



Learning2.0: The Impact of Web2.0 Innovation on Education and Training in Europe

Report on a validation and policy options workshop organised by IPTS
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Executive Summary

At the beginning of 2008, the Institute for Prospective Technological Studies¹ (IPTS) and the European Commission Directorate General Education and Culture (DG EAC) launched a study on Learning2.0, which aimed to i) gather evidence of take up of social computing by Education and Training (E&T) institutions in Europe, ii) understand the impact of such phenomenon on innovation of educational practice and on its potential for a more inclusive knowledge society, and iii) identify challenges and bottlenecks so as to devise policy options for EU decision makers.

IPTS organised a workshop at the end of October 2008 and invited experts in the field to validate the main findings of the project.

This report offers a structured account of the debate that took place during the two day expert workshop rather than a synthesis of the research results. The key messages that arose from the discussion can be summarized as follows:

1. Social computing is transforming the learning panorama by providing unprecedented opportunities for self-directed learning, collaborative learning and lifelong learning, among others.
2. The use of social computing for learning purposes, even though it originates outside educational institutions, is likely to exert a significant impact on formal education and training. In particular, it can positively contribute to the modernisation of E&T institutions that is required to fulfil the learning needs of contemporary society.
3. The Learning2.0 phenomenon is challenging current educational models by i) transforming teaching and learning practice (pedagogical innovation), ii) posing new requirements with respect to the management of E&T processes (organisational innovation), and iii) devising new tools for teaching and learning (technological innovation) that contribute to more inclusive education opportunities for EU citizens (inclusion).
4. The boundaries between school and home, between formal, non formal and informal learning, between teachers and learners, between education and entertainment media, between content management systems, learning management systems and Web2.0 tools are blurring. The emergence of blended learning settings can be read as a sign that the Learning2.0 phenomenon may disrupt the very notion of the role of E&T institutions in contemporary society, setting the stage for a new schooling culture.
5. Even though trends suggest that E&T may be on the verge of a new era, there is still a poor understanding of the Learning 2.0 phenomenon and its implications for learning processes, learners, teachers, and education providers. Additional research is needed and a number of critical areas were identified at the workshop.

¹ IPTS is one of the 7 research institutes that make up the European Commission's Joint Research Centre.

6. Policy intervention is fundamental to ensure that E&T reaps the benefits of the new learning opportunities enabled by social computing. A number of areas that would benefit from policy intervention were identified at the workshop.

Introduction

Learning2.0 builds on social computing, which refers to "social" digital applications that enable online interaction and collaboration between users. They are co-creators of content and form a network which constitutes a collective resource. Examples of such applications are, amongst others, social networking services (e.g. Facebook), collaborative filtering (Amazon, Last.FM), social bookmarking (del.icio.us), folksonomies (Flickr), multi-media content-creation (e.g. Wikipedia, blogs, Flickr & Youtube) social search engines (yoono.com), file sharing (Emule), mashups (BBC backstage), and online multi-player games (World of Warcraft or Second Life). In recent years, these applications have attracted a lot of attention, and have become very popular especially with young Internet users (See Pascu et al, 2008).² The strong growth of social computing applications has been seen by many as a sign of changing times. Users – as consumers, citizens, patients, learners, workers, etc. – are now playing an increasingly important role in the way products and services are shaped and used. This may have important social and economic impacts on all aspects of society: on information and knowledge sharing, learning, health, government, business, the media, the third sector, and others. These impacts may be disruptive as they are changing existing practices and allowing new players and markets to emerge, which challenge existing players, industries (e.g. media sector) and institutions (e.g. education).

With respect to learning processes, and teaching approaches, methods and resources, social computing provides a collection of tools that are affecting educational practices at different levels. On the one hand, an increase in the *personalization of learning paths* is widely acknowledged. Learners are becoming active stakeholders who are empowered to shape their own learning spaces and resources (by actively creating content) and to define their own learning pace. On the other hand, Web2.0 applications are enablers of *collaborative learning processes*, where peers and more knowledgeable actors function as scaffolding for the development of new abilities, and competences by the learners. What is more, collaboration takes place not only among pupils: now teachers and educational organizations can also reap the benefits of an unprecedented abundance of means to collaborate with peers. Even though signs of transformation can be spotted, there is little scientific evidence on the actual impacts of social computing on Education and Training (E&T). For this reason, the Institute for Prospective Technological Studies (IPTS) and the European Commission Directorate General Education and Culture (DG EAC) launched a study on Learning2.0, which aimed to:

1. Explore the impact of social computing on E&T in Europe;
2. Assess the specific contribution of Learning2.0 practices to innovation and inclusion in E&T, identifying opportunities and challenges;
3. Assess the position of Europe in this domain; and
4. Identify options for EU research and innovation policies.

² Pascu, C., Osimo, D., Turlea, G., Ulbrich, M., Punie, Y. & Burgelman, J-C. (2008) Social computing - Implications for the EU innovation Landscape, Foresight, 10(1), March 2008, pp. 37-52.

Research focused on the collection and analysis of existing practices and was carried out in four parts:

1. Desk research on the current practice of using social computing in E&T in Europe and the rest of the world, assessing in particular the potential impact of Learning2.0 on formal E&T;
2. Stakeholders were consulted through a survey of more than 200 cases of Learning2.0 initiatives. The objective of this case collection was to provide an empirical basis for further research on the impact of social computing on learning;
3. An in-depth case study investigated some paradigmatic examples of innovative Learning2.0 practices, identifying factors for failure and success in order to assess good practice and the impact of Learning2.0 on innovation;
4. A second in-depth case study investigated some paradigmatic examples of using social computing to offer lifelong learning opportunities to groups at risk of exclusion, identifying factors for failure and success in order to assess good practice and the potential of Learning2.0 strategies to support equity and inclusion.

The research results were presented to a panel of experts during a two day workshop organised on IPTS premises on the 29 and 30 October 2008. The workshop was set up to validate the research insights and to envision future trends in the E&T context. It also considered policy options that would help Europe reap the benefits of social computing in the E&T field and facilitate Europe's transformation to a competitive knowledge-based society. The workshop was an important part of the project as the theme under study is very recent and rapidly changing. Given the multi-disciplinary nature of the field of ICT-enabled learning (and Web2.0-enabled learning in particular), it was fundamental to bring together experts from different backgrounds. In the end, 22 external participants from industry, academia, consultancy and EU policy-making attended the workshop. Participants received beforehand draft results of the research, which were then presented and discussed during the workshop. In addition, brainstorming and open discussion sessions were held on missing issues, on the market position of Europe in social computing and on policy options for future EU research and innovation (see Annexes for the workshop agenda and a list of participants).

This report presents the major outcomes of the workshop discussion. It does not provide a synthesis of the results³ of the different studies; neither does it summarise the presentations made at the workshop. Rather, it is a structured account of the debates that took place during the workshop.

³ The reader can find all the publicly-available reports of the project at the following URL: <http://is.jrc.ec.europa.eu/pages/Learning-2.0.html>

1 Innovating E&T: Learning 2.0 and its Potential

The workshop began with a presentation of current Learning2.0 initiatives across Europe and beyond. The variety, richness and scope of the different examples suggest that E&T is on the verge of an important change. The expert panel emphasized that the change educational institutions are about to face derives from the new culture enabled by the social computing wave. Workshop participants initiated the debate by arguing that social computing is not about technology, but about the social appropriation of technological tools to achieve results. They claimed that its unprecedented take up makes it a phenomenon of irrevocable impact.

The discussion led on to the innovating potential of social computing for E&T. Workshop participants mapped the innovative potential of Learning2.0 along three main axes: pedagogical, organizational and technological. The main arguments are reported in the next sections.

1.1 Pedagogical Innovation

Though the data collected in the study (both via the Web-based survey and in the in-depth case studies) does not provide a full picture of the current situation, it allows us to identify the emerging trends which shape the way social computing affects learning.

The distinctive traits of the Learning2.0 phenomenon that were identified and discussed during the workshop are listed below:

- Collaboration,
- Networking,
- Blended learning scenarios and personalisation of learning paths,
- Engagement and motivation.

Collaboration. Social computing applications represent a flexible tool for collaborative meaning making and content creation, and for identification, aggregation and exchange of learning content and metadata. The way social computing actually provides a framework for collaboration is shifting the focus from *individual problem solving* to *collaborative problem setting*. From an educational point of view, functionality like collaborative editing (e.g. Wikipedia) can be seen as an opportunity for peer and reflexive learning. Workshop participants highlighted the fact that the kind of collaboration enabled in Learning2.0 (where the base platform is the Web, as opposed to closed virtual learning environments or closed content management systems) also favours the construction and deployment of groups of interest and communities of practice that remain active even after the class/course/module is finished.

Box 1 summarises the input experts gave on collaborative learning enabled by social computing during a brainstorming session held on the first day of the workshop.

It is worth mentioning that user-generated content in learning contexts was not a major topic of debate during the workshop. However, the issue was raised that, should Learning2.0 become a mainstream practice, the quality of educational content would have to be addressed. The hype around the phenomenon is drawing attention to the benefits that social software provides for collaborative content production, and for elaboration and reflective thinking on resources that are *always beta*. However further research is needed to understand whether existing mechanisms guaranteeing the reliability of content produced by non professional entities (e.g. the Wikipedia model) are scalable to suit the educational context (teacher and student-generated content) and whether there is a need for additional means of quality control on collaborative educational resources. This is a challenge that needs to be tackled for the further development of Learning2.0.

LEARNING2.0 has potential to affect learning processes by fostering new ways of collaborating, in particular by:

- Building on distributed knowledge,
- Enabling peer group learning,
- Enabling the construction and deployment of groups of interest and communities of practice,
- Providing a framework for professional interaction,
- Supporting a decentralised model of E&T, that a larger group of learners can access,
- Giving rise to learning communities and transforming organisations into learning communities,
- Creating innovative collaborative dynamics,
- Allowing learners to generate new learning contexts (and not only content), where reflexive learning transforms the very process of learning.

Box 1. Experts' statements concerning Learning2.0 and collaboration.

Other participants were of the opinion that the real debate relates to *free knowledge*, i.e. knowledge that users are free to read, listen to, watch, or otherwise experience; to learn from or with; to copy, adapt and use for any purpose; and to share derived works similarly (as free knowledge) for the common good. In this respect, Learning2.0 - thanks to the importance of content generated by non-commercial actors - is affecting the way institutions and stakeholders understand content and copyright by creating room for novel models of knowledge production and consumption.

Networking. Social computing applications are also providing a number of alternative, though compatible, solutions for communications. Increased interconnectedness and communication among both teachers and students affects the way practices evolve in the learning context. It fosters new interactive processes that support *reflection in action* and also expands the learning context beyond the classroom. As mentioned, Learning2.0 builds on the concept of peer learning and community, supporting thereafter a decentralised model of E&T, which allows access by a larger group of learners (inclusion). Experts pointed out that social computing tools for networking and communication contribute to the creation of new forms of interactions (e.g. among teachers as well as students). They generate communities which form new learning contexts,⁴ thus providing opportunities for E&T organisations to evolve into learning and reflexive communities.

⁴ Further information on second level innovation on learning with respect to the generation of learning contexts can be found in the Eifel team blog: <http://www.learningfutures.eu/>

Blended formats and personalisation.

When social computing is incorporated into educational practice it also supports more personalized learning paths, pace and environments (e.g. e-Portfolios; personal learning plans; learning diaries). This is due - at least in part - to the emergence of blended formats and learning scenarios that blur the boundaries between formal and non-formal learning, classroom and distance learning, intra- and extra-institutional learning, and combine different pedagogical approaches.

It was pointed out that more research on reflection should be carried out, to understand whether the social computing phenomenon is actually affecting the development of reflective abilities and meta-cognition.

Box 2 summarises the experts' statements on the personalisation of learning paths, made during the brainstorming session.

Engagement and motivation. It was also generally acknowledged that the emerging educational formats, created thanks to the new tools available, are more engaging for the learner than the traditional formal education formats. The fact that learners have more control over learning pace, structure and content (thanks to different media), and an increased sense of ownership regarding the learning outcomes, motivates them to greater commitment to the learning experience. It was pointed out that engagement and motivation are critical factors for the success of learning experiences and that it would be worth collecting evidence to further specify how Learning2.0 tools and practices actually enhance them.

Box 3 provides a snapshot of experts' insights into the way Learning2.0 favours learners' motivation.

Some experts, however, underlined that there is no full understanding of how the availability of tools for networking, collaboration and tailoring of content actually

L2.0 has potential to enable personalised learning paths by:

- Providing tools that enhance self-organisation and autonomy (of both individuals and organisations) and 'just-in-time' learning,
- Allowing a shift of control of learning paths from education systems and schools to the individual learner,
- Empowering learners,
- Creating the basis in formal education for self-directed Lifelong Learning by helping the learner to construct a set of resources and networks that will be available throughout life,
- Undermining the importance of curricula and syllabi in favour of learning pathways,
- Enhancing the importance of identity construction within the individual's learning path,
- Lowering the barrier between formal and informal/non-formal learning, between school time and free time with respect to learning.

Box 2. Experts' statements concerning personalisation of learning paths that Learning2.0 is enabling.

L2.0 affects the learning processes by engaging participants in learning dynamics that enhance their motivation, by:

- Making learning experiences more emotional and leveraging on the emotional importance of ownership of content production and appropriation of learning dynamics.
- Fostering the construction of identity.
- Fostering the transition from traditionally static, text-based E&T material to evolving multimedia content (audio, video, simulations, blogs, etc).
- Leveraging on narratives and creative storytelling.
- Providing engaging formats like life-swapping and immersive learning environments.

Box 3. Experts' statements concerning Learning2.0 as fostering learners' motivation.

impact on cognitive development or what they actually support in a learning process. Scientific evidence of the value of virtual worlds for – for instance – improved performance in the construction of knowledge is not available. Additionally there are few guidelines which would enable education providers to exploit the new tools in the most appropriate way.

Other participants warned about the risk of oversimplification that could lie behind an attempt to formalise the added value of the above functions for learning. It is important to keep a systemic perspective and look at the generation of *contexts for learning* without focusing on specific applications. It was mentioned that the social computing paradigm is actually providing conceptual resources (e.g. folksonomies, social tagging, and dynamic categorisation) to overcome the limitations of taxonomies and ontologies, by moving “from trees to piles of leaves”.⁵

Even though there is some evidence that the social computing phenomenon has the potential to transform E&T in what was labelled Learning2.0 in the study, some issues are still open for debate as far as learning and learning processes are concerned. In particular, the panel did not reach consensus on how the Learning2.0 phenomenon challenges the *provision of structure* to support learning, creative thinking and creative co-construction of knowledge. It was pointed out that the in-depth case studies seem to indicate that structure is necessary to ensure learning progress. Some claimed that, though the unstructured environment of social computing attracts users, it is not sufficient to keep them in and focused. There was debate as to whether it will remain a requirement to impose structure in the context of formal education, or whether structure could emerge from free activities. Furthermore, the panel did not reach consensus about the role of teachers (and schooling institutions) in this respect, envisioning that, in some cases, learners themselves might define the necessary structure for learning by shaping the educational context in an experiential way.

The main challenges brought about by Learning2.0 approaches with respect to educational theory and pedagogical innovation can be summarised by stating that learning is moving the borders of formal education and schooling systems. This requires a profound re-thinking of i) what learning is beyond the borders of formal education; ii) the role of formal education in contemporary society; iii) the educational methods that shape the practice (there is an increasing demand for focus on the active part of learning, i.e. on the social construction of knowledge, rather than on the passive part of learning, embodied in instructionist theories).

1.2 Organisational innovation

The experts participating in the workshop agreed on the importance of social computing as a driver of innovation and transformation of E&T Institutions.

Much of the discussion centred on the demand for change in the role of teachers who are now requested to provide ‘scaffolding’ to learning. There was disagreement on how much support learners would still need from teachers, or from a structure provided by the learning context and how far Learning2.0 tools are capable of making the learner independent in the learning process.

⁵ Weinberger, D. (2005). Taxonomies to tags: from Trees to Pile Leaves. Release 1.0. Esther Dyson's Monthly Report, 23(2), 1-36.

The future role of institutions (see Section 1.2.1) was also discussed at length. It was agreed that Learning2.0 has started and is mainly happening outside schools, and that it currently has a limited impact on institutional practice. Opinions differed, however, on whether it actually challenges the future of schooling.

Opinions on the future of curricula were diverse. According to some of the experts, a curriculum of basic skills and knowledge should be preserved to provide the grounding for learners to start constructing knowledge in an autonomous manner. Others claimed that current curricula are far from granting this common grounding.

Finally, the experts expressed opposing opinions on the future of assessment and accreditation (see Section 1.2.2). Some argued that summative assessment does not accurately evaluate an individual's competences, implying that there is a need to move towards community-based formative assessment. Employers would be more interested in what people were able to do than in formal certificates. Other experts argued that people in certain occupations, e.g. doctors and plumbers, should be assessed and accredited against some kind of standard.

Box 4 summarises the input from participants during the brainstorming session on the impact of social computing on educational organisations.

L2.0 is affecting educational organisations by:

- Shifting the focus from teaching to learning.
- Advocating the opening up of educational institutions to the external world, even without a change in their core processes.
- Affecting the way institutions and stakeholders understand content and copyright by creating room for free knowledge that users can read, listen to, watch, or otherwise experience; learn from or with; and copy, adapt and use for any purpose; and share derived works similarly (as free knowledge) for the common good.
- Creating new producer-consumer relations and roles and fostering changes in the educational enterprise.
- Having a multiplier effect with respect to the diffusion of innovations at the core of organisations.
- Preparing the advent of emerging technologies.

Organisations will face a number of challenges such as those relating to:

- The ownership of processes.
- The loss of a monopoly with respect to teaching pupils.
- The appropriation and diffusion of innovations (technological and of practices) at all levels of the organisation.
- Economic imperatives.

Some did not agree that educational systems and schools in particular will be transformed by the social computing wave:

- Learning2.0 does not provide alternatives to classroom management, assessment - L2.0 does not match current systems of activities.
- Teachers have no time to spend on exploring the Web2.0 or on integrating it into their practices.

L2.0 will not transform those educational systems where curricula are pivotal and centrally defined. Neither will it affect all systems in the same way since, across Europe, teachers have different degrees of freedom with respect to educational formats, materials and methods.

Box 4. Experts' statements on the organisational impact of Learning2.0.

1.2.1 The role of teachers

Complementing traditional educational models with social computing tools is dramatically changing the role of teachers. They are becoming facilitators of

processes of knowledge (co) constructions, in which learners take a far more active part than they have ever done. Current educational systems may be failing to support their teaching staff to face this challenge.

With respect to the e-learning paradigm, the Web2.0 approach is far less technology-centered and far more learner-centered. This shift of focus carries important changes in the way teaching is understood. Teachers are seen more and more as “scaffolding”, i.e. as guides who help children/students to learn to perform (cognitive) activities that they could not master by themselves.

The breadth of the guidance teachers are capable of providing, thanks to the new social computing resources, encompasses their ability to motivate pupils to commit to self-directed learning experiences, to provide them with structures that keep them focused on the learning objectives, to highlight critical features of the task that they might overlook, thus facilitating the carrying out of the learning activities so that objectives are met. Web2.0 technologies, by providing external support that helps the autonomy of the learner, facilitate the fading away of the role of the teacher. For some experts, Learning2.0 provides the right context to transform the teacher's role according to the principle of contingent instruction proposed by Wood and Wood.⁶

The expert panel agreed that the Learning2.0 wave is not spreading with the same intensity everywhere or with the same consequences. Firstly, Europe is characterized by a wide variety of educational systems that differ – for instance – with respect to the level of freedom teachers have in adopting innovative resources, learning materials, tools and even training plans.⁷ Evidence demonstrates that the Learning2.0 transformation is most effective and successful where there is support from the school (see, for instance, the Jason Welker's Wikinomics example⁸) and not only from an infrastructure point of view.

Secondly, experts remarked that the Learning2.0 transformation is not a "mainstream" phenomenon and is usually implemented by single individuals. It is a challenge for organizations and policy makers to disseminate the value of Learning2.0 innovation and to promote its adoption. The networking possibility enabled by social computing could be seen, for instance, as an opportunity for teachers to network with peers, to reflect on their own practices and transform them, and to collaborate within and outside their own schools.

Thirdly, experts underlined that, whereas the Learning2.0 paradigm advocates a more important role for teachers in the new learning processes, it is not fully understood whether this is what teachers want, or whether they share the vision that social computing and educational theory experts have built around the Learning2.0 approach. It was also noted that today's teachers hold a position because they are expert in *content* (especially at University level), rather than because they are expert in facilitating knowledge acquisition/construction. At present, many of them are frightened by the demands that providing ‘scaffolding’ for personalized learning paths

⁶ Wood, D., & Wood, H. (1996). Contingency in tutoring and learning. *Learning and Instruction*, 6(4), 391-397.

⁷ Analysis of the educational policies and frameworks of the different EU Member States was proposed as research line, to understand how different organisational and curricular contexts give rise to different opportunities for innovation in educational practices.

⁸ http://www.welkerswikinomics.com/Welkers_Wikinomics/home.html

may impose on them in terms of time and effort. What's more, teaching the teachers to become Learning2.0 facilitators would take too long, considering that the pupils are already much more familiar with the new tools than their teachers.

1.2.2 A need for transformation of certification and accreditation systems

During the workshop, there was much debate on formal certification and the way it is being challenged by new practices emerging in society thanks to the changes brought about by the social computing phenomenon.

It was argued that social computing is actually providing an alternative to certification and accreditation, by fostering the model of social recognition, thus challenging the core structure of formal education.

No consensus was reached. Some experts claimed that there is some content that needs to be certified, e.g. doctors need to know the names of bones – i.e. some standardised measures for accreditation of competencies will always be required. Others claimed that patients are not really interested whether their doctor knows the names of bones, but they do care about his/her ability to cure them. In this respect, peer recognition might be considered to be a better proxy for the doctor's ability to cure than certification.

Shifting from a certificate-centred model to a peer-recognition based one, in any case, would need a system to recognize the acknowledgement of competence demonstrated within communities of practice.

Some experts argued that the two models are not contradictory, rather complementary: certificates represent a sort of signalling to the labour market, but distinctiveness is communicated via social, community recognition. Indeed, certificates are generally used when a person enters the labour market. After 20 years of experience, what certificate he/she has does not really matter. The common opinion was that reputation, recognition, and peer review are gaining more and more relevance and that they are already complementing credits and certificates in many situations. A possible replacement of certification by reputation-based social recognition was not excluded. However, some statements though were more sceptical, hinting at the unfairness and overrated importance of peer-reviews, though it was agreed that current models of assessment and certification are suboptimal and would benefit from being redefined in scope and modalities.

1.3 Technological innovation

Workshop participants were unanimous in the view that Learning2.0 is not only the result of technological innovation, but also the outcome of social computing take up in educational practices. It depends far more on pedagogical and organisational innovation than on technology.

The debate however highlighted some technology-related aspects that may affect take up, such as universal access, broadband, open software-related issues, and licensing of content.

Some of the experts mentioned that Web 2.0 has generated an unprecedented amount of information and data-points about users, most of which is beyond users' control, and could 'come back' to haunt them (e.g. cyber-bullying, information posted on social networks used as negative evidence in screening job applicants, social engineering or identity theft). E&T institutions are risk-averse as regards adopting educational material, the quality of which is not certified, and also where the safety of their students⁹ is concerned. If Learning2.0 builds on the World Wide Web, it is clear that pupils and their teachers have no 'safety net' in relation to their online activities, beyond their own critical skills.

Furthermore, it was remarked that Web2.0 applications raise issues relating to intellectual property and moral rights of authorship intrinsic in cultural production. Such rights are not clearly recognised, and are hard to attribute. There is a risk that they will get lost in a regulatory void.

The point was also made that the Web2.0 environment very much counts on *reputation*, which has become a key factor for success in transactions mediated by ICT. Participants highlighted the fact that reputation dynamics, linked for instance to feedbacks systems, folksonomies, public comments and recommendation systems are likely to inspire the evolution of accreditation and certification systems in the E&T domain (see Section 1.2.2).

Other issues that were raised concern *design and development* of new applications and the need to actively involve teachers in the process of defining requirements and to adopt an iterative design approach. Ensuring that education-specific solutions are designed by involving prospective users was mentioned as a requirement to ensure that the tools will be appropriated in teaching practices (LeMill,¹⁰ the Web community for finding, authoring and sharing learning resources, was cited as an example that calls for an early involvement of teachers in the design of educational resources based on the Learning2.0 paradigm).

During the discussion, it was mentioned that the Learning2.0 approach calls for flexible access to educational resources that does not fit today's compartments. The boundaries between school and home, between formal, non formal and informal learning, between teachers and learners, between education and entertainment media, between content management systems/ learning management systems and Web2.0 tools are blurring. Experts agreed that this blurring of the boundaries calls for an open mobile platform that enables production and usage of educational content which is accessible to anyone, anywhere. It was noted, however, that educational content for mobile usage is in the early stages (e.g. podcasts), and full take up by industry and users has yet to come.

Though the panel did not disregard the fact that technological enablers could become the locus for future disruption of existing modes of educational material consumption (e.g. mobile learning), they insisted that technology should not be the main focus of attention. They believed that the modernisation of E&T will come about through the

⁹ During the workshop, it was mentioned that while many schools are incorporating the Internet among their educational resources, and others are experimenting with it as a learning platform, there are also institutions that have chosen to ban Web 2.0 sites like YouTube to prevent children from accessing unsuitable content.

¹⁰ <http://lemill.net/>

promotion of a learner-centred approach, rather than by adoption of one technology or another.

1.4 Inclusion

Part of the discussion focused on the effects that the transformation of the E&T sector by the adoption a Learning2.0 approach might have on the growth of a more inclusive European society. Participants acknowledged that social computing has the potential to foster greater inclusion and that this potential could be exploited in educational contexts. The IPTS study on Learning2.0 practices provided evidence of a number of successful E&T initiatives which could represent ways for Europe to foster inclusion. Though the experts agreed that the limited number of these initiatives does not allow general statements on the contribution of social computing to the inclusion area, they did, however, claim that, when adopted in educational contexts, social computing can be used to i) build a bridge between minorities and majorities: ii) open up new possibilities for learners by going beyond the borders of formal education (non formal self-directed learning): iii) help young immigrants to understand the new context in which they find themselves and build their own identity in Europe; and iv) help institutions, teachers and learners to embrace diversity.

The main challenge at present is to define criteria to identify the actual value and success of such initiatives. Some were proposed during the workshop: (a) the opening up of job opportunities, (b) the creation of lifelong learning opportunities and (c) the creation of a third learning space, away from school and home, the learner's private and individual space for development. It was also pointed out that an important facet of social computing relates to the concept of *identity* (how individuals define themselves – e.g. by setting up a profile page - and how individuals are identified by others – e.g. by leaving behavioural traces in the digital environment). Some experts highlighted that the development of a concept of identity is a critical learning process (e.g. students construct their own identity, and learn to recognise the identity of others). The identity dimension was therefore mentioned as relevant for an analysis of the impact of Learning2.0 initiatives for an inclusive society.

The actual success in supporting inclusion of the projects analysed in the study was debated. Some experts argued that even though new learning opportunities are provided, the certificates issued by targeted initiatives might not open up new training or job opportunities for the learners. Others held that the idea behind the surveyed projects is to enable learners to be accepted and successful in more traditional and recognised training programmes. Therefore, their value lies not in a certificate, but in acquiring “learning to learn” skills. Again the issue of certification remains unresolved. In addition, the experts mentioned the risk that Learning2.0 might end up empowering those that are already empowered. It could create new forms of exclusion through new technological and digital skill divides (e.g. the increased access to information needs greater and greater skills to cope with the information overload), and also worsen the effects of economic divides.

It was further noted that there is no single disruptive technology behind inclusive Learning2.0. In fact, most of the projects surveyed in the study rely on very basic technological solution that might not even be classified as “2.0”. Rather, in all these examples, human transformation is the disruptive factor; new dreams, a new passion. However it was pointed out that digital exclusion is a fundamental barrier f

Learning2.0, beginning with access to bandwidth. Furthermore, it was argued that if the core value behind the paradigm is that of providing learning *to everyone anywhere*, then further research and development on the mobile platform should be encouraged.

2 A New Schooling Culture

The experts underlined the fact that the social computing phenomenon has already deeply affected the way people learn, empower themselves and are able to achieve better performance thanks to the availability of a *collective intelligence*. However, though this change can already be traced in society, formal education has not yet been capable of reaping the benefits from this transformation.

The very notion of 'Learning2.0' arose to seize the opportunities Web2.0 can offer to current educational models, and to understand how they are being challenged by bottom-up initiatives taking place at the boundaries of the educational system. The panel indicated that institutions and policies have failed to anticipate the disruptive potential of the phenomenon and are now facing the challenge of finding ways of keeping pace with societal change.

The expert panel argued that embracing the Learning2.0 paradigm requires far more than the introduction of new tools. A new culture must be fostered, where being at school is a motivating, engaging experience, where learners are active stakeholders, where they are owners of tangible learning outcomes which remain accessible as open content. The shift to learner-centred schooling, where learners participate in the definition of learning activities requires a cultural shift. Some of the workshop participants stressed that it is crucial to understand how social computing can contribute to such a shift, whether by making schools *learning organisations* or by disrupting the current models that inspire E&T. Some advocated the need for new foundation principles for education. They maintained that current educational models reflect the needs of an industrial society and claimed that a knowledge society has different requirements, which have yet to be defined.

Many contradictions were mentioned that need to be tackled before new E&T models can be devised that fully appropriate social computing technology and mindset. One relates to

Some experts argued that the innovative potential of the Learning2.0 phenomenon lies in its ability to disrupt existing educational schemes. They claimed that Learning2.0 is a distributed and emergent phenomenon which does not have the school (formal education) as its main learning environment. They made the point that a focus on formal education could risk de-emphasising the fact that Learning2.0 mostly happens outside the formal schooling system (lifelong learning). They also said that the attempt by E&T institutions and policy bodies to appropriate social computing within the boundaries of formal education risked underestimating the phenomenon, which may actually be challenging the overall purpose of current educational systems. The discussion led to the assertion that today's schooling reflects the response of the industrial era to the needs of society and production systems. The transition to the knowledge society undermines the logic and values on which existing education systems were moulded. Mass education is most probably not capable of coping with the emerging needs of a society that is much more pluralistic and focuses on the individual, rather than on the masses. The biggest task for schools is to open up to society, to provide resources to the community as a whole, and to overcome the paradigm of the 1st industrial revolution.

Box 5. Current educational systems need modernising to address the needs of the knowledge society. Social computing can represent a lever for disruptive innovation.

the tension between the **learning outcomes** that are expected within a traditional learning paradigm and the learning outcomes that are achieved thanks to the emerging practices enabled by Web2.0 tools.

The experts identified an additional contradiction arising out of the two different timelines involved. On the one hand, the social computing phenomenon is characterised by extremely fast evolution in terms of both applications and practices.¹¹ On the other hand, adoption by institutional actors takes time. Likewise, whereas the take up by society is proceeding fast, the market for educational platforms (e.g. professional training) is still based on standard-compliant dedicated learning content management systems (LCMS). The experts claimed that the professional training market is mainly driven by a cost-reduction principle. If the minimisation of cost is a key constraint, Learning2.0 may not be suitable because it is very human-resource intensive (i.e. it strongly relies on the facilitator's support).

It was also pointed out that further research is needed to understand how institutions transform when Learning2.0 is implemented. For example, how does an organisation's vision change? Are there changes in the way leadership is managed and exerted? Does the adoption of the new tools (conceptual and material) encourage creativity and innovation? Is there a transformation of the organisational paradigm that provides meaning to the institution, such as a shift from a mechanical vision to a biologically inspired (organisation as a machine vs. organisation as a living being)? The evidence collected so far from the case studies and the data base indicates an ongoing transformation that deserves greater analysis.

¹¹ It was noted by one of the experts that the study (review of practices, database, and case-based analysis) should remain 'always beta', i.e. always open to update. Because of the speed of evolution of practices in this particular domain, this research cannot be considered closed, because it will soon become an obsolete snapshot of 2008 state-of-the-art.

3 Identification of Risks

The panel suggested that the formal education world is likely to undergo a process of disruption. It also noted that if E&T institutions are to be part of the transformation and not just suffer its consequences, they must address a number of challenges and risks. The risks that were identified during the workshop are listed below. Where the participants devised possible means of mitigating the severity of the identified risks, these are also mentioned.

- a. There is a risk that Learning2.0 will fail to penetrate educational systems. To mitigate this risk, the experts suggested:
 - Not pushing the paradigm as ICT-enabled learning, and learning the lessons of eLearning.
 - Keeping the focus on the boundaries between formal and informal learning, and on learning settings and contexts wider than the class/school.
 - Ensuring that teachers are involved in the process of transformation, that they share the Learning2.0 vision, that they are skilled enough to promote the transformation.
 - Elaborating incentives for teachers who adopt, set up and promote innovative initiatives.
 - Developing indicators of success to monitor the evolution of the take up process.
 - Encouraging organisations to support bottom-up initiatives.
 - Rethinking the notion of learning outcomes and certification in the light of social computing-enabled practices, to keep the pace with the transformation of society.
 - Fostering the dissemination of best practices, taking into account that social computing phenomena tend to evolve at very high speed.
 - Setting up a cost-benefit analysis. It was argued that the economics of Learning2.0 is an important dimension that has not been looked into deeply enough yet.
- b. The appropriation of the Learning2.0 approach by formal education institutions may lead to a negative impact on the quality of education, and specific risks could arise from:
 - A superficial adoption of social computing applications and in particular of social networking sites. It may lead to a commoditisation of E&T. It was proposed that the development of critical skills in learners be supported.
 - Lack of a formal structure could create entropy. It was proposed that further research be carried out on the role of structures in learning and on the tools (including human actors, i.e. peers, individual, facilitators) that could mediate the provision of structure.
 - Information overload, which might cause loss of focus on learning objectives. The development of critical skills was again proposed as a way of dealing with this risk, together with an emphasis on the teacher's role as a facilitator.

- Discarding the added value of traditional learning methods and approaches because the benefits of Learning2.0 are overrated. Further research, controlled experiments and longitudinal studies were suggested.
- c. Learning2.0 might lead to an impoverishment of the quality of educational content resulting in poorer educational material and also the discouragement of further engagement with social computing applications. The experts saw the development of critical skills by end-users as a crucial means of combating this risk. Additionally, it was mentioned that professional content providers could play an active role in defining new production/consumption models (business models were not addressed).
- d. Learning2.0 could aggravate social and digital divides: "It will empower those already most empowered". It was suggested that the impact of Learning2.0 on inclusion and exclusion should continue to be assessed.
- e. Due to the human effort demanded by management of Learning2.0 processes, experts questioned their sustainability. There is, as yet, no data on this issue, and it was suggested that research be carried out in order to assess the economic impact of the emerging paradigm.

4 Research Needs and Policy Options for Europe

One of the workshop sessions was dedicated to the identification of levers for Europe to reap the benefits of the take up of social computing for learner empowerment. The following sections provide a summary of the discussion on research needs and policy options.

4.1 Research needs

The experts agreed that a high level perspective should be applied when studying the transformation social computing is making in learning opportunities. It was suggested that a broad perspective on the Learning2.0 phenomenon ensures that trends and experiences, flourishing at the edges of traditional education contexts, are not dismissed because of a focus on the core, i.e. on formal E&T environments. Broadening the scope of Learning2.0 beyond the domain of E&T was seen as critical to understanding the way social computing is affecting society and what learning requirements are being imposed by the knowledge society (e.g. what the requirements are that the new recruiting policies emerging on the labour market pose on educational certification).

The panel identified the following issues as relevant for a Learning2.0 research agenda:

What is really new in Learning2.0? Learning2.0 is the result of the impact of social computing on learning, teaching, managing learning environments, and creating and using educational content. It is blurring the boundaries between study, entertainment and social interaction, reflecting the global transformation of a knowledge-based and networked society. However, there is still a need for a deeper understanding of what is really new. The experts advocated the need for more experiments and controlled trials to highlight policy implications in the following aspects of learning:

- i) the way we learn (epistemology of knowledge transformation and development of cognitive function),
- ii) the way the tools that mediate learning are created (educational content and context),
- iii) the goal of education (teaching how to learn, rather than what to know),
- iv) the environments where learning happens (in school, at home, in virtual spaces, on the move),
- v) the actors providing the structure for learning (teachers, peers, individuals themselves).

Can Learning2.0 support innovation and creativity? It was pointed out that neither learners nor teachers are aware of how changed learning and teaching paradigms impact creativity and innovation. More research is needed on how innovation processes are changed as a result of ICT-related processes – inside and outside educational settings.

How can teachers be helped to deal with the transformation? Research should address ways of strengthening teachers and investigate more deeply initiatives run by teachers to understand their way of thinking.

How can new guidelines for assessment and certification be defined? Experts pointed out that research should consider how technology can be used to recognise learning that is already taking place, with a focus on the accreditation of experience. The education system as it is cannot absorb a model that is tailored to non-institutional learning. Some experts warned that “better qualified” should not be confused with “better educated” i.e. the level of qualification can be increased without the level of skills rising. Portfolios could be used to record processes of creativity.

What are the drawbacks of Learning2.0? Research is needed to explore the potential drawbacks of the new tools and practices (from cyber bullying, to increased social and digital divides, to the effects of different adoption and appropriation rate across different institutions and nations).

Monitoring the evolution of practices and the rise of innovations. The IPTS study provides a picture of a number of current initiatives that are valuable indicators of a process of transformation taking place at the moment. The experts agreed that there should be a follow up of the study because the field is evolving so fast that the current study will quickly become outdated. This could, in turn, lead to a misinterpretation of the dynamics of the knowledge society. It was suggested that the inventory be kept open for ongoing input and that surveys be set up to gather data on new experiences and emerging trends in the use of Learning2.0 by different actors and organizations.

4.2 Policy options

The experts highlighted the fact that the E&T panorama in Europe is not uniform. Though the various examples of Learning2.0 practices discussed during the workshop indicated significant potential for transforming this panorama, different Members States have profoundly diverse education systems. European policies have, therefore, a particularly difficult challenge in supporting any transformation of this kind. But this does not mean there is no room for policy actions. On the basis of the research presented, the debate, and the benefits and the risks identified during the workshop, concerning innovation as one of the pillars of the Lisbon Strategy, the following policy options were jointly generated:

Exploit research results: The experts proposed asking the following question: What way of learning could emerge within Learning2.0 which would most foster the EU’s capacity for innovation? Innovation could thus be targeted as a result of changed learning paradigms. Examples from the current Learning2.0 study could be selected to support the thesis that creativity and innovation can be triggered in a targeted way by new learning paradigms.

Develop assessment and certification: Certification is important for ICT-facilitated learning and personalized learning approaches. In order to ensure that social technology is used effectively to support learning, a certain degree of standardisation is needed. It was mentioned that the European Qualifications Framework could be used as a starting point to reform education systems by putting the notion of “competences” at the centre and by taking into account changed learning patterns. However, standards should be kept open and simple and based on realistic models. It was also proposed that stronger emphasis be put on competences like creativity that, at present, are difficult to assess.

Allocate funding: Some experts underlined that although the Learning2.0 approach might seem inexpensive (since it relies on existing infrastructure) its actual implementation requires a significant human resource investment (in terms of competences, effort and time). Funding, therefore, is an item to be considered on the policy agenda.

Disseminate research results and raise awareness: (1) It was pointed out that there are powerful media for exchanging ideas, practices and research evidence, but EU policy makers tend to use traditional means that may not be effective in disseminating results and raising awareness of ICT potential in supporting the changes needed in E&T systems and institutions. It was therefore suggested that a broad collaborative consultation should be launched. (2) Since most people are not aware that learning is a lifelong process, a “Learning awareness media campaign” could be launched, explaining to people how they can learn outside E&T.

Address equity issues: The experts observed that there is a risk of widening digital divides. Initiatives should be directed “at the bottom rung of the ladder”, using the technologies that users prefer and already use, like mobile technologies and interactive TV. These channels can be used to provide learning packages and link networking activities around educational issues. More policy initiatives are needed to bridge the gap between the European Society and groups at risk of exclusion.

Set up Living Labs for Learning2.0: Some experts suggested that more experimental research should be conducted and proposed that “Living Lab” approaches be adapted to Learning2.0; furthermore, it was pointed out that the “Living Labs” have strong policy support at the highest level which might contribute to focussing awareness on the topic.

Train Teachers: (1) Teacher training should be more research-based, so that teachers can integrate research results into their teaching, creating a classroom atmosphere that supports innovation and creativity. Additionally, teachers need to be empowered to reflect on and defend their methodological choices. For example, they must be enabled to make a reasoned decision on whether to choose Learning2.0 methods; they need to know which environments and tools to use for which activities and to be able to inform students and parents. (2) Support for teachers needs to address the dimension of peer learning in teacher networks as well.

5 The Future of Learning

The experts were invited to discuss the future of learning and their comments have been clustered as follows.

The future of learning will be triggered by learners. Most experts subscribed to the idea that major changes will originate from the changed living, learning and communication patterns of the younger generation and that therefore the young learners are in the most favourable position to shape and lead this process: (1) One expert argued that as making a profit in the education market requires targeting either industry or consumers, and the industry is reluctant to invest in Learning2.0 approaches, the consumers, i.e. the learners, will be the ones to take up the new tools and approaches and initiate change. (2) Another expert envisaged that, in 5 years' time, learners will create their own personal environments for learning; education providers will become one of many providers of learning opportunities; and it will be possible to mix and match learning opportunities; (3) a third expert pointed out that there are already initiatives at universities, for example, that award credit points to students who help their teacher in implementing eLearning strategies. Thus, we might witness in 5 years' time the commitment of more and more students to such processes. It was pointed out that if students push adults to use technology, as is foreseen, new learning opportunities could emerge due to societal pressure in 5-10 years time. However, it was remarked that it should be ensured that students have better critical competence when using social computing for learning. The need was identified to address the question of how they can achieve such competence.

The future of learning is Web-based. The experts claimed that one of the most remarkable shifts of perspective brought about by social computing in the world of ICT-enabled learning has to do with the fact that it promotes platform-independent approach. They argued that (1) the Web is the platform: there is no need for any additional (closed) platform; (2) it is preferable to take learning opportunities to where the audience is already, underlining the fact that the learners and their needs are the starting point for all learning.

The future of learning is mobile and embedded in the environment. It was pointed out that mobile technologies are ideal for information distribution, but that the technology is not yet here. However, many experts expect mobile devices to become the most commonly-used learning technology in the near future. Furthermore, in workplace learning in particular, the experts envisaged information being distributed in the environment and mobile technology to be the interface to tacit knowledge and organisational expertise. New photo-sharing tools were mentioned as a future technology that could be important for learning: photos could be embedded automatically in personal profiles, allowing users to present their experiences to others and compare them. Grid computing, grid networks, semantic Web and Web3.0 were also mentioned as important technologies that could support future learning. It was argued that problems associated with these technologies include spying, surveillance and consumer patterns which will need to be addressed.

The future of learning will be shaped by new ways of recording and visualising the outcomes of learning processes: It was observed that we are still lacking a technology that enables the representation of the fact that learning processes have

taken place and that knowledge has been acquired or developed. The creative and intellectual development of a person is not yet adequately captured by knowledge management systems. We need tools that are able to represent dynamic processes of learning over time.

The future of learning will be built on new paradigms: The experts expect that learning and living will converge further; changing people's lives. At the same time reflection, self-awareness, and self-expression will be supported by a new set of tools. An increase in learning at the workplace is to be expected. Some experts predicted the disappearance of schools and teachers: learning will move to homes, learners will be enabled to set up their own individual learning courses and teachers will become redundant. Others emphasized the need to empower teachers. They argued that teachers are losing control, and are afraid of the new developments. Teachers observe that students are learning outside of schools and do not know how to react to this phenomenon. We will continue to need teachers in the future, but these teachers will need to have a better scientific understanding of what learning is and how it happens in the human brain in order to support the learners' (personalised) learning processes.

The future of learning will be closely linked with people's identity: It was observed that outside learning we are moving from data owned by organisations to data held by people. This change in ownership is the common denominator of all Web2.0 and signals the recovery of control by the user. One expert observed that personal data will become crucial and will be managed by the individual owners themselves: you as a user decide how to use your data and who you allow to access it.

The future of learning will lead to new certification forms: Again, these issues gave rise to controversy. Some experts argued that employers already "google" prospective employees rather than looking at their certificates, while others maintained that the certification of competences will always remain under the control of accredited institutions regardless of how and where the knowledge was acquired. One expert suggested developing a competence system with a jointly developed wiki for different professional profiles. Such a system could be used to help individuals create their CVs and communicate their competences to external actors. It would also indicate learning gaps. We might see the emergence of new knowledge management systems, aggregating knowledge, personalising and interconnecting it.

The future of learning requires business models that are not in place as yet: The general perception is that the education field is likely to become more competitive than it is today. In this respect, it can be foreseen that, in five years' time, universities will be more visibly using Web2.0 tools because of the need to recruit students as clients; more universities will make their teaching more transparent, because their funding will be dependent on it.

However, a cost-benefit analysis for setting up Learning2.0 educational practice has not been carried out yet. Whether the future of education will be based on the deployment of social computing will depend on its economic sustainability.

6 Final Remarks

This report presents the major outcomes of an expert workshop that explored the impact of the Learning2.0 approach for E&T in Europe. Rather than providing a synthesis of the results of the different IPTS studies that were presented at the workshop, it offers a structured account of the debate that took place.

A special challenge for studying this phenomenon is the limited availability and comparability of short and longer-term data on the take up and use of social computing tools in educational contexts. The recent nature of the phenomenon, its experimental nature within formal education contexts, and the speed of its evolution are among the main reasons for being cautious in interpreting the collected data. Notwithstanding this warning, it was acknowledged by experts that the research is a valuable first step towards spotting trends and understanding a process of transformation that is likely to affect the way education is organized. The experts highlighted the areas where more research is needed to understand the phenomenon in depth so that the process of transformation can be supported in the most effective way.

The workshop highlighted the fact that there is a shared belief that Learning2.0 is happening and it is a phenomenon emerging from outside institutions. However, it is likely to impact on formal E&T institutions more and more. In particular, it was mentioned that Learning2.0 has a strong potential for supporting the innovation that E&T needs to fulfil the needs of contemporary society. The workshop pinpointed many issues that must be addressed by research to understand the phenomenon (added value, drawbacks and bottlenecks). It also indicated that policy development plays a key role in ensuring that formal education benefits from the take up of the Learning2.0 approach.

7 Annexes

Agenda

DAY 1 – WEDNESDAY, 29 OCTOBER 2008

Session 1: Opening

09:30 Welcome and introduction. (Yves Punie and Lieve van den Brande)

09:40 Objectives of the workshop (Yves Punie)

10:00 Presentation of participants

Session 2: An overview of Learning2.0 in Europe and the rest of the world

10:30 Presentation of IPTS desk research results (Christine Redeker)

11:20 Discussion

Session 3: The landscape of Learning2.0 in Europe

12:00 Presentation of the IPTS Learning2.0 database results (FIM and Arcola)

12:20 Discussion

Session 4a: A closer look at the potential of Social Computing to support innovation in learning

14:00 Presentation of the IPTS in depth case studies on innovation (FIM)

14:20 Discussion

Session 4b: A closer look at the potential of Social Computing to support inclusion in learning

15:00 Presentation of the IPTS in depth case studies on inclusion (Arcola)

15:20 Discussion

Session 5: Key impact areas of Learning2.0 on E&T: A brainstorming exercise

16:30 Introduction (Kirsti Ala-Mutka)

16:40 Moderated brainstorming and clustering activity

17:30 Discussion and reflection

18:00 *Close of first day*

DAY 2 – THURSDAY, 30 OCTOBER 2008

Session 6: Opportunities and challenges of Learning2.0

09:30 Summary of first day discussions (Kirsti Ala-Mutka)

09:45 Moderated group activity (Kirsti Ala-Mutka)

10:15 Presentation of group results

10:35 Discussion

Session 7: Policy options for Europe

11:15 Introduction: Policy options for Europe (Lieve van den Brande)

11:30 Open discussion on policy options and avenues for further research

Session 8: A vision on the future of Learning2.0 in Europe

12:00 Open discussion on the future of ICT in E&T in Europe

12:45 Workshop Conclusions (Yves Punie)

13:00 *End of Workshop*

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Abstract

This report presents the outcomes of the expert workshop held at the Institute for Prospective Technological Studies (IPTS) on 29 and 30 October 2008 to discuss the impact of the social computing on Education and Training (E&T) in Europe.

The workshop aimed to validate the results of the Learning 2.0 study, launched by IPTS in collaboration with DG EAC. The study explored the impact of social computing on E&T in Europe (in terms of contribution to the innovation of educational practice, and to more inclusive learning opportunities for the knowledge society). It also assessed Europe's position in the take up of social computing in formal educational contexts and - by identifying opportunities and challenges - devised policy options for EU decision makers.

The report offers a structured account of the debate that took place during the two day workshop. It reflects the discussion on the potential of social computing take up in organized educational contexts, focusing on innovation (from the pedagogical, organisational and technological standpoints), and on inclusion. It further discusses how, despite the recent emergence of the phenomenon mostly outside E&T institutions, its primarily experimental nature within formal E&T contexts, and the speed of its evolution, there are clear signs that it can transform educational practice and that a new schooling culture is called for. The report then presents the main risks that were identified by the experts and proposes a number of items for research and the policy agenda to respond to the educational needs of society as it is being transformed by the social computing wave. Finally, it summarizes the trends identified as likely to affect the future evolution of the learning landscape.

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