# Mass Collaboration with Social Software in TEL

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## The Social Web as Cultural Revolution

The Internet has undergone numerous transformations in its less than 20 years of existence. As discussed in the first of our selected papers, a fundamental transformation was its migration from *Web 1.0* (with a broadcast-oriented architecture enforcing a strict separation between consumers and producers) to the social *Web 2.0* (supporting broad-based participation allowing users to create and share collaboratively constructed artifacts) (O'Reilly, 2005).

Web 1.0 environments were focused on a platform where authors could publish information and make it accessible for large audiences enabling flexible opportunities for one-to-many communication. The majority of users were recipients of the content provided by a minority of publishers.

Web 2.0 environments supported the continual evolution and improvement of tools, services, and information repositories by allowing active participation. Users in Web 2.0 can migrate (if they desire to do so) from passive consumers to "prosumers" (Tapscott & Williams, 2006): persons who simultaneously consume and produce information. The produced content can range from small pieces of information (e.g.: tags, tweets, ratings, or traces of the navigation behavior) to substantial contributions (an entry in Wikipedia, a movie in YouTube, or a 3D model in Google's 3D Warehouse). Based on a large number of prosumers, these small contributions can be aggregated and represent the "collective intelligence of the masses" (Surowiecki, 2005). Web services can harness this collective intelligence and make it accessible for individual users, for example by providing recommendations, tag clouds, or collaboratively written texts.

This technical revolution of the social Web 2.0 was seen initially to have an impact on many aspects of our culture by enabling new business models that are defined by openness, interaction with peers, sharing, and acting globally (Tapscott & Williams, 2006). Tapscott and Williams observe that "millions of people already join forces in self-organized collaboration that produce dynamic new goods and services that rival those of the world's largest and best-financed enterprises"(p. 11). This new mode of innovation and value creation called "peer production" describes what happens when masses of people and firms collaborate openly to drive innovation and growth in their industries (von Hippel, 2005). Jenkins suggests that peer production is not an isolated event by citing empirical data that in the USA "more than one-half of all teens have created media content, and roughly one-third of teens who use the Internet have shared content they produced" (Jenkins, 2009, p. xi). Benkler goes one step further by arguing that the social Web will provide enhanced autonomy of people and will

impact democracy, justice and human development (Benkler, 2006). Cress, Jeong and Moskaliuk (2016) and Cress, Kimmerle and Jeong (2016) describe how these emerging forms of mass collaboration can have an impact on education.

## Learning as Participation

Besides these expectations that the Web 2.0 could have a positive influence on economics and democracy, it has the potential to provide new opportunities for learning. More than 35 years before the concept of Web 2.0 was created, Illich stated that "a good educational system should have three purposes: it should provide all who want to learn with access to available resources at any time in their lives; empower all who want to share what they know to find those who want to learn it from them; and, finally, furnish all who want to present an issue to the public with the opportunity to make their challenge known" (Illich, 1971, p. 75). He dreamed of an "educational opportunity web" where learners can engage in collaborative activities serving as foundations for new learning opportunities. By giving not only access to existing information (e.g., curriculum-based learning materials taught in courses), socio-technical environments based on Web 2.0 architectures also provide opportunities for collaboration in small and large groups (further enriching the learning ecologies provided by more traditional research in Computer-Supported Collaborative Learning CSCL). With social software such as wikis, blogs, Facebook, and Twitter, thousands of people can exchange knowledge and co-construct new knowledge.

These are developments towards what has been described as a second metaphor of learning (Sfard, 1998). Whereas in cognitive psychology "learning" mostly was considered as *knowledge acquisition*, where individuals developed an abstract internal representation of the world around them, more situated approaches describe learning as *participating*. Knowledge, described in this metaphor, is not something that people *have*, but something people *do*. In this perspective, learning happens by participating in sociocultural activities described as legitimate peripheral participation (Lave & Wenger, 1991). This complementary view explores a much broader perspective on learning (Engeström & Sannino, 2010) that is not restricted to formal settings in schools or universities, but happening in real life by observing others and interacting with them (National Research Council, 2009). Paavola, Lipponen, and Hakkarainen added to Sfard's two metaphors of learning a third one: the *knowledge creation metaphor* (Paavola et al., 2004). This metaphor understands learning as a collaborative effort directed toward developing some mediated artifacts including knowledge, ideas, practices, and material or conceptual artifacts.

Brown and Adler (Brown & Adler, 2008), in the second selected paper, describe the new possibilities that the social web has with regard to this understanding of learning. With social software people can directly interact in large-scale virtual worlds and participate in projects where they interact and collaboratively create knowledge. One unique opportunity of Web 2.0 is support for *long-tail learning* (Collins, Fischer, Barron, Liu, & Spada, 2009) by providing opportunities for interactions of passionate learners sharing an interest in idiosyncratic niche topics. Whereas traditional formal education provides learning environments in support of a selected curriculum, the web offers content and social ties to an almost unlimited number of

people. Long-tail learning occurs in socio-technical environments that provide information and support special interests of individuals.

One of the hottest topics these days is creating Higher-Education Courses with massive enrolments (also referred to as a "massive open online course" (MOOC)) having the objective to support education for everyone and for all interests. There is currently a substantial interest based on developments such as:

- MIT's and Harvard's *edX project* offering online learning to millions of people around the world[1];
- *Coursera,* offering free courses for everyone by an alliance between Stanford, Princeton, Michigan, and Penn[2];
- *Udacity*, a private company with the goal of creating and offering classes to hundred thousands of students[3].

Interesting questions to ask based on these developments are:

- *what is covered* by these educational experiences (by being free, open, and large-scale; by containing rigorous content; and by offering learning analytics opportunities (Duval, 2011) based on very large numbers of participants); and
- *what is not covered?* (If MOOCs base on the traditional model of an instructionist classroom, there is little support for self-directed learning, debate and discussions, and reflective conversations. However platforms where developed hat take into account an explicit pedagogy of collavorative and social learning, e.g. the platforms FutureLearn or OpenClassrooms?

Interesting complementary developments (covering a very large number of idiosyncratic topics and thereby being supportive of the Long-Tail framework for learning) are:

- the *Khan Academy* that advertises its role as "Watch. Practice. Learn almost anything for free with over 3,100 videos"[4]
- *iTunes U* (organized by Apple) supporting the design and distribution of courses to allow students to "learn anything, anywhere, any time"[5]; and
- the *One Laptop per Child (OLPC)* initiative focused on the $100 computer, which so far has been delivered to over 2.4 million children and teachers primarily in developing countries[6]

## Theoretical Frameworks for Learning with Social Software

As the world is becoming more complex and interconnected and the changes within human life times are further accelerated (Drucker, 1994) new learning ecologies are needed. The knowledge needed to cope with systemic problems transcends the individual, unaided human mind. Social software focused on connecting humans and artifacts provides new opportunities,

[1] https://www.edx.org/
[2] https://www.coursera.org/
[3] https://www.udacity.com/
[4] https://www.khanacademy.org/
[5] http://www.apple.com/education/itunes-u/
[6] http://one.laptop.org/

and theoretical frameworks are needed to create a fundamental understanding of the strengths and weaknesses of mass collaboration.

Whereas in former times collaboration was mostly bound to smaller groups, social software now provides the possibility for collaboration of masses of users. Because this is a new phenomenon, only some initial theoretical frameworks exist so far (Benkler, 2006). Following the initial vision of Illich's learning webs, Scardamalia's and Bereiter's knowledge-building model (Scardamalia, M., & Bereiter, 1994) represented an early important forerunner for the social Web. They used a platform where students can generate their own theories about a given topic, describe it and share it with others by writing contributions into a shared artifact where the articulated ideas could be discussed with others for further elaboration and/or criticism. Through such a logic of "abduction" (Glassman & Kang, 2011) the group as a whole reaches deeper insights into the domain of interests and allows the group members to develop a shared understanding.

The third selected paper describes the "Co-Evolution Model of Individual Learning and Collective Knowledge Building" (Cress & Kimmerle, 2008; Kimmerle, Moskaliuk, Oeberst & Cress, 2015) that explicitly deals with mass collaboration. It takes into account that in mass collaboration users need not necessarily form a group with common interests or common goals. Instead, users can just work in parallel and each can make use of the shared artifact. Nevertheless, as users refer to each other and interact with them, the group represents a self-organizational system. Users, considered by the model as cognitive systems, interact with the artifact by internalization and externalization. As a result of this interaction, learning occurs in four ways: as internal accommodation or assimilation (the individual learns) or as external accommodation or assimilation (the social system learns) (Cress, 2013).

The research of the Center for LifeLong Learning & Design (L3D) at the University of Colorado, Boulder, has been grounded in the basic objective that a science of learning for the 21st century needs to explore richer learning ecologies than traditional curriculum-based classroom learning by conceptualizing learning as an inclusive, social, informal, participatory, and creative lifelong activity (Collins, & Halverson, 2009). The learning goals and the content of the learning activity should not only be determined by curricula but by interest-based, self-directed learning objectives. Many problems (specifically design problems) are unique and ill-defined and the knowledge to address them is not "out there", requiring contributions and ideas from all involved stakeholders (Fischer, 2007, 2016). Learners in such settings must be active contributors rather than passive consumers and the learning environments and learning organizations must foster and support mindsets, tools and skills that help learners become empowered and willing to actively contribute.

L3D's concept of "cultures of participation" (Fischer, 2011) (the fourth selected paper) articulates a framework and describes socio-technical environments that provide learners of all ages with the means to become co-creators of new ideas, knowledge, and products in personally meaningful activities. The research on cultures of participation has focused on three specific aspects: (1) *meta-design* that defines and creates social and technological infrastructures in which cultures of participation can come alive and new forms of collaborative design can take place; *(2) social creativity* that creates environments in which

participants collectively can transcend the individual human mind by supporting interactions between people and shared artifacts; and (3) *richer ecologies that* create different levels of participation by differentiating, analyzing and supporting distinct roles with regard to people's variations in expertise, interests, and motivations.

## Examples for Empirical Analyses of Mass Collaboration

An increasing number of studies analyze learning and mass collaboration with social software. Some prototypical examples are:

- Bryant, Forte and Bruckman investigated *how people become Wikipedians*. Based on the concept of legitimate peripheral participation they show that users, as their participation becomes more central and frequent, adopt new goals, new roles and use different tools. Their perceptions of Wikipedia change, they start to identify with the site and the community (Bryant, Forte, & Bruckman, 2005).
- Kittur and Kraut examined the *quality of the mass collaboration* with regard to explicit and implicit forms of coordination of mass settings. They investigated how the number of editors in Wikipedia and their coordination methods affect the quality of an article. They came to the conclusion that adding more editors to an article improved article quality only when the authors used appropriate coordination techniques and it was harmful when they did not (Kittur & Kraut, 2008).
- Another social software tool, which stimulated empirical research about its potential for learning is *social tagging*. Fu, Kannampallil, Kang, and He provided a cognitive model of semantic imitation showing that users over time adapt to the conceptual structure of the collective. Their data show evidence that by using a social tagging system users internalize the conceptual structure of the community, and thus learn incidentally (Fu, Kannampallil, Kang, & He, 2010).
- *Citizen science* facilitated by the web and conducted by pro-amateurs (Leadbeater & Miller, 2008) in areas such as protein folding (e.g.: Fold It[7]), astronomy (Galaxy Zoo[8]), and life on earth (animals and plants in the Encyclopedia of Life (EOL)[9]) have created synergistic interactions between professional and pro-amateurs creating new learning cultures that benefit all participating stakeholders.

## Drawbacks of Mass Collaboration

Mass collaboration with social software opens up new opportunities for TEL, but the approach is not without drawbacks (Keen, 2012; Carr, 2010). One such drawback is that in many situations humans are reluctant to participate actively. Even if they wish to have access to other people's information and knowledge, they are not willing to contribute their own knowledge and information, especially if this needs effort (Kimmerle & Cress, 2008). Furthermore, humans may be forced to cope with the burden of being active contributors in *personally irrelevant activities* that can be illustrated by "do-it-yourself" societies (Fischer,

[7] http://fold.it/
[8] http://www.galaxyzoo.org/
[9] http://eol.org/

2011). Through modern tools, humans are empowered to perform many tasks themselves that were done previously by skilled domain workers serving as agents and intermediaries. Although this shift provides power, freedom, and control to customers, it also has forced people to act as contributors in contexts for which they lack the experience that professionals have acquired and maintained through the daily use of systems, as well as the broad background knowledge to do these tasks efficiently and effectively (e.g., companies offloading work to customers).

More experience and assessment is required to determine the design trade-offs for specific contexts and application domains in which the *advantages* of cultures of participation (such as extensive coverage of information, creation of large numbers of artifacts, creative chaos by making all voices heard, reduced authority of expert opinions, and shared experience of social creativity) will outweigh the *disadvantages* (accumulation of irrelevant information, wasting human resources in large information spaces, and lack of coherent voices). The following research questions need to be explored:

- Under which conditions is a fragmented culture (with numerous idiosyncratic voices representing what some might characterize as a modern version of the "Tower of Babel" and others as refreshingly diverse insights) better or worse than a uniform culture (which is restricted in its coverage of the uniqueness of local identities and experience)?
- If all people can contribute, how do we assess the *quality and reliability* of the resulting artifacts? How can curator networks effectively increase the quality and reliability?
- What are the roles of *trust, empathy, altruism, and reciprocity* in such an environment and how will these factors affect cultures of participation?

## Challenges and Opportunities for Future Research

Mass collaboration with social software in TEL is a new phenomenon providing many interesting challenges and opportunities for future research. Some of those are the need to: (Fischer, 2011):

- identify the *social abilities, technical skills, and cultural competencies* people need for active participation;
- extend the *theoretical framework* to support the design of socio-technical environments in which users can act as co-designers in personally meaningful problems;
- analyze different *design objectives and requirements* (e.g.: creating seeds for open, living artifacts) and consumers cultures (e.g.: create complete systems);
- broaden the scope of human-centered design from the usability of systems to providing resources, incentives, information to encourage participation and sustain it and allow users to reflect upon *changing their behavior*;
- create a deeper understanding how TEL approaches harness important social benefits related to *national priorities such as* energy sustainability, lifelong learning, education, and healthcare; and

- differentiate domains in which TEL approaches will flourish and be successful from the ones which are not suited by exploring the *drawbacks* associated with these new approaches.

With consideration of these topics mass collaboration has the potential to change our view on learning by pointing to the strong interrelation about individual processes of knowledge acquisition and collaborative and social processes.

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