in the analysis of information gathered from them, it became clear that the recorded sources were of interest for more than the *ab initio* identification

of candidate weak signals. Issues emerged from workshops that begged questions about how that issue appears in the recorded sources (principally blogs and conference abstracts). Since we have already worked to acquire and process the source text, it is a relatively easy task to develop the role of text mining to **support an inquiry that links text mining and workshops more closely**. This will help us to augment scenario driven workshop discussions and converge the analysis of multiple sources presented in the final version of D4.2.

3 Influence of past road mapping and foresight efforts

We are also analysing past road mapping and foresight efforts with the aim to (a) fine-tune our own methodological approach, (b) have a baseline of past signals and roadmaps against which to compare our own work and (c) identify signals and scenarios which should be revisited. Following the overview of two foresight studies executed by the Lernovation consortium and IPTS. Other studies are listed at the end of this section – their analysis is still work in progress.

3.1 Lernovation – Foresight Project (2009)

URL: <http://www.eden-online.org/european-scene/learnovation-initiative.html>

Objectives: Exploring future drivers and scenarios in TEL, with the aim to achieve a shared vision and a set of recommended actions.

Method and scope of inquiry: Three Delphi Rounds with 44 experts (out of 200 invited), 22 of which completed all three rounds. Delphi statements described factors influencing TEL until 2020, whose impact were to be rated by the experts. Additionally experts were asked to suggest what policy actions were needed in order to ensure that the identified factors led to desirable outcomes.

Example results: According to the adoption paradigm used, the study argues that innovation tends to be disruptive to educational systems. This is mainly caused by different adoption rates among early adopters and laggards. Hence given the pressures on educational systems worldwide, the study discusses four scenarios:

- *Mc-Learn:* The leading driver here is cost-effectiveness, which will lead to the consolidation of a few learning providers. Standardisation will be on the rise to ensure transferability of assessment and learning materials, however, meta-cognitive and self-regulation skills will be under-supported.
- *Civitas:* Leading drivers for this scenario are responsiveness to local learning needs and pluralism, taking into account the prevalence of different value systems. Internationalised higher education will be available only at a few elite institutions.
- *The monad:* Due to global threads and rejection of multiculturalism, innovations in learning systems suffer and fragmentation between different forms of learning increases (e.g. formal and informal learning). Funding is shifted to other research foci.
- *Babelogue:* This scenario is characterised by mutual respect and interconnected centres and interdisciplinary centres of excellence. There is a (welcomed) proliferation of educational models, which are continuously discussed and compared with little effort due to an increasingly networked community of stakeholders.

Reuse / lessons learned: The notion that forecast and road mapping is not an end in itself but best applied to some practical action is common to Learnovation as well as TEL-Map. Also the need to categorise results according to their areas of application (Higher Ed; Professional Learning, Schools etc) is acknowledged in both projects. What we can learn from this effort is the benefit of related scenarios (in this case all four scenarios represent reactions to external influences in a systematic way – inertia and innovation, context oriented and efficiency driven). Our method so far has been to use scenarios in order to highlight tensions in specific PESTL areas. This approach led to two types of problems, firstly, often a particular tension was perceived to be dominated by more than one PESTL area and, secondly, discussing several scenarios in one session was challenging as participants had few opportunities to maintain similar streams of discussion throughout the workshops, resulting in a more fragmented experience than would have been necessary otherwise.

3.2 IPTS – Study (2011)

URL: <http://ftp.jrc.es/EURdoc/JRC66836.pdf>

Objectives: The study aims for two main objectives – a descriptive vision for TEL in order to understand how current trends and strategies are shaping TEL’s future and a normative vision for TEL, outlining how TEL should contribute to social cohesion, socio-economic inclusion and economic growth.

Method and scope of inquiry: The study uses three types of stakeholder consultation: workshops, online consultations and group concept mapping. Several events have been organised over a period of 10 month.

Example results: The overall normative vision comprises three main themes: (1) personalisation, (2) collaboration and (3) informalisation. These three themes have then be applied to grand challenges in

- initial education: (a) multiculturalism, (b) early school leaving, (c) fostering talent
- workplace learning: (d) labour market re-integration, (d) re-skilling, (e) transition from higher education.

For example, in the area of workplace learning – the study identifies a shift of responsibility from employers to employees, who need to assume a more active role in furthering their continuous education. However, employers remain involved as they need to shape training opportunities in ways that enable employees in efficient and targeted ways. The latter requires rethinking the distinction between formal and informal learning. Smart ways of using ICT can facilitate the acknowledgement (accreditation) of informal learning accomplished while working. **Reuse / lessons learned:** Like TEL-Map, the IPTS study uses ‘paradigms’ and ‘novel forms of learning’. ‘Paradigms’ are used to describe high-level changes, such as learning becoming a lifelong and life-wide activity. Put differently, learning blends more and more with every day activities facilitated by the ubiquity of ICT. This paradigm shift towards lifelong and life-wide learning is then supported by a set of new skills and learning strategies needed to make it happen. New Skills: risk-taking, creativity, networking, resilience, pro-activeness etc. New forms of learning: tailor-made, targeted activities; peer learning, blended learning, use of ePortfolios etc.

Our conclusion from this study was that the underlying skills and learning strategies are not necessarily new in themselves but the way they are discussed represents indeed a shifting paradigm. This can also be perceived in the public discourse, when education is discussed in the context of migration, an aging population and Europe's struggle to remain competitive. These external pressures highlight the need to keep modernising the European Education and Training System.

The following road mapping and foresight projects are still analysed but similar findings and lessons learned are expected.

1. iCoper
(http://www.icoper.org/deliverables/ICOPER_D8.8.pdf)
2. iKnow
<http://wiwe.iknowfutures.eu/>
3. JISC observatory
<http://blog.observatory.jisc.ac.uk/>
<https://www.strategysignals.com/26633-21121-106@ac&geuset>
4. European foresight platform
<http://www.foresight-platform.eu/briefs-resources/>
5. ITEK
<http://itec.eun.org/web/guest/results>
6. Finnnode
<http://signaalit.finnnode.fi/presentations/show/584/10727>
7. VISIR (& ELIG)
http://www.elig.org/index.php?option=com_content&view=article&id=34&Itemid=16
8. Inteleo
<http://intelleo.eu/index.php?id=15>
9. Learning Scenarios at Shell (OEB)
<http://learningscenarios.org/>

4 Phases of inquiry and the targeted use of tools

A tool-centric viewpoint is shown in the rather detailed diagram of Figure 3, but this should not distract from the significance of the 'Core Phases of inquiry' at the bottom of the diagram, that is the purpose for which the tools exist.

This core process, iterative and under-pinned by human interaction, is supported by different tools; the identification of candidate factors is supported by tools in the "Strong Signals" and "Weak Signals" columns and the cross-referencing and validation is supported by tools primarily from the "Inquiry" column. The Inquiry Tools are largely intended for internal use to contribute to and back-up other published results.

The Analytical Toolset is driven by the Core WP4 Process to transform information sources (on the left of the diagram) into various forms of published material that are released through a range of outlets to match the degree of added-value. The following account is intended to clarify and explain what the diagram summarises.

Sources are split into two according to their origin: “exogenous sources” are those that have been created outside TELMap and are largely the medium-to-large scale bodies of writing we have been bracketing under the term “recorded sources”; “endogenous sources” are those that are being created through TELMap activity, largely (but not exclusively) through engagement with stakeholders in TEL and which we have been bracketing under the term “human sources”. The endogenous sources are small-scale bodies compared to most of the exogenous sources but are more targeted and rich. This distinction is reflected in the tools that use each kind of source and the role of the information provided by that source in a tool. In general terms: while text mining can help to discover knowledge from a large scale textual source it also destroys meaningful semantics that can be efficiently perceived in small scale sources.

Exogenous sources are:

- ⤴ Conference abstracts, which are correlated with authorship information from the DBLP bibliographic database that also feeds into the AERCS database (the Academic Event Recommender system for Computer Scientists at RWTH Aachen – <http://bosch.informatik.rwth-aachen.de:5080/AERCS/>).
- ⤴ TEL Blogs, which are crawled and indexed by the Mediabase at RWTH Aachen.
- ⤴ Conference papers, the full text of which are only partially available to us.
- ⤴ Published scenarios from other projects and reports from technology trend analysts. These are relatively small-scale sources that we have not yet processed but which could be used in a similar way to our endogenous sources.

Endogenous sources arise from the activities of WPs 3,4 and 5 through workshops, cluster activities and desk research.

Outlet routes for the results of text mining cover a spectrum of formality:

- ⤴ The deliverables D4.1-3
- ⤴ Google Gadgets, which are available from the Dashboard and may conveniently be embedded in personal dashboards (e.g. iGoogle), blogs etc. These are analysis-free visualisations, lacking a value-add from human analysis.
- ⤴ GitHub the “social coding” site is used to deposit and share the source code for most of the tools we have developed. It also offers web page hosting which we use to disseminate automatically-generated reports and dumps of output data to enable alternative interpretations to be made than those we make.
- ⤴ The Learning Frontiers Portal hosts both roadmapping artefacts and stories. The former is our main outlet for the results after they pass through processes of interpretation and discourse. The latter provides us with a route to publish in a less formal way.
- ⤴ Slideshare is being considered as a route for a more rapid turnover of filtered but maybe un-analysed alerts, each with a concise style and limited scope, that can be easily embedded and hooked into RSS and Twitter.

In addition, the inquiry-focussed tools generally have an indirect route to publication of human-validated components via the roadmapping pages of the TEL-Map web portal.

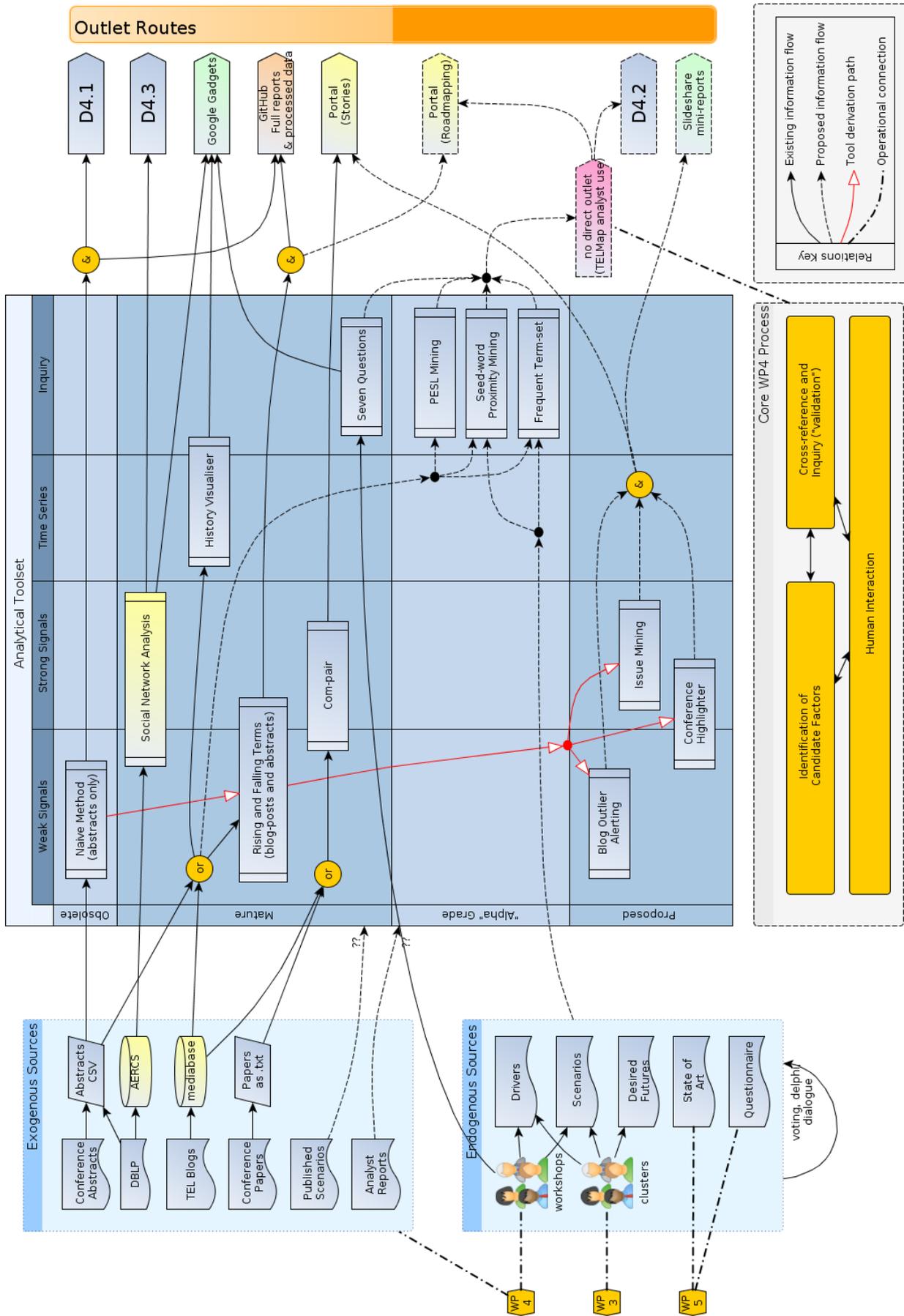


Figure 3: Relationship of Analytical Tools to Sources and Outlets

5 The analytical toolset

5.1 Developing the role of text mining

In developing the role of text mining in TELMap, the principles that were adopted at the outset of this stream of work in WP4 have been maintained. The principles of importance are:

- that we should adopt well-understood algorithms and statistical methods that are supported by well-maintained code libraries;
- that we should largely use methods and visualisations that disclose real-world meaning (as opposed to abstract statistical measures);
- the “principle of parsimony” from the statistics community, which urges adoption of the least complex model.

Examples of Application of the Text Mining Tool-set

Since this document is an interim deliverable for work in progress, examples of tool application are given here to make clear what their capability and role is independent from the emerging – and therefore changing and unclear – narrative.

Rising and Falling Terms

The results from the “Naive Method” presented in D4.1 are indicative of the results from the more refined method known as “Rising and Falling Terms”.

Com-pair

The comparison of the full text of ICALT and ICCE conference papers for 2011 that was published on the Learning Frontiers website [<http://www.learningfrontiers.eu/?q=story/east-and-west-two-worlds-technology-enhanced-learning>] was undertaken using Com-pair. Figure 4 shows one side of the comparison: those terms with a statistically significant higher occurrence in the ICALT papers compared to the ICCE papers. The vertical axis is the negative log of the probability that the difference in observed term frequency can be ascribed to “chance” on the basis of Pearson's Chi Squared Test. Colour coding and block size indicates the number of papers containing the term.

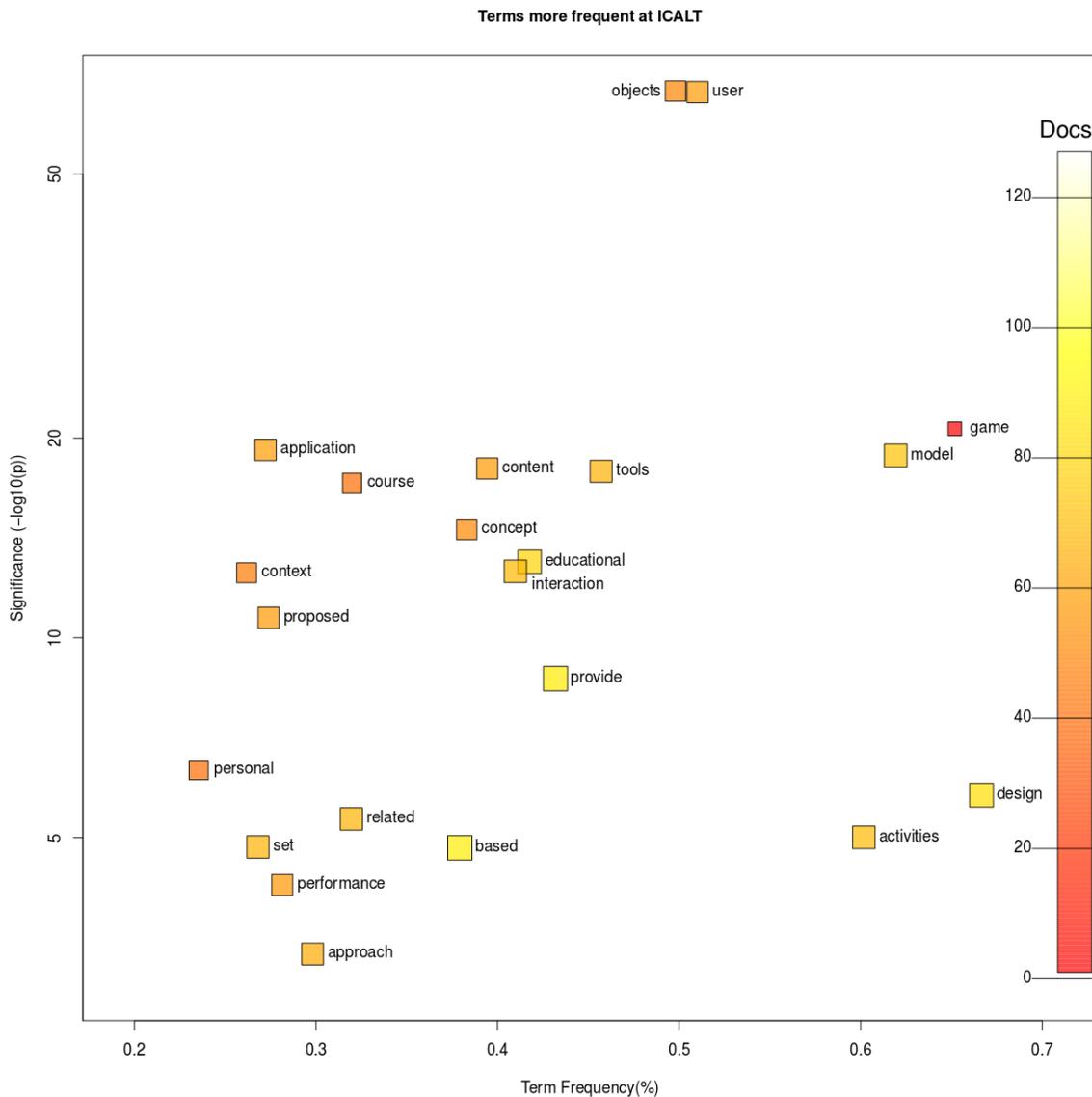


Figure 4: Terms with a statistically-significant higher frequency at ICALT 2011 compared to ICCE 2011

History Visualiser

This example (Figure 5) of the History Visualiser, which can be applied to any of the data sets feeding Rising and Falling Terms, shows how a selection of terms figured in CETIS blog posts in late July 2010. The slider at the bottom can be used to change the date or an animation can be shown. The axes, colouration rules and bubble sizes can be configured: in this case size relates to the percentage of blog posts containing the term and the colour matches the positive sentiment score, which is also the horizontal axis. The JISC Innovation Forum was in progress in late July 2011, which accounts for the location of, and positive sentiment associated with, “innovation” at that time since CETIS is a JISC Innovation Support Centre.

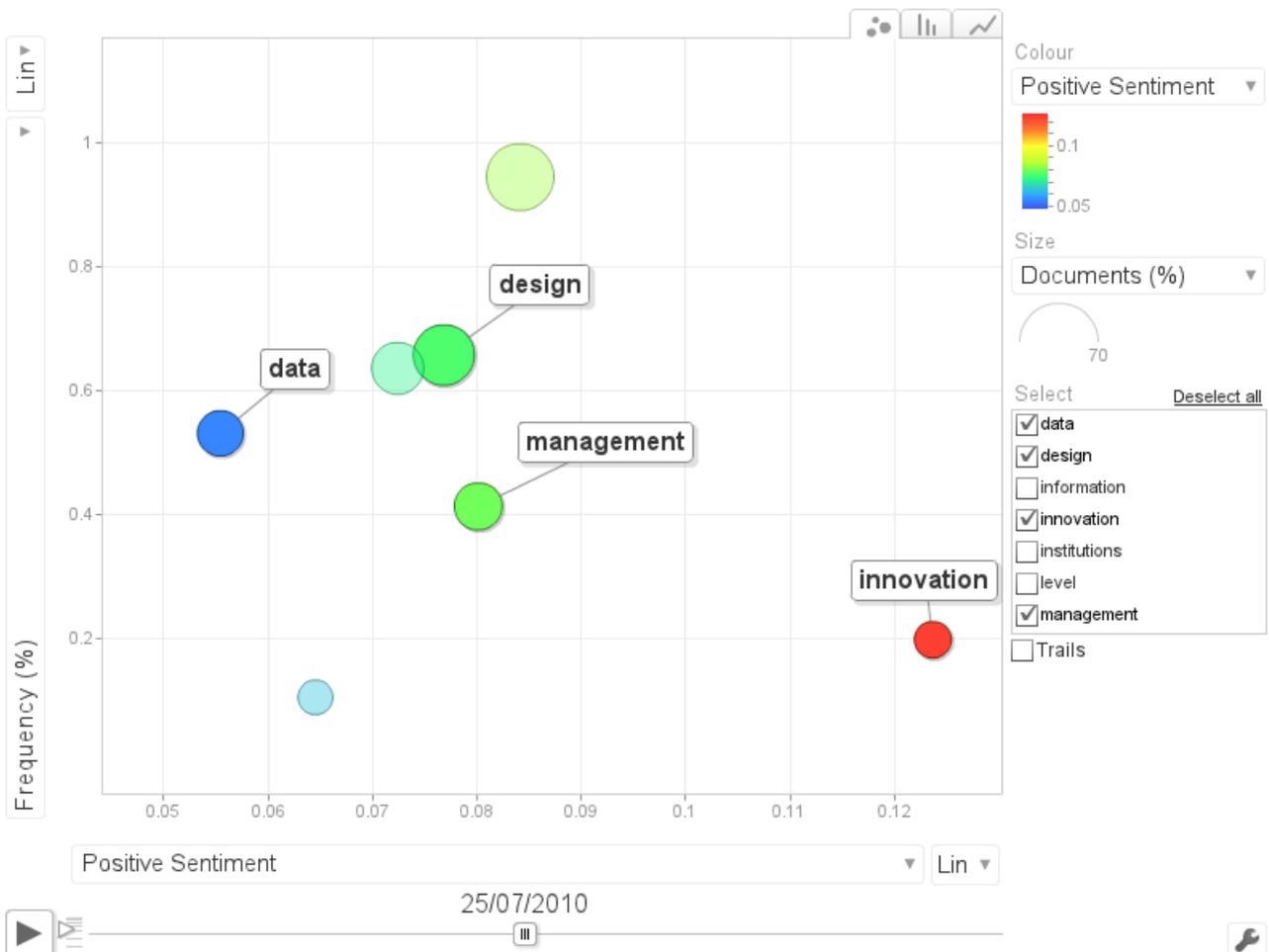


Figure 5: Snapshot from History Visualiser

Seven Questions

The responses from the Seven Questions are processed to create an interactive Google Gadget or web page. This allows a question to be chosen, leading to a sentiment/orientation analysis (using the Harvard General Inquirer lexicon) and a clickable word cloud (to reveal responses containing the term). Figure 6 shows responses from the ALT-C 2011 workshop “Preparing for the Thaw” to the question about an unfavourable outcome for learning technology in 2025 that contained the word “data” and a radar plot that is surprising in not indicating strong negative sentiment.

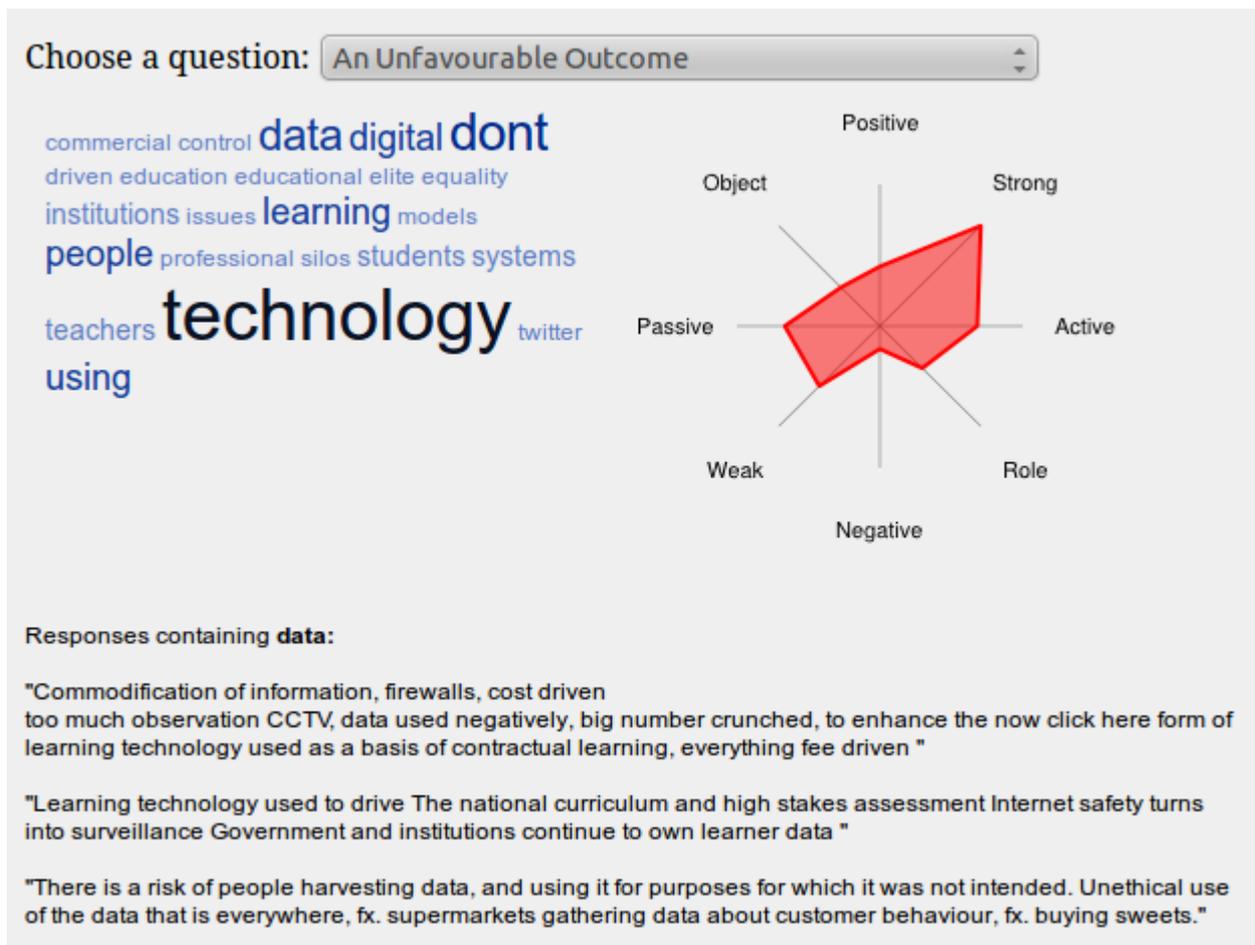


Figure 6: Seven Questions Google Gadget

Seed Word Proximity Mining

Seed word matching takes two forms. The first one – finding documents containing all of the seed words but potentially with gaps, synonyms and different ordering is probably best explained using a simple example where the seed words are “cat sat mat” and some short sentences are scored.

Using the same scoring penalty for a gap and mis-ordering of the seed words gives the following scoring:

- score= 0.5625 for "The Cat sat on the mat" (two-word gap, “on” and “the”)
- score= 0.421875 for "The cat sat. On the mat was a dog" (a “.” increases the gap)
- score= 0.421875 for "On the mat a cat was sat" (word order is not the same)
- score= 0.177978515625 for "The Cat sat and ate a mouse on the mat" (a longer gap)

Whether to permute, use synonyms (either manually or using WordNet) and the penalties are all configurable.

The second form uses the same computation to map out proximity of word pairs (ignoring word order), leading to a “heat map” as shown in Figure 7, which maps proximity in the conference

abstracts from ICALT, EC-TEL and ICWL in 2010. The “denrogram” on the left shows how, in hierarchical form, the terms are clustered on the basis of proximity while the cells in the map are coloured according to the proximity of the pair (orange-yellow-white indicates increasing proximity).

The heatmap shows that the pairs (personal, learning) and (mobile, learning) are both of similar and closest average proximity. It also shows that the pair (personal, learning) has a lower average proximity than the pair (mobile, learning) since the latter is more pale. The dendrogram shows that both “device” and “location” have similar patterns of proximity with other terms, although they have relatively low average proximity as a pair.

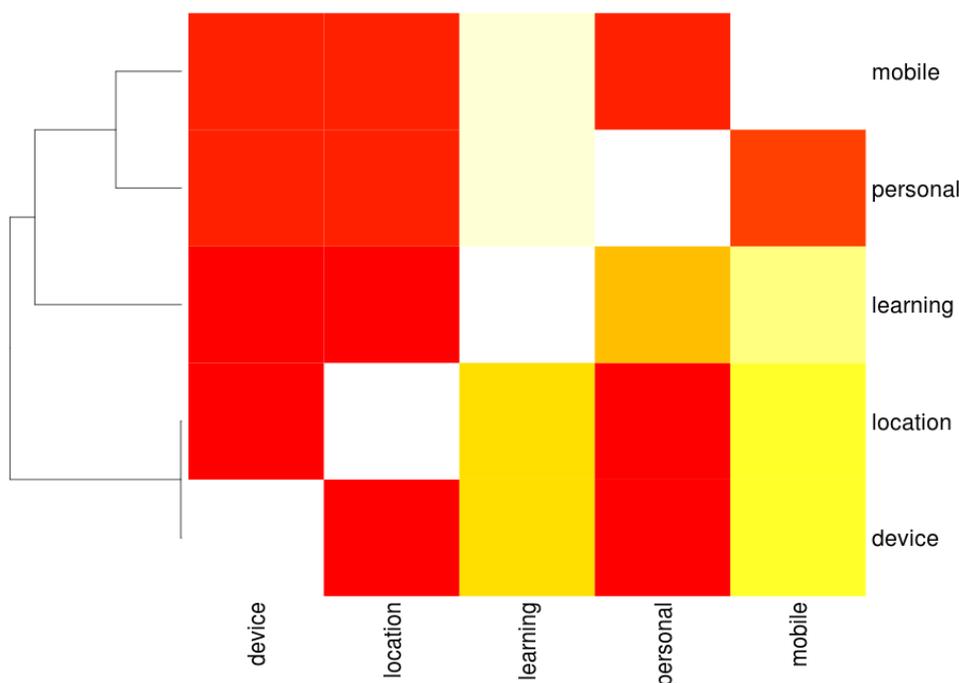


Figure 7: Heat-map of Word Proximity (2010 conference abstracts)

Frequent Term-set

Frequent Term-set gives the following raw output to indicate the association rules that have been discovered, in this case arising from the 2010 abstracts of ICALT, EC-TEL and ICWL.

lhs	rhs	support	confidence	lift
35 {flexible}	=> {learning}	0.007073955	0.7333333	2.119579
36 {serious}	=> {game}	0.007073955	0.6111111	16.106403
37 {active}	=> {learning}	0.009003215	0.7000000	2.023234
38 {supported}	=> {learning}	0.009646302	0.7142857	2.064525
39 {personal}	=> {learning}	0.010289389	0.6956522	2.010668
40 {devices}	=> {mobile}	0.009003215	0.6086957	18.930435
41 {materials}	=> {learning}	0.012218650	0.7037037	2.033939
42 {experience}	=> {learning}	0.011575563	0.6206897	1.794001
43 {describes}	=> {paper}	0.013504823	0.8076923	5.211459
44 {objects}	=> {learning}	0.019935691	0.9117647	2.635305

The conventional measures quoted for association rules are, with their contextualised explanation for rules with a single word on left and right hand sides:

- support – the proportion of sentences containing the word on the LHS of the rule;
- confidence – the probability of the word on the RHS of the rule being present in a sentence that contains the LHS word;
- lift – the probability that a sentence contains both LHS and RHS words divided by the product of the probability that a sentence contains the LHS and the probability that a sentence contains the RHS (lift is a measure of the strength of the association)

Rule #36 can be read as: “if a sentence contains 'serious' then it is 61% likely that it also contains 'game'. The reverse does not apply. In this case, the lift of 16.1 indicates that this is a strong association.

NB: only rules with a single word on either side are given but rules may be discovered with sets of N words on either or both sides.

A more accessible overview is afforded by visualisations such as shown in Figure 8.

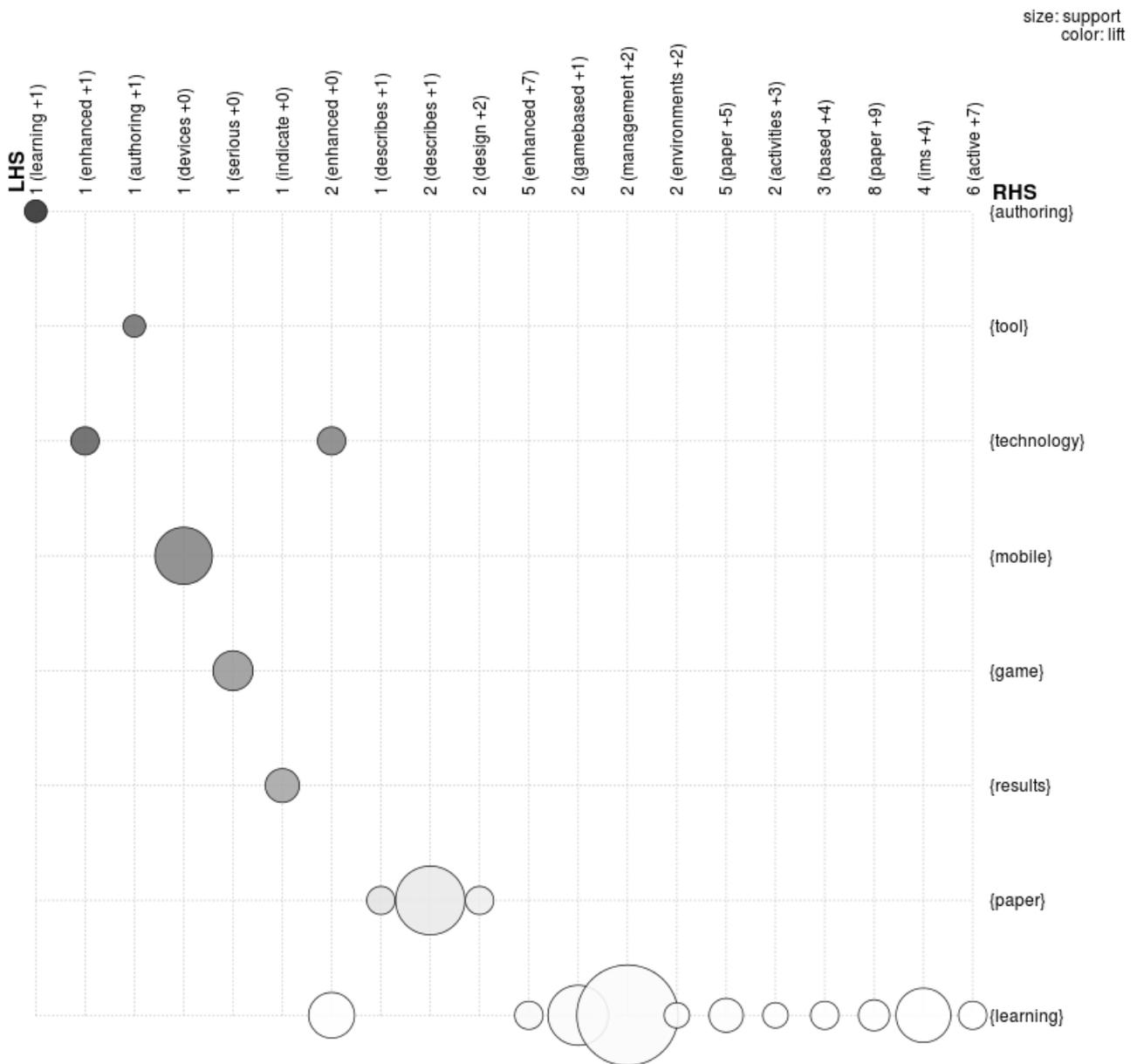


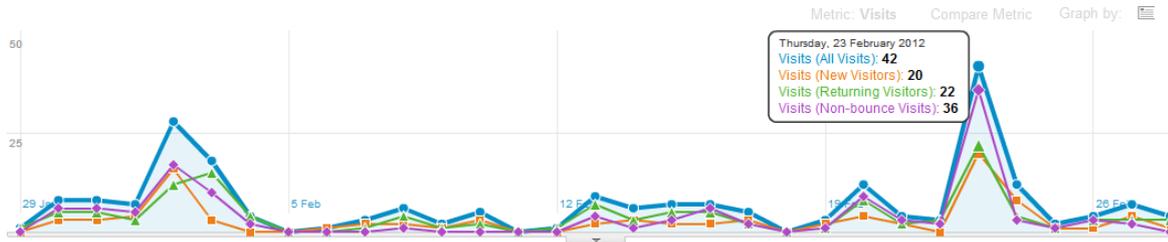
Figure 8: Frequent Term-set Example (conference abstracts from 2010)

Tweets as indicators

An option under investigation is also the analysis of tweets including relevant hash tags. The wordle cloud below shows 60 Tweets including TEL-Map's "#telroadmaps". The cloud shows other twitter accounts that have been retweeted (@lrnsen, @stellarnoe, @gfbertini ...) – hence might be interesting for further analysis as well as topic indicators such as games, mining, cloud, global and policies.

- **New Visitors** 42.47% of Total visits
- **Returning Visitors** 57.53% of Total visits
- **Non-bounce Visits** 56.16% of Total visits

Overview



94 people visited this site

Visits

- All Visits: **219**
- New Visitors: **93**
- Returning Visitors: **126**
- Non-bounce Visits: **123**

Edit Profile

Your profile is incomplete. Please update your profile with the required information.

Profile Type: Global - Use my Global IdeaScale Profile details

Country I Live In *

My First Area Of Expertise Is *

My Second Area Of Expertise Is

Type Of Organisation: *

Type Of Organisation (If None Of The Above):

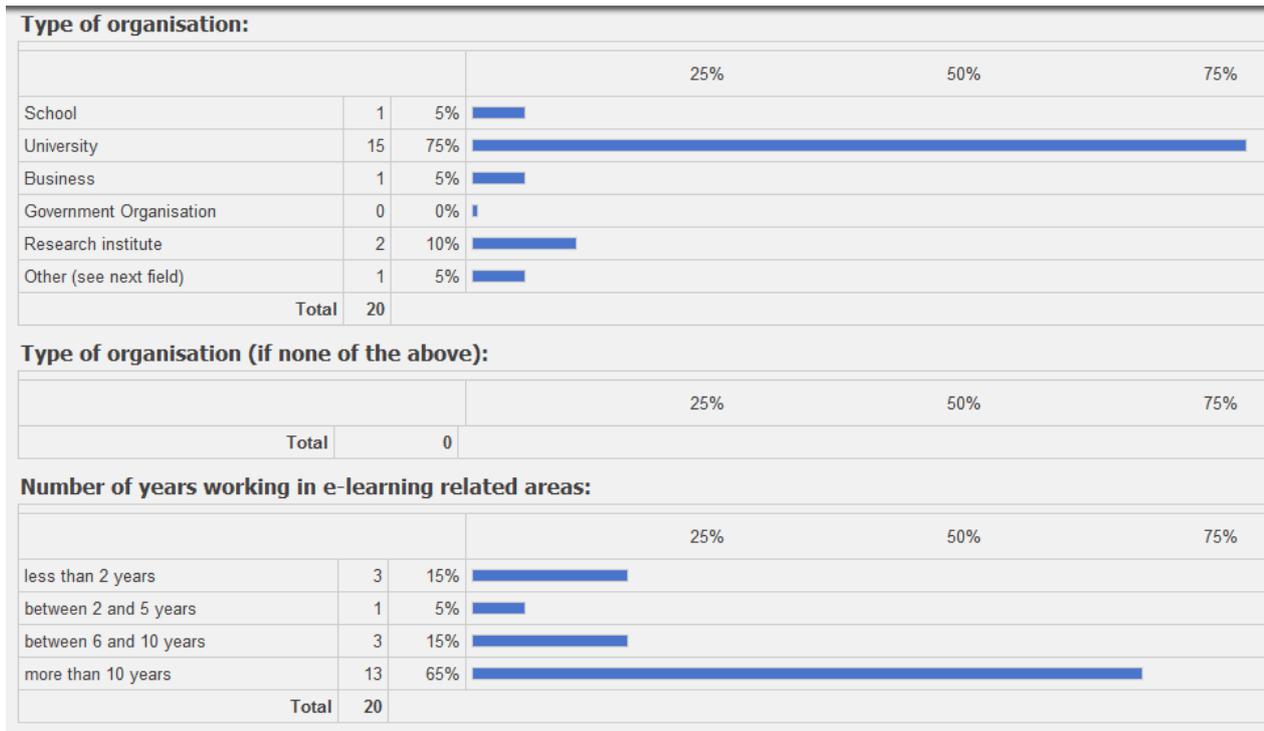
Number Of Years Working In E-Learning Related Areas: *

I Agree To The [Terms Of Service](#) For This Community.

Save

Left hand is a screenshot of requiring personal information so that evaluations and contributions could be categorised later.

The following screen present the data of the 20 people who subscribed to the service prior and during the Cetus workshop. Not surprisingly the overview reflects the nature of Cetus with 75% coming from the university sector and most of the participants having more than 6 years e-learning related experiences. The idea, which will now be implemented in the portal, was to feed the crowd voting system on an ongoing basis spurred by scenario driven workshops.



Below a screenshot of the actual results screen. Users could select a category - in this case the economical dimension – where statements with the highest net votes bubble to the top. Selecting any of these statements would show how many votes were in favor or against the statement and list all comments.

Learning Frontiers [Home](#)

Roadmapping TEL

Ideas that influence the future of technology enhanced learning

[Submit New Idea](#)

Economical Dimensions : Browse Popular Ideas

Recent (7) **Popular (7)** Hot (6) My (0)

Categories

- All Ideas
- Social Aspects
- Technologies
- Economical Dimensions**
- Political Debates
- Legal Implications

Social Web

5

Usage statistics

28 ideas posted

26 comments 128 votes 24 users

[View the Leaderboard](#)

What we're discussing

6 votes

ECONOMICAL DIMENSIONS »

Students are seen as customers, expecting more for their money

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 ... [more](#) »

1 comment Submitted by [l.yuan](#) 5 days ago

5 votes

ECONOMICAL DIMENSIONS »

Graduate unemployment will be an issue for years to come

Effective undergraduates will find ways to distinguish themselves, for example by developing a web-based portfolio and their web reputation.

Add your comment Submitted by [a.r.cooper](#) 8 days ago

3 votes

ECONOMICAL DIMENSIONS »

Cheap large-scale online courses are a threat to the Academy

Cheap large-scale online courses are capable of replacing a significant percentage of conventional teaching time. The "Introduction to AI" course ... [more](#) »

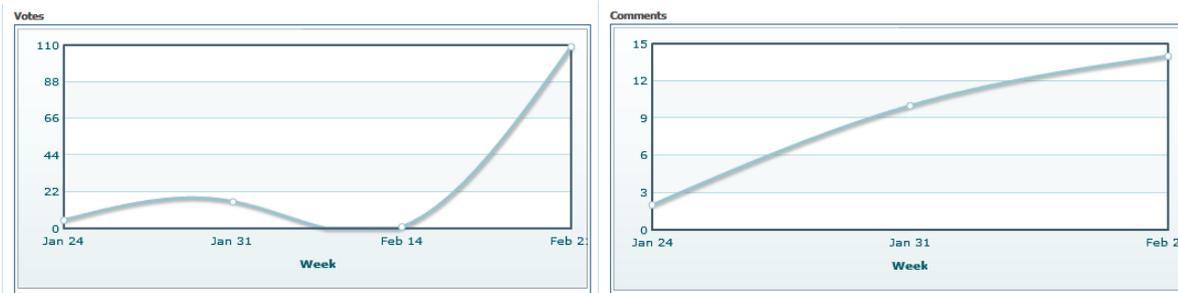
Add your comment Submitted by [a.r.cooper](#) 8 days ago

0 votes

ECONOMICAL DIMENSIONS »

Does unemployment drive enrolment in online courses?

The system was very userfriendly as people could vote by a simple click on the thumbs up or down icon. However, voting activity is still a multiple of commenting activities as we can see in the next two curves: a maximum of 110 votes versus 14 comments.



Expert Delphi

The functionality of the Delphi capacity has some overlap with crowd voting. The difference is that rather than aiming for a very large amount of votes, the Delphi capacity should provide the arguments behind a particular vote. Therefore experts should revisit their votes and, comparing them with other experts' judgements, attach reasons and small facts that led to their evaluation.

Following two mockups which are currently under development.

Navigating Delphi Statements

Sort Statements by: [Agreement](#) | [Impact](#) | [Desirability](#) | [Comments](#) | [Reads](#) | [Date](#)

Filter by main category: [?](#)

- social aspects around learning
- technologies for learning
- economical implications
- political discussions

Face-to-face interactions continue to be highly desirable

By [A. Cooper](#)

13 May 2010 16:43

Physical co-location and (especially intimate) face-to-face interactions will continue to be seen to be an essential aspect of high quality education. Students who can afford (or otherwise access) this will generally do so. Employers will value awards arising from courses containing it more highly than those that do not.

Agreement Currently rated 5 by 7 people

Impact Currently rated 6 by 7 people

Desirability Currently rated 4 by 7 people

Tags: [tag1](#), [tag2](#), [tag3](#), [tag4](#)

[Category](#)

[Rate & Comment](#)

[Reads \(19\)](#) | [Comments \(2\)](#)

Tag cloud

software statistics teaching technology tips
 tool tools toread travel tutorial tutorials
 tv **twitter** typography ubuntu **usability**
 video videos visualization web web2.0
 webdesign webdev wiki windows wordpress work
 writing youtube

Szenarios

open education OER society of
 scholars modelling learning designs

Employers are conservative when it comes to education

By [A. Cooper](#)

13 May 2010 16:43

While employers bemoan narrow knowledge of graduates, poor "soft skills", etc, their shortlisting criteria continue to favour candidates with conventional degree titles and high grades from research-intensive universities. They will generally fail to take advantage of rich portfolio evidence.

Agreement Currently rated 5 by 7 people

Impact Currently rated 6 by 7 people

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Tags: [tag1](#), [tag2](#), [tag3](#), [tag4](#)

[Category](#)

[Rate & Comment](#)

[Reads \(19\)](#) | [Comments \(2\)](#)

Home > Delphi > Evaluation > Statement XYZ

Contributing Evaluating Reports

Rate & Comment Delphi Statements

[Face-to-face interactions continue to be highly desirable](#)

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Physical co-location and (especially intimate) face-to-face interactions will continue to be seen to be an essential aspect of high quality education. Students who can afford (or otherwise access) this will generally do so. Employers will value awards arising from courses containing it more highly than those that do not.

Supporting Link: <http://www.telegraph.co.uk/education/universityeducation/>

Agreement ★★★★★
 Impact ★★★★★
 Desirability ★★★★★

Tags: [tag1](#), [tag2](#), [tag3](#), [tag4](#) Category

Comment Preview [b](#) [i](#) [u](#) [quote](#)

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Current Ratings:

6 Political, Legal, Economic and Social Indicators of Paradigm Shifts

Our analysis in D4.1 concentrated on publications for the recorded sources stream and interviews for the human sources stream. We then had acknowledged the limitations of these sources, since their content is filtered in some ways, e.g. a very speculative idea might not be accepted in a peer reviewed publication and a less popular opinion might not be voiced in an interview. Hence, besides further developing our tools we also extended the scope of data we could analyse, including blog postings (6.1) and online interactions around events (6.2).

6.1 From the TEL “Blog-sphere”

The “PESL Mining” tool was used to discover blog posts from 2011 and into early 2012 with strong senses of political, economic, social or legal (PESL) subject matter. A total of slightly over 7000 blog posts was analysed. The 20 highest-scoring posts in each of the PESL categories was manually analysed and the following intersections with TEL were identified. These have not yet been validated through consultation or discourse (e.g. through Delphi).

Economic Signals

A review of the 20 highest-scoring posts using the lexicon of economics terms was rather disappointing in that the top two were about education on financial life skills and a very high proportion were from a single source, the “Learning Change” blog of G.F. Bertini (<http://gfbertini.wordpress.com>). An investigation of the top 40 posts showed that 27 were from

this source. A greater range of sources would give greater confidence of relevance but the Learning Change articles are well-written and well-informed and hence comprise a good source of signals for consultation/discourse.

The signals we identify from this source are:

- student loans/debt (the scale of student loan debt among US former-students is compared to the sub-prime mortgage crisis)
- the relationship between technical and non-technical innovation/revolution and economic factors (with the implication that education and training may need re-orientation)
- youth unemployment and protest (how will the next generation of youth be affected by the shattering of the “study hard → earn well” assurance)

Signals identified from other sources are:

- widening perspective on “open source” (open source is no longer limited to software, although the retention of the word “source” is misleading, having been adopted for open hardware and “open source ecology” which seeks to weave “open source permacultural and technological cycles together”)

Legal Signals

The scores for content of legal terminology were found to be rather low: the maximum score was less than half that of other categories and the distribution to be biased towards very low scores. (Note, however, that there are far fewer terms in the legal lexicon and that categories cannot realistically be normalised to allow for comparison). “Learning Change” figures again and the majority of posts identified as being concerned with matters legal are not relevant to our interest in the development of the “learning society”.

Identified signals are:

- international copyright (in particular the aggressive US laws and their pursuit outside the USA but with implications on the conduct of education and its subject matter)

Political Signals

The most prominent posts are again dominated by Giorgio Bertini – Learning Change – and posts from other sources generally fail to make an explicit connection to education and training or even to be implicitly connected.

Identified signals are:

- social capital and political bias (there are reasons to question an undifferentiated “social capital is beneficial for knowledge sharing” viewpoint which may call into question assumptions about social learning contexts)
- undesirable consequences of corporatisation of higher education (although the viewpoint may be contested, the claim is that the civic purpose of HE as an institutional space for radical ideas, as “public sphere” is under threat)

Social Signals

The detection of social signals is hampered by the frequent use of terms such as “social media” that exists in TEL-related writings. Hence the word “social” was removed prior to scoring the documents.

Again, “Learning Change” is prominent, although there is more variation. It is clear that the lexicon being used is not well-suited to our purpose; whereas for economic, political and legal categories, the high-scoring posts were generally correctly classified, there are now more cases that look like accidents.

Identified signals are:

- leadership theory in crisis (the claim is that whereas leadership is high on the human capital agenda, the theories are weak and hindering the development of new and more effective leadership styles)
- global education policy (an argument that there is an emerging globalisation and mediatisation of education policy)
- playing games and brain development (a neuroscientific understanding of the effect of video games and social media on the brain and where it leads education)

Concluding remark

The dominance of a single source – Learning Change – from around 700 separate sources was an unexpected discovery that may be construed as a signal. This observation implies that the majority of TEL blogs that we used – which are believed to be broadly representative of TEL-relevant blogs in English – neglect economic, legal and political matters. Even when these topics were detected, the content of the post rarely made a connection to education or training even though this is where the centre of gravity of the blog lay. The conclusion seems to be that these environmental factors may be shaping TEL but that this shaping is less of a purposeful and active reaction and more a sub-conscious influence.

6.2 From workshops and scenarios discussions

6.2.1 Online Educa Berlin

On Dec 2nd we facilitated a panel discussion with the topic: *Signs on the wall: Reading indicators of change to inform your TEL strategies*. The debate started with a short introduction of roadmapping in general and the TELmap road mapping process in particular. Panel member then presented their scenarios depicting signs of change related to emerging learning technologies or changing socio-economic conditions impacting learning.



Figure 9: Panel Members l.t. r.: Vana Kamtsiou (Brunel University, UK), Ralf Klamma (RWTH Aachen, GER), David Griffiths (University of Bolton, UK), Paul Lefrere (KMI, UK), Lieve Van den Brande (European Commission, BE)

As indicated in the structural outline of the workshop above, each presentation was followed by a short discussion initiated by 2-3 questions raised by the speaker.

05'	Intro Participants and outline of the session – Christian (ZSI, AT)
10'	Interactive Road mapping and TEL-Map's focus on implementation - <u>Vana</u> (Brunel University, UK)
10+5'	Technology: The implications of Web-Video - Ralf (RWTH Aachen, Germany) << 5 min PESTL debate >>
10+5'	Economics: The future shape of the university - <u>Dai</u> (University of Bolton, UK) << 5 min PESTL debate >>
10+5'	<u>Social</u> : Imposing choices, responsibilities and cost - Paul (KMI, UK) << 5 min PESTL debate >>
10+5'	Political: TEL and the implementation gap - <u>Lieve</u> (European Commission, BE) << 5 min PESTL debate >>
05'	Wrap Up and upcoming opportunities to get involved with TEL-Map– Christian (ZSI, AT)

Following a brief example of a scenario presented during Online Educa Berlin.

The future shape of the university

Importance of the topic

The University has dominated the provision of higher education, and many countries have a policy of expanding participation in university education. At the same time the independence of universities, and the privileged status of teachers practice as being beyond managerial control are coming under pressure. The future of technology enhanced learning is closely linked to this process because

- It is a driver of change, in as much as it provides technologies which make changes possible which were previously inconceivable
- It is constrained by the social, political and economic context in which it acts.

Possible future scenarios

In this presentation I outline two perspectives on the future of the university, and identify drivers which may determine the future form which it will take. A possible future is outlined in which education becomes a commodity, delivered through the Net, and controlled by IP and labour market legislation.

1. The commercial university

“Publishing giant Pearson has announced details of its plans to offer degrees in a range of vocational subjects from 2012” Times Higher Education 14th December 2010. *TEL will facilitate the shift of control of curricula from the University to commercial publishers.*

2. Assessment: its locus of control

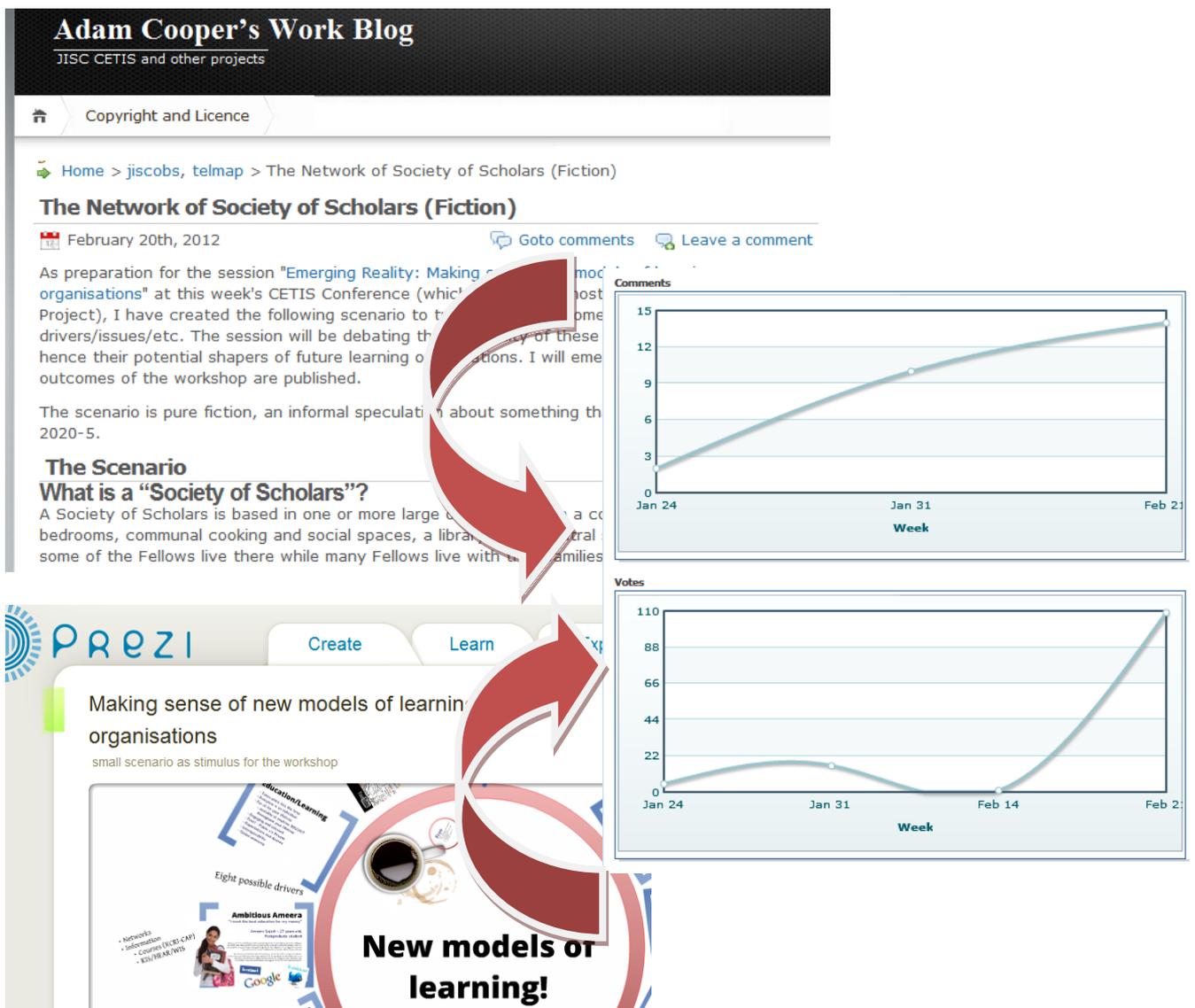
Assessment and certification is an increasingly central part of what Universities offer, but one in which their freedom of action is increasingly constrained by the managerial, supervisory and legal framework (at least in the UK). Pearson PLC will fund the establishment of the Oxford University Centre of Educational Assessment with a £2.4 million gift. “In order to provide feedback quickly and make scoring of the responses affordable, the new assessments will rely heavily on artificial intelligence scoring Pearson’s Automated Scoring of Writing, Speaking, and Mathematics Pearson White Paper May 2011. *TEL techniques will enable assessment to be carried out sufficiently effectively to satisfy regulators and students.*

6.2.2 JISC-CETIS workshop

A second workshop was organised on the 23rd of Feb during the Cetus Conference in Nottingham. Again, individual speakers presented a scenario:

- Society of Scholars
(A. Cooper, University of Bolton)
- Catering for different personas in times of mass customisation
(D. Sowden, University of Hull)
- Learning design and the limits of technological support
(C. Voigt, Centre for Social Innovation - AT)
- The implications of 'Open Higher Education'
(B. Olivier, R. Millwood, University of Bolton)

This time participants were provided with the scenario text upfront, however, a webaccess statistics showed that only few took advantage. Similar to the Berlin workshop each presentation sparked some good discussion, which we had associated with 7-8 statements about the future of education. Participants could then express their agreement or disagreement in parallel to the running debate.



Following one scenario discussed during the workshop followed by some specific drivers participants were encouraged to evaluate and comment upon. The scenario is pure fiction, an informal speculation about something that might happen by around 2020-5.

The Society of Scholars

A Society of Scholars is based in one or more large old houses with a combination of study-bedrooms, communal cooking and social spaces, a library and a central seminar. Students and some of the Fellows live there while many Fellows live with their families and study there.

There are no fixed courses but a framework within which depth and breadth of scholarship is guided and measured. This framework is validated by an established University, which awards the degree and provides QA (all for a fee). The Network of Societies of ScholarsTM has additional ethical codes and strict membership rules. The physical co-location is a central part of the Society, combined with the wider (virtual) network of peers.

Genesis

Societies of Scholars sprang out of an initial “wild card” experiment where a small group of progressive academics with experience of inquiry-based learning pooled their redundancy payments from one of many rounds of staff-culling. A few sold their houses. Their idea was to strip out the accumulation of both central services and formality of teaching and learning setting and to get back to basics while reducing cost and being able to do more of what they enjoy: thinking and talking. In doing this they hoped to attract students who were otherwise being asked to pay ever higher fees to endure ever more “commoditised” offerings and suffer poor employment prospects. The promise of high wages to pay off high debt is elusive for many who follow the conventional route. Graduate employment and student satisfaction are worse for those who opt for the newer “no frills degree course” offerings, which have cut costs without re-inventing the educational experience.

For several years they struggled to attract students but gradually a few gifted students managed to develop ultra-high web reputations started to attract more applications. The turning point was the winning of an international prize for work on “Smart Cities”, which led to a media frenzy in 2018. This triggered a spate of endowments of new Societies by successful entrepreneurs and the establishment of satellite societies to Cambridge and Oxford Universities in the UK and ETH Zurich in Switzerland with others quickly following (all recognising the threat but also the early-mover opportunity).

Character of a Society of Scholars

Societies are highly reputation conscious as are the individuals within them. They are highly effective at using the web, what we called “new media” in the naughties and in media management generally. With the exception of assessment, Fellows and Students undertake essentially the same kind of activities; the Students strive to emulate the attitude and work of the fellows. Both divide their time between private study, informal and formal discussion. Collaboration works. There is no “Fellows teach Students”; all teach each other through the medium of the seminar. All consider “teaching the world” to be an important (but not dominating) part of what they do. The selection process plays a key role in shaping the character of the Society. Students are admitted NOT primarily on the basis of examination grades but on evidence of self-discipline, self-awareness and especially self-directed intellectual activity.

Course and Assessment

There are no specified courses and all Students follow a unique pathway of their own. Fellows offer guidance and almost all Students piece together a collection of topics that are identifiable (e.g. similar to a conference theme, a textbook, etc). There is no fixed minimum or maximum period of study. Societies typically focus on 3-4 disciplines but always adopt a multi-disciplinary perspective, for example computer

science, electronic engineering, built environment and social theory was the combination that led to the "Smart Cities" prize. Online resources are exploited to the fullest extent. Free or cheap MOOCs (massively open online courses, especially the form pioneered by Stanford University and udacity.com) are combined with the for-fee examinations offered alongside them. Wikipedia is considered to be a "has been"; Society members (across the Network) and others collaborate on DIY textbooks using a system build on top of "git" (permitting multiple versions, derivatives, etc see GitHub for a "social coding" example) and a decentralised network of small servers. While being widely useful this activity is also a valued learning activity with the side effect of promoting coherence in the study pathway.

Assessment is complicated primarily by the idiosyncrasy of all pathways but also by the need to connect achievement to the breadth/depth framework. An award is typically evidenced by a mixture of: externally taught and examined modules; public examinations of the University of London; a patchwork of personal work (a "portfolio"); contributions to the DIY textbooks; seminar performance.

Demand and Expansion

Societies of Scholars are niche occupiers in a much wider higher education landscape. Demand is no more than 5% and supply only about 3% in 2025. There is a feeling that graduates of the Societies are the "new elite". While some politicians call for the massification of the Society concept, society at large recognises that they need a special kind of student: more of an intellectual entrepreneur. The rise of the Society of Scholars has, however, started to change the way society understands (and answers) questions like: "what is the purpose of education?"; "how does learning happen?"... The long-term effect of this change on the face of education is not known yet (2025). Employers in particular have understood what Societies offer and, while graduate unemployment for those following a conventional route to a degree remains close to 2012 levels, Society graduates are highly employable. Employers value: creativity, good communication skills, media-savvy people, multi-disciplinary thinking, self-motivation, intellectual flexibility, collaborative and community-oriented lifestyle.

The Drivers/Issues

This is a summary of some of the implicit or explicit assumed drivers/issues embedded in the scenario and which determine the plausibility of it (or alternatives). They are intentionally phrased as statements that could be disagreed with, argued for ... Physical co-location and (especially intimate) face-to-face interactions will continue to be seen to be an essential aspect of high quality education. Students who can afford (or otherwise access) this will generally do so. Employers will value awards arising from courses containing it more highly than those that do not. Telegraph newspaper article. Graduate unemployment will be an issue for years to come. Effective undergraduates will find ways to distinguish themselves.

Wikipedia (and similar centralised "web commons" services) are unsustainable in their current form. As the demand from users rises and the support from contributors and sponsors wanes (it becomes less cool to be a Wikipedian) a point of unsustainability is reached. One option is to monetise but another is to "go feral" and transition to peer-to-peer or decentralised approaches.

Universities and colleges will increase the supply of course and educational components, disaggregated from "the course", "the programme" and "the institutional offering". Examinations, Award Granting and Quality Assurance are all potentially independent marketable offerings. David Willets article on the BBC (see "Flexible Learning") Cheap large-scale online courses are capable of replacing a significant percentage of conventional teaching time. The "Introduction to AI" course demonstrated this: see <http://is.gd/JOseb>. Employers are conservative when it comes to education. While employers bemoan narrow knowledge of graduates, poor "soft skills", etc, their shortlisting criteria continue to favour candidates with conventional degree titles and high grades from research-intensive universities. They will generally fail to take advantage of rich portfolio evidence.

6.2.3 Weak Signals rated in *learningfrontiers.ideascale.com*

Each scenario was linked to a set of PEST statements, that had been entered into the ideascale application – a crowd voting tool. Most statements came from the social and economic domain (Figure 10), which also reflects the tenor of the discussion reflecting on the sustained pressure on education systems in light of the recent economic crisis.

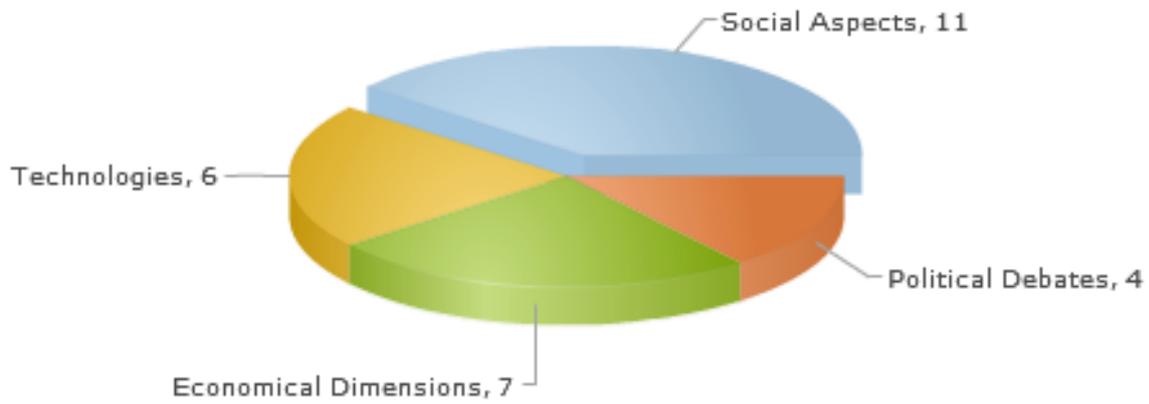


Figure 10: Distribution of PEST statements (n=28)

Category	Net Votes	Vote Up	Vote Down	Comments	Title	Details
Economical Dimensions	6	6	0	1	Students are seen as customers, expecting more for their money	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.
Economical Dimensions	5	4	1	0	Cheap large-scale online courses are a threat to the Academy	Cheap large-scale online courses are capable of replacing a significant percentage of conventional teaching time. The "Introduction to AI" course demonstrated this: see http://is.gd/JOseb .
Economical Dimensions	7	6	1	0	Graduate unemployment will be an issue for years to come	Effective undergraduates will find ways to distinguish themselves, for example by developing a web-based portfolio and their web reputation.
Economical Dimensions	2	1	1	1	Modelling learning makes learning relevant to performance	In cases where modelling of learning events is targeting concrete activities (e.g. business processes), learning can happen real time and in immediate proximity, rather than in ahead of time and with low proximity to work tasks.
Economical Dimensions	6	2	4	0	Modelling learning is a waste of time and money	Very little uptake of learning design tools can be found outside the research community despite ongoing efforts made since 2003 or earlier.
Economical Dimensions	2	1	1	0	Does unemployment drive enrolment in online courses?	A US perspective ... In 2010 enrollment for accredited online college courses rose by 10%, which far exceeds the less than one percent growth in the overall student enrollment in higher education institutions generally. With an average U.S. unemployment rate of 9.64% for 2010, many working adults are returning to school for additional education to both increase job security and future career opportunities. As many of these individuals already have work and family commitments, the flexibility of online programs provides an opportunity not available through traditional college programs. Consequently, surveys indicate that 42% of students who are thirty or older are taking entire programs through distance education.
Political Debates	5	5	0	1	HE diversity is evolving	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.

Category	Net Votes	Vote Up	Vote Down	Comments	Title	Details
Political Debates	6	6	0	0	Disaggregation of what the Academy offers - more supply	Universities and colleges will increase the supply of course and educational components, disaggregated from "the course", "the programme" and "the institutional offering". Examinations, Award Granting and Quality Assurance are all potentially independent marketable offerings. (See under "Flexible Learning" at the "supporting link" page.)
Political Debates	8	8	0	1	Without institutional rewards, teachers won't model instruction	Instructional modelling tools require teachers to invest considerable time. However, it seems like it is mainly educational institutions that reap the benefits. Digitized instructional models help comparability of courses (Bologna Declaration), documentation for accreditation, re-use by beginning teachers, etc. So one could argue that it's the institution's duty to reward the associated effort with monetary as well as intangible means.
Political Debates	3	3	0	2	Privacy implies knowing which data you give away and why	Monitoring software on mobile phones has been around for a while but now privacy concerns seem to get into the spotlight more often. A debate started weighing convenience (e.g. carrier's service improvements) against the risk these programs posed for private data.
Social Aspects	4	4	0	0	Social Media will soon be embedded in learning	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
Social Aspects	5	5	0	1	There is no appetite for exchanging runnable learning designs	The VLE market is highly concentrated, with a lot of lock in. So there is not a lot of demand for shifting learning designs between systems. On the other end of the scale, a lot of learning design involves very lightweight designs with tools available on the web, where there is not much orchestration available.
Social Aspects	6	3	3	2	Employers are conservative when it comes to education	While employers bemoan narrow knowledge of graduates, poor "soft skills", etc, their shortlisting criteria continue to favour candidates with conventional degree titles and high grades from research-intensive universities. They will generally fail to take advantage of rich portfolio evidence.

Category	Net Votes	Vote Up	Vote Down	Comments	Title	Details
Social Aspects	8	8	0	1	Face-to-face interactions continue to be highly desirable	Physical co-location and (especially intimate) face-to-face interactions will continue to be seen to be an essential aspect of high quality education. Students who can afford (or otherwise access) this will generally do so. Employers will value awards arising from courses containing it more highly than those that do not.
Social Aspects	3	1	2	2	Modelling learning design needs a shift from process to ecology	Today's learners are less and less concerned with learning solutions to known problems, since routine (highly structured) tasks will be automated and eventually completed without human involvement. Hence our understanding of design must change. Rather than aiming for a (customised) process, new design approaches should outline and validate 'spaces of opportunities' filled with 'services' rather than instructions.
Social Aspects	7	2	5	1	With informal learning, learning design tools become obsolete	Informal learning is based on the notion that the need to learn comes with the need to adapt to ever faster changing situations in complex systems such as most of today's workplaces. This is not any longer compatible with the idea that optimal learning processes can be captured in abstract models.
Social Aspects	5	3	2	0	Modelling learning is intrinsically rewarding	Modelling one's own teaching is a help for subsequent offerings of the same course. Also sharing and discussing learning models with peers (e.g. in a dedicated COP) can be highly rewarding if feedback and encouragement comes from like-minded people. All in all, modelling helps people to actively improve their teaching.
Social Aspects	2	2	0	2	TEL as an extension of your mental capacities	Access to gadgets, Internet etc. are natural extensions of your capabilities - and should be treated as such by formal education
Social Aspects	2	2	0	2	Learners value being listened to and taken seriously	If learners' opinions are taken account of in ways that show respect, they will be motivated to engage more with courses and to identify more with their institution. Example from a university, using Ideascale: "Any idea that receives 50 votes will automatically be assigned to a committee in USG, so your ideas will really make a difference."

Category	Net Votes	Vote Up	Vote Down	Comments	Title	Details
Social Aspects	3	3	0	2	There is a price for free online courses	A free online course at Stanford University on artificial intelligence, to be taught this fall by two leading experts from Silicon Valley, has attracted more than 58,000 students around the globe — a class nearly four times the size of Stanford's entire student body.
Technologies	6	6	0	1	Ubiquitous broadband is becoming widely available	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).
Technologies	6	6	0	0	Adoption of Data-driven Learning Analytics	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.
Technologies	4	1	3	1	Free and non-monetised services are unsustainable	Wikipedia (and similar centralised "web commons" services) are unsustainable in their current form. As the demand from users rises and the support from contributors and sponsors wanes (it becomes less cool to be a Wikipedian) a point of unsustainability is reached. One option is to monetise but another is to "go feral" and transition to peer-to-peer or decentralised approaches.
Technologies	4	1	3	0	Existing design tools for learning models are expressive enough	The concern that existing modelling techniques, such as IMS-LD, are not expressive enough, seem unfounded. Possible ramifications can be modelled up-front and allow for flexible execution of learning designs.
Technologies	7	6	1	1	Modelling TEL suffers due to separation of design & execution	Existing tools for authoring and playing learning designs require you to envision possible ramifications upfront. Therefore automated learning designs can't react to emerging situations such as groups 'appointing' an interim leader. Hence a lack of flexibility is a showstopper.
Technologies	4	2	2	3	Apple reinvents the textbook	Apple's recent foray into education seems to have hit the right notes. In just three days of iBooks 2 release, almost 350,000 e-books were sold. While India is yet to see the launch of iBooks 2 and iBooks Author, independent developers in the education space are already eyeing the digitised space.

7 Outlook: Tighter integration with cluster work in WP3

TEL-Map comprises three clusters: UK HE which started in Oct 2001, schools to be established in May 2012 and HE Libraries (or heritage), which is about to start in the next months.

The general objective is a two way exchange between the road mapping work in the clusters and the Data Mining / Delphi study / weak signals analysis in WP4. Concretely this means that we aim to support future cluster meetings by (a) bringing relevant candidate signals of change (including signals of changing learning paradigms) to the table and (b) get suggested signals of change out of the clusters, which can then be enriched with further evaluations and comments.

In the long run, this tight integration between weak signal analysis and cluster can be an important ingredient to achieving the envisioned adaptive road mapping. 'Adaptive' in the sense that clusters re-evaluate their roadmaps in light of upcoming changes (threads and opportunities).

8 References

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Kuhn, T. S. (1970). *The structure of scientific revolutions* (2nd ed.). Chicago, Ill.: University of Chicago Press.

Popper, K. R. (1970). Normal science and its dangers. In I. Lakatos & A. Musgrave (Eds.), *Criticism and the growth of knowledge*. Cambridge Eng.: University Press.

Van der Heijden, K. (2005). *Scenarios: the art of strategic conversation*. New York: Wiley.

9 Appendix

9.1 Weak Signal (WS) definition and structured WS data set

A: Weak signals can hint at threads (non-linear, unforeseen, surprising signal) or opportunities (linear, largely anticipated developments); in either case, spotting weak signals helps organizations and individuals to be better prepared for a range of futures scenarios.

B: Which information is perceived as a weak signal depends on the observer's background knowledge, role within the organization, personal network as well as the dominant views of the time.

C: No weak signal ever rises to dominance by itself, but is accompanied by shifts in political, economic, technological, and social thought and invention.

D: Hence, determining the actual meaning, influence and desirability of a weak signal is not an entirely objective process but requires the observer's judgment.

E: Therefore, detecting weak signals poses a challenge to the observer's creativity. Observers of weak signals need to interpret information in different contexts, explore information for surprising implications or use information for a completely new set of objectives.

	Section	Categories	Format	Example
	Login (also anonymous)			
B	1. Name (ID)		<i>txt</i>	Ambjoern
	2. Gender		<i>List</i>	M
	3. Age		<i>List</i>	55 – 65
	4. Type of Affiliation		<i>List</i>	University
	5. Role	TEL Provider; Res.; End-Users	<i>List</i>	Researcher
	6. Years of experience		<i>List</i>	30+
	7. Decision-making Level		<i>List</i>	Substantial
	8. Background strength	STEPL	<i>List</i>	Technological
	WS - Candidature			
A	1. Heading	Concise and engaging	<i>txt</i>	Massive open online courses on the raise – enabling participatory education
	2. Content	Desired Developments, Upcoming Developments,	<i>txt</i>	Stanford offers an open course on AI 58.000 subscriptions 1000 + students required to participate

	3. Link to TEL	How is it relevant to TEL		New forms of learning ...
C	4. WS - Background	Focus on Areas - STEPL	List	Social (pedagogical)
	5. Tags	Needed for navigation WS	txt	MOOC, Access, Open Content
	6. Source	URL, Interviewee, Media-Base, collection	txt	URL >> NY Times - http://goo.gl/P8m09
	7. Published		Y/N	Editorial decision?
WS – Evaluation				
D	1. Agreement	How confident are you in this weak signal being correct?	1 ... 5 (-2 .. 0 ... 2)	5
	2. Desirability	Is a current development, or overcoming a current challenge desirable?	1 ... 5	2
	3. Influence	How strong do we consider the WS's influence developments over the next 10 years.	1 ... 5	2
E	4. Multiple Arguments (including STEPL focus and sources)	Arguments the support ratings, specially ratings that diverge from the existing	txt	G. Siemens http://goo.gl/qV6HH Focus - Economical Run by a commercial company; is it taking into account previous lessons learned

9.2 Links to Blog posts

Links to economical source material (from 40 highest scoring):

- ✦ Student loans/debt
 - <http://gfbertini.wordpress.com/2011/09/23/is-the-near-trillion-dollar-student-loan-bubble-about-to-pop>
 - <http://gfbertini.wordpress.com/2011/06/11/student-loan-default-trend-compared-to-the-subprime-loan-crisis>

- <http://gfbertini.wordpress.com/2011/10/12/student-loan-debt-among-top-occupy-wall-street-concerns>
- ✦ Innovation and economic factors
 - <http://gfbertini.wordpress.com/2011/10/01/technological-revolutions-and-financial-capital-the-dynamics-of-bubbles-and-golden-ages>
 - <http://gfbertini.wordpress.com/2011/05/01/employment-effects-of-technological-and-non-technological-innovations-2>
 - <http://gfbertini.wordpress.com/2011/09/06/innovation-for-digital-inclusion-conference>
- ✦ Youth unemployment and protest
 - <http://gfbertini.wordpress.com/2011/06/11/global-employment-trends-for-youth-on-the-impact-of-the-global-economic-crisis-on-youth>
 - <http://gfbertini.wordpress.com/2011/10/03/japans-economic-stagnation-is-creating-a-nation-of-lost-youths>
 - <http://gfbertini.wordpress.com/2011/08/19/chile-student-protests-point-to-deep-discontent>
 - "<http://gfbertini.wordpress.com/2011/10/08/chilean-girls-stage-occupation-of-their-own-school-in-education-rights-protest>" (which was actually identified as being a "legal" posting)
- ✦ Open Source
 - <http://leighblackall.blogspot.com/2011/01/open-source-ecology-and-factor-e-farm.html>

Links to political source material (from 20 highest scoring):

- social capital
<http://gfbertini.wordpress.com/2011/02/04/social-capital-and-political-bias-in-knowledge-sharing>
- corporatisation of HE
<http://gfbertini.wordpress.com/2011/11/22/occupy-colleges-now-students-as-the-new-public-intellectuals>

Links to social source material (from 20 highest scoring):

- leadership theory
 - <http://gfbertini.wordpress.com/2011/09/11/developing-a-new-perspective-on-leadership-theory-from-a-tree-of-knowledge-to-a-rhizome-of-contingencies>
- global education policy
 - <http://gfbertini.wordpress.com/2011/01/12/the-sociology-of-pierre-bourdieu-and-researching-education-policy>

- playing games and brain development
 - <http://elearningstuff.net/2012/02/14/playing-games>

Links to legal source material (from 20 highest scoring):

- ✦ international copyright
 - <http://fm.schmoller.net/2012/02/richard-odwyer.html>