Web 2.0 goes academia: does Web 2.0 make a difference?

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Abstract: Web 2.0 is often attributed with a high potential to address today's challenges in knowledge management and distributed collaboration. This is due to the focus on innovative and creative sociotechnical concepts that are strongly influenced by informal communication and collaboration. This development has already reached industry. Using the term 'Enterprise 2.0', different possibilities to use social software in enterprises are researched. But also in academia, cooperation to generate new knowledge and add it to the scientific discourse may radically change under open Web 2.0 conditions. In addition, teaching and learning scenarios might be moved towards technology-enhanced lifelong learning communities. In this article, we will give an overview of the influence that Web 2.0 has on academia and what innovative forms of cooperation might emerge from this. Before we focus on academia and show the potential of Web 2.0 in this domain, we first describe Web 2.0 as a sociotechnical phenomenon and show how technical and social systems differ in order to define Sociotechnical Communities (STCs) and the criteria for them.

Keywords: technology-enhanced learning; Web 2.0; educational change; higher education; sociotechnical design; social software; academia; research; collaboration.

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1 Introduction

Web 2.0 (O'Reilly, 2005) is already an incredible success story, even if it is only a few years old. The focus on more or less new software systems that particularly address human communication and collaboration has already had a lot of impact on the public internet and organisations' intranets.

The most common characteristic of Web 2.0 or social software is to enable people to share knowledge online, for example, in wikis, via communication tools (*e.g.*, weblogs), in social networking applications (*e.g.*, Xing or Facebook) and social tagging services (*e.g.*, del.icio.us).

The most important (new) concept in the Web 2.0 is *participation*. It is a free cooperation of as many people as possible without any restraints from organisations, processes, technologies or particular (technical) platforms. To achieve this participation, some additional key concepts are often cited:

- *usability* – achieved by being web-based and interactive (Ajax) and allowing easy integration and combination (feeds, Really Simple Syndication or RSS)
- *'me'-centricity* (*e.g.*, Twenge, 2006; Palfrey and Gasser, 2008) – the core of Web 2.0 is a direct usefulness for the single user – which can lead to high intrinsic motivation – in contrast to the indirect value defined by the benefit for teams and communities

- *Flow experience* – to participate at a Web 2.0 platform can support fun, makes its users creative, supports happiness and therefore promotes a flow experience (see a definition about flow in Csikszentmihalyi, 1990).

Buzzwords and headlines like "Everyone is a Publisher" and "Wisdom of the Crowds" (Surowiecki, 2004) are representatives for lots of projects to fill this phenomenon with life.

Because Web 2.0 or the social web focuses on innovative sociotechnical concepts that are strongly influenced by human communication and collaboration, practitioners as well as researchers often assume that Web 2.0 has high potentials. These potentials may also be supposed for academic practice with respect to teaching, learning and research and, therefore, will have a sustaining impact on this field. For example, cooperation to generate new knowledge and add it to the scientific discourse may radically change under open Web 2.0 conditions. In this contribution, we will show some potentials and good-practice examples for such a transformation within the field of research and teaching.

Before we focus further on Web 2.0 within academia, we first describe Web 2.0 as a sociotechnical phenomenon and show how technical and social systems differ in order to define Sociotechnical Communities (STCs) and the criteria for them. This discussion is intended to give a basis for the classification of the Web 2.0 potentials presented in this contribution and in all the other papers in this special issue.

2 Web 2.0 and Co.: a sociotechnical phenomenon

While Web 2.0 is often connected with only some (new) technical features, in reality, it is more a social shift than a technical development. The successful implementation of Web 2.0 ideas depends on the design of the complete Sociotechnical System (STS) – including motivational systems, free participation, more informal than formal structures, supporting me-centricity by also having an outcome for the entire group, fostering communication and active interaction and enabling a flow experience.

2.1 Sociotechnical systems and sociotechnical communities

In general, "a socio-technical system (STS) is a social system sitting upon a technical base, with email a simple example of social communication by technology means" (Whitworth, 2009). The components of an STS consist of technical and social parts (Coakes, 2002).

When we talk about technical systems, we mean Information and Communication Technologies (ICTs). In contrast, social systems are, for instance, people in groups or companies. To create a successful interplay of social and technical systems, it is essential to understand the differences: the social one is autopoietic and constituted by communication and contingency, while the technical one is deterministic (to its utility) and allopoietic (Luhmann, 1995). The focus of an STS in general lies on the 'web of communications'; in other words, an STS is technically mediated human interaction.

From this viewpoint, an STS is "a system that includes hardware and software components that has defined operational processes that are followed by human operators and that operates within an organisation. It is therefore influenced by organisational

policies (rules), procedures and structures" (Sommerville, 2004). Typical STSs are, for example, groupware systems, knowledge management systems and social networking applications and web-based communities.

In contrast to general web-based, online or virtual communities in society such as Wikipedia or Facebook, this special issue focuses on the STCs in academia. An STC is defined as a network of social relationships of people sharing the same topics or problems fostered mainly by computer-mediated human interactions. An STC, depending on the content, lifespan and group size (Preece *et al.*, 2004), is part of an existing formal institution and is different from general online communities since an STC delivers a kind of interaction space that enables communication between members and other people within a university, faculty, organisation or company. An STC has the potential to reduce social complexity and information overload from the official organisation and makes it easier to get only the information that a member needs at a given time (Jahnke, 2008).

The challenge in creating such STSs is in designing the interaction between the social and technical parts. Whether this type of system really contributes to knowledge sharing within organisations depends on the corporate culture and the degree to which the social and technical structures are adjusted to each other and how they are integrated. In other words, it depends on how efficiently and successfully the technical system interacts with the social system and vice versa (Herrmann *et al.*, 2007). In this context, Eason (1988) emphasised: "the specification of a new socio-technical system must include the definition of a social system which enables people in work roles to co-operate effectively in seeking organizational purposes".

2.2 Social software

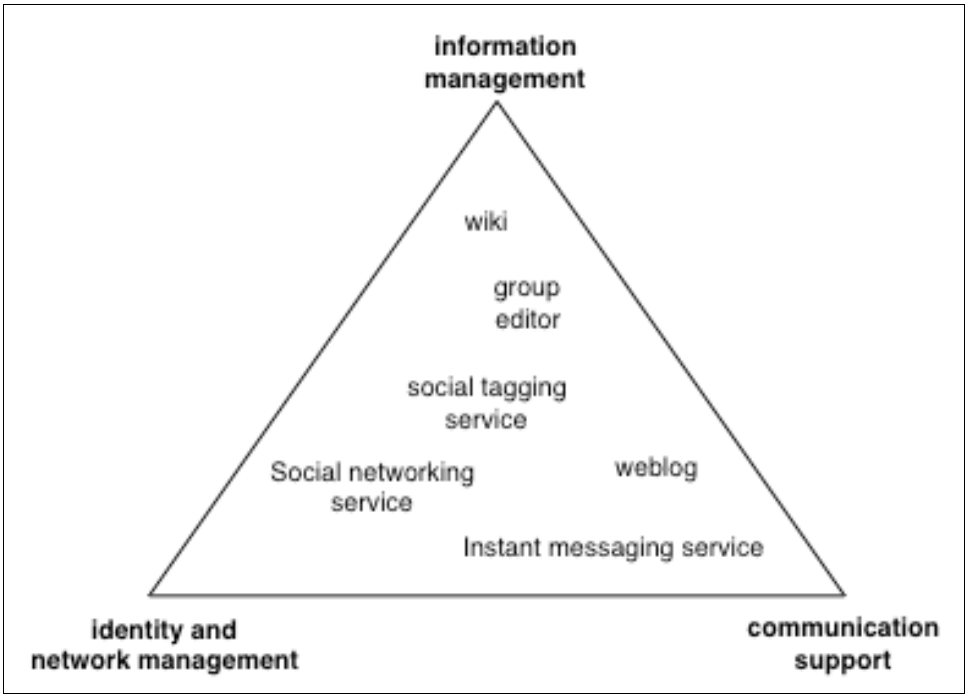
The technical part (application) of Web 2.0 is social software – software or services that support, extend or derive added value from human social behaviour (Coates, 2005). Here, we have the core concepts from Web 2.0 again: it is about human behaviour and the participation of single users, not primarily about collaboration (like in groupware). In other words, the focus is on making it easy for the single user to create and comment content (for his/her own use or for simple intrinsic motivation) and not so much on complex collaboration scenarios. STCs and other forms of collaboration occur more or less as a by-product of the single user's activities.

McAfee (2006) summarised the characteristics of social software through an acronym: Search, Links, Authoring, Tags, Extensibility, Signals (SLATES). We are using a slightly adapted version to characterise the core concepts further (Koch and Richter, 2008):

- being able to publish contributions or edit content as easily as possible ('Authoring')
- contributing structuring metadata by tagging ('Tags')
- adding additional content and metadata by annotation and linking ('Authoring', 'Links')
- possibility to subscribe to new content ('Signals')
- being able to find new content ('Search', 'Tags')
- the modular, service-oriented and data-centric design of applications ('Extensions').

Social software can also be classified into some core application classes, *e.g.*, wikis or weblogs. We have tried to organise the application classes into a triangle, with the core support concepts at the edges: information management, identity and network management and communication (see Figure 1 or related work, *e.g.*, by Schmidt, 2006, or Hippner, 2006).

Figure 1 The social software triangle



Source: Koch and Richter (2008)

The three core support concepts in the social software triangle can be used to identify the support potential in different application domains:

1 *Information management* – Users collect, co-write and annotate information, *e.g.*, in social tagging services or in group editors like wikis.

2 *Communication (support)* – Users communicate directly with each other, synchronously in instant messaging applications or asynchronously in forms and weblogs.

3 *Identity and network management* – Users present themselves to others and search for/find others by this information and link to each other; additionally, information about the current status and activities of the users are distributed to the network (network awareness – the network as an information filter). This part is nicely supported in Social Networking Services (SNSs), but also partly in social tagging services and instant messaging services.

2.3 Computer-mediated human behaviour, (in)formal structures, social roles

The social part of STCs is the human behaviour and interaction that consist, on the one hand, of people playing roles and using technical systems to communicate and share knowledge. On the other hand, the technical system restricts the interaction between community members by its software and hardware functions. Social roles define a set of activities performed by individuals (Goffman, 1972) and the range of expected behaviour within a group. For instance, a person who teaches has special behaviour patterns such as 'giving some instructions to the group', 'beginning when the class starts' or 'standing in front of the class'. The group expects such activities and labels such people 'teachers'. If the person in the teacher's role would make totally different things, parents, students or other teachers would probably intervene. They would give negative feedback and sanctions or commence discussions with the abnormal teacher to rearrange his/her behaviour. To conclude, a role and its role playing depend on the values and norms of a group, community or social system. A person's role playing can be restricted by people who have the possibility or power to restrict alleged 'false' behaviour. Therefore, a role and the assessment of good or bad role playing are relative. Giddens (1984) made clear that the role (sum of expectations) of a role owner underlies temporal and historical processes that have a duality. On the one hand, a role, defined as expected behaviour, is composed of those who interact; simultaneously, there are, on the other hand, (past and still-existing) rules, resources, regulations, values, norms and social relationships that were/are produced and reproduced during human interactions that restrict role negotiation.

Why is this important to know? Such dynamic role playing affects the STCs in academia. With regard to taking up Web 2.0 in academia, the challenge is to design a technology-enhanced role playing that supports – but does not impede – a free participation and a flow experience. That is not as easy as it seems since the academic world is often characterised by more formal regulations than free structures.

Formal structures are characterised by conventional forms of behaviour and established conventions, for example, behaviour which is formally bound by a work contract or job description (*e.g.*, teachers, formal moderators). Informal structures are rather casual, unofficial, loose and not triggered by any rules (*e.g.*, activities of informal moderation). Both formal and informal organisational structures and processes affect STCs. Thus, one question is important: how could we design the flow experience for an STC if such a community is part of a formal faculty, institution or university?

From the sociological point of view, the potential of a Web 2.0 application or web-based community is its informal structure. In leisure communities such as Wikipedia, Twitter, Dodgeball or Xing, the social part merges with the technical part almost perfectly since the people's 'me-centricity' is supported very well. It is a classical informal structure. People can use the system whenever they want to and they do not participate when they do not want to do so.

Bringing Web 2.0 applications into organisations now leads to a potential conflict. On the one hand, we want to support the informal potential; on the other hand, there are also some rules from the formal organisation. With regard to teaching and learning STC scenarios, a faculty has examination rules, bachelor and master rules and other formal

study conditions. With regard to research STC scenarios, researchers have underlying job conditions and the social synergy of a community will be lost when people steal from others, for example, time (spam), money (scams), credibility (lying), reputation (libel) or anything else of value (Whitworth, 2009).

While mutual interactions in Xing or articles in Wikipedia create enormous benefits, synergy is just one possible human interaction outcome (Table 1).

Table 1 The outcomes in Web 2.0 scenarios

		Other(s)		
Outcome for…		*Gain*	*Minor effect*	*Loss*
Self	Gain	*Synergy*	Opportunity	Antisocial
	Minor effect	Service	Null	Malice
	Loss	Sacrifice	Suicide	*Conflict*

Note: Interaction types according to Whitworth (2009, p.18).

To conclude, an STC needs the design of technical systems like Web 2.0 applications in combination with the well-orchestrated design of social structures like (computer-mediated) human interactions involving social roles and a sufficient balance between the informal ways of communication and formal rules. What such a sociotechnical design has to take into consideration in the academic world will be described in the next section.

3 Web 2.0 in the academic world

In this section, we will discuss the different ways to use Web 2.0 concepts and social software in academia. We separate our discussion by application domain, first covering the applications supporting learning (Section 3.1) and then covering the applications supporting research (Section 3.2). In the subsections, we further structure the discussion according to the main support functions described in Section 2.2.

3.1 Shift from teaching practice to learning processes

The current discussion in higher education focuses on a shift from teaching to learning (*e.g.*, Barr and Tagg, 1995, Reeves, 2006). This is a shift from teacher-centred to student-centred teaching and learning concepts. Student-centred learning means reversing the traditional teacher-centred understanding of learning, putting students at the centre of the learning process and letting them participate in the evaluation of their learning. The focus is shifted from the teacher, who possesses and communicates knowledge with a particular aim, to the students, who acquire the knowledge they need to solve a problem with the help of the teacher. Students get a more active role and have to collaborate with each other and the teacher to learn.

It is important to note that a student-centred learning approach also means that students need to be better qualified in managing their own learning process and, therefore, need more information about how their curriculum is structured. Not just pure professional information must be presented, but also administrative information.

The teacher should be accepted as an expert, coach, consultant or facilitator depending on the situation of the learning process thanks to his/her professional expertise, not his/her formal status as a lecturer. This is not as simple as it seems because teachers think that they lose their native rights, which they were used to having by their role or status alone.

Such a learning approach refers to strategies that put the learner in control of constructing their own learning. This paradigm takes into consideration the pace, repetition, learning styles, motivation, self-regulation and responsibility to learn. In such an approach, there is a shift from teaching to learning, where the teacher needs to take responsibility for ensuring that all students learn – and make progress.

With regard to this shift to the learning paradigm, Lave and Wenger (1991) introduced their concept about 'situated learning'. It is a process of learning in a learning community of practice. This learning process can be characterised as a situated activity, for example, students hear something new from the teacher and immediately apply the new knowledge in their context. The teacher's instructions and the students' learning processes are closely combined. Such learning approaches are also called case-based, project-based or problem-based learning scenarios. The main goal is to foster a new balance between the teacher's instruction and the students' learning processes. Berger and Luckmann (1967) and Lave and Wenger (1991) argued that learning should not be viewed as simply the transmission of abstract and decontextualised knowledge from one individual to another, but a social process whereby knowledge is co-constructed. Therefore, such a learning approach should be situated in a specific context and embedded within particular social interactions and didactics methods.

To apply effective learning methods, Dale (1954) created a learning pyramid with the most effective learning methods or means. These are: 'teach to others/immediate use/explain something new to other people', 'practice by doing' and 'discussion in a group'. Methods like 'follow a speaker during a 90-min lecture', 'reading', 'audio-visual perception' and 'demonstration' are less effective. They do not support the learner. Instructions are still important; however, there is a balance between the learner's constructional processes and the well-organised processes of the instructions from the teacher.

Traditional computer-based learning concepts are instruction-centred, *e.g.*, vocabulary training software. More up-to-date learning systems are more flexible and adaptable to different existing levels of knowledge and learning strategies, but are usually controlled by the teacher as well. They do not implement concepts that embed the whole learning process into the given curriculum and empower the students to manage their own learning. Web 2.0 and social software offer new possibilities to support easy-to-use student-centric learning based on collaboration. Therefore, the generic potential of social software to support communication and collaboration might have a large impact in new e-learning scenarios and tools.

Regarding the discussion on the learning-centred paradigm, one can identify different concepts belonging to the paradigm. Table 2 shows these concepts and lists the characteristics of Web 2.0 and social software that support these (new) concepts well. In the following subsections, we will further explore these possibilities and link to the articles in this special issue addressing particular support possibilities.

Table 2 The learning paradigm with Web 2.0 characteristics

The learning paradigm	*Characteristics of Web 2.0 with regard to the learning paradigm*
Student-centred approach: focusing on students and learning processes	Web-based systems that support easy participation and online human communication, creating new knowledge by many-to-many users' communication
Changing the teacher's role: from giving instructions to creating learning environments and situations (*e.g.*, teaching how to learn)	Web 2.0 applications that support interaction, cooperation and collaborative learning, for example, discussion boards or wikis
Supporting the learner's role	Support the shift from consumer to producer ('con-ducer'), for example, tagging or blogging
Focusing on learning outcomes and goals	Changing concepts like case-based learning, project-based learning, research-based learning or conceptual change (Duit, 1999) and its transfer into Web 2.0
Promoting self-organisation and active learning arrangements	Web 2.0 enables the building of new social relationships and social networking over the internet
Connecting knowledge acquisition and learning strategies	Communication about teacher's content, foster web-based communities or STCs with social networking tools, support learning communities to connect newcomers with full participants

3.1.1 Information, collaboration and cooperation

With regard to the learning paradigm mentioned above, information, collaboration and cooperation are important key factors for designing technology-enhanced learning communities. Different tools supporting the (co-)creation, communication and annotation of information can be used here.

One example shows the paper written by Angela Carell and Isabel Schaller in this special issue. They describe a case study including Netvibes.com, a blog and other applications. Their paper presents how Web 2.0 applications can be orchestrated to support a scenario-based learning process in a face-to-face class. The pattern of orchestration includes the learning approach (*e.g.*, scenario-based learning), the task mode (*e.g.*, designing something new), the learning mode (*e.g.*, face-to face), the length of the learning session (*e.g.*, one week), the role of technical support (*e.g.*, to enhance the collaboration process during face-to-face sessions and beyond) and Web 2.0 applications (*e.g.*, Netvibes, blogs, BibSonomy for searching references, text editors). Finally, they show the effects that this will have on the cooperative learning process of students.

A second example is available in this special issue: Alessandra Agostini, Giorgio De Michelis and Marco Loregian demonstrate their experience with a blog to support a design-oriented course including a learning-by-doing approach at the University of Milano-Bicocca. They chose a blog as an informal support to the traditionally formal structures in the classroom. The authors picture the suitability of the blog with regard to three key concepts for supporting participative learning: the creation of a community knowledge base, the support of the process of knowledge creation and transfer and the facilitation of the knowledge gate-keeping role of some actors in the learning community. The results show a quantitative and qualitative improvement of students' participation

in the learning experience. For example, the blog posts were often helpful and cited during lectures and project presentations and triggered discussions during regular lessons (*e.g.*, on technology, approaches, scenarios).

3.1.2 Communication

Enabling communication can be supported in different ways and for different scenarios in teaching and learning environments. Either one could focus on the teaching scenario itself, for example, the communication opportunities within a tutorial, a lecture and a course, or one could support communication, which takes place 'between' several courses. The third scenario combines both cases. In any case, such scenarios include, for example, a discussion board or other Web 2.0 communication tools (*e.g.*, Twitter).

An example that combines both is the Informatics Portal University of Dortmund (InPUD)-Community at the Faculty of Computer Science of the Dortmund University of Technology (see Jahnke, 2009, for more details). The InPUD-Community, launched in 2001, includes an overview of all the classes and lectures that are offered within a semester. The community provides information about lectures, including any tutorials that are being held (and when they are being held), course materials, notices for examinations, lecturer contact information and – most importantly – several free discussion boards about courses and study services (*e.g.*, 'how to study successfully'). The communication tool is used *within* lectures and *about* lectures. It ranges from discussions about course content, definitions of or solutions to exercises to organisational issues, *e.g.*, where and when is the next learning group, what could be the content of the examination or what the quality of the teachers' discussion is. The last point is a critical one, especially when the students criticise the teacher's instruction. However, from the sociological point of view, a teacher can learn a lot about the teaching process when he/she admits the student's discussions.

The next example focuses on the support of students' reflection and communication. After leaving the lecture hall, students more or less reflect about the contents of the lesson. To support learning – defined here as a reflective thinking process via communication within a group – lessons' content could be rearranged. Such a new orchestration should be designed from the students' perspective. Web 2.0 tools for supporting synchronous and asynchronous communication could be useful here. A Web 2.0 example is given by Markus Heckner and Silke Schworm in this special issue. They demonstrate that tagging and blogging offer the opportunity to actively engage students in follow-up course work. Their paper presents the results of a case study of an undergraduate university seminar. The so-called 'Tagblog' service combines blogging, tagging and rating as three forms of online user contribution to the development of a shared, emergent group knowledge repository.

3.1.3 Networking

While collaboration and communication tools mainly support existing or new learning communities that are formed just for one course, SNSs can even go further and support course-spanning learning communities. SNSs can help:

- (re)find other learners to connect across the borders of learning communities
- (re)find experts (*e.g.*, former students) and (temporarily) include them in learning communities

- stay informed about the activities of the people in the own network (and spontaneously build and enhance learning communities based on this information)
- communicate directly and indirectly with other community or network members.

As another Web 2.0 tool, SNSs are not focused on grouping learners, but on offering the single learner a possibility to find others and network with others.

An interesting example of using this potential to network across the borders of learning communities is the usage of the open-source SNS platform Elgg at Harvard University.[1] Elgg is used in several courses as a complete replacement to an existing Learning Management System (LMS) and is more popular among the students than Facebook (because of privacy issues).

A second example is given by Francesca Grippa and Giustina Secundo in this special issue. They develop the understanding of how Web 2.0 applications can be used to support a project-based learning approach. The authors show that Web 2.0 technologies can change the way a distributed learning community interacts. Their technology-enhanced learning system supports the students coming from Morocco, Tunisia, Egypt and Jordan and involved in an international master's programme. Following the feedback provided by students in their case study, they conclude that Web 2.0 tools can enhance learning effectiveness in terms of learners' satisfaction, knowledge creation and learning performance and the acquisition of learners' competencies and skills. However, the use of Web 2.0 requires the rethinking of teachers. They have to change their mental models about teaching and learning to enhance a collaborative 'learning 2.0 process'.

A third example is pictured by Ilena Hamburg and Timothy Hall in this special issue. They describe an e-learning scenario for vocational training in Small- and Medium-sized Enterprises (SMEs). Utilising Web 2.0 applications, the e-learning communities in SMEs could also enhance knowledge sharing, cultural interchange and networking to support their employees as lifelong learners. However, the main problem is that learning and work activities are separate. Therefore, the authors show the advantages of the development of communities of practice as social networks and describe a project wherein SMEs could learn from academia on how to use Web 2.0.

3.2 Changes in research practices

Research is a complex activity that is hard to nail down for analysis or discussing support functions. One recent attempt to conceptualise the activity is by Graziano and Raulin (2007), who presented a model of mutually interdependent phases:

- idea generation
- problem definition
- procedures design
- observation
- data analysis
- interpretation
- communication.

According to this model, one could try to identify the support functions and tools for each phase (as done by Tang *et al.*, 2003). We will not follow this approach further, but just build on the fact that at least several steps in the research process are done collaboratively.

In this line of thinking, we have to distinguish further if one or more steps in the process are done in close collaboration (in a team) or if the steps are done by one researcher and (minor) support from the community is included in one way or another.

The collaborating members of research projects can be regarded as virtual teams or the more loose collaboration between researchers and the research community as exchange in virtual communities. For research teams and communities, more or less the same requirements are true as they are for cross-institutional teams and communities in industry. A lot of what has been said about using social software to support teams and communities in and around organisations – *e.g.*, in Enterprise 2.0 (see, for example, Newman and Thomas, 2008, for more information on this) – is true for research.

Nevertheless, one has to mention some particularities of teams and communities in research, which are very well matched by Web 2.0 features – even better than in most industry settings.

First, there is decentralism and heterogeneity in the structure of the different set-ups in which researchers work together. This has been a main obstacle to the usage of interorganisational groupware tools in research until now. Social software tools are usually more modular and open and can be more easily combined.

Second, a central characteristic of research is the opening of research work to existing and potential partners in and outside the organisation and the integration of a number of continuously developed tools to support research activities.

Social software is very well fit to support research. But does its use change research? In our opinion, it does not change a lot. Research always has made use of open communication media and decentred organisations. It is now easier for small partners to participate, more people can be involved in a project and everything is quicker, but the main character of research is not changed by this.

In the following sub-subsections, we will briefly summarise the usage of social software in research – according to the model presented in Section 2.2. In the discussion of each support function, we will also distinguish between the usage scenarios 'team' (a small group of people working on a common goal) and 'community' (a group of people with similar interests/backgrounds, helping each other).

3.2.1 Information, collaboration, cooperation

One important task in group research is the collaborative development of content. The classical tool is a group editor, *i.e.*, an editing application that allows a group of people to work on documents. Such group editors – like Google Docs or Wikis – are already used a lot by research teams to brainstorm, develop theories, collect data and write papers together.

In addition to close collaborations on single documents, there is an even larger domain where research communities collaborate on collecting and annotating information. Examples are encyclopaedias like Wikipedia or bibliographic databases like BibSonomy or CiteULike.

In this special issue, an example is given by Aurélien Bénel and Christophe Lejeune. Their paper focuses on the 'how to' of research methods. In more detail, the authors reflect the process of data analysis, for example, text interpretation. They show that Web 2.0 technologies have analogies with philosophical hermeneutics. The authors illustrate examples in archaeology and sociology, two social and human sciences which were early adopters of punched cards and computers. For these disciplines, they show how software can be designed and prototyped for a document-driven research, interpretation and intersubjectivity to provide an appropriate tool for researchers to do their data analyses collaboratively, for instance, computer-supported collaborative text interpretation.

3.2.2 Communication

In addition to collaboration on content (either on documents or large collections of information), communication in teams and between teams is of major importance for successful cooperation (and therefore, for research, too). The medium that has mainly been used in this domain until now is e-mail – which shows some disadvantages. Weblogs seem to be a step forward here.

A weblog is a continuously updated message service whose messages are usually presented in reverse chronological order. Messages can be commented on and cross-linked. Following the 'me-centricity' of Web 2.0, weblogs are usually bound to single persons, *i.e.*, there is only one author. However, there are also weblogs authored by several people, *e.g.*, in the form of project blogs. No particular tools or knowledge of tagging languages is needed to publish messages. Compared to e-mail, the advantages of blogs are the commenting and linking features and the storage feature – it is easy to find old blog entries via different archiving and search methods. Another advantage to e-mail is in the possibility for the receiver of a message to determine which messages he/she wants to receive. This is due to the fact that there are no particular receiver lists defined by the blog author, but potential receivers can subscribe to the (RSS) feed of a blog if they want to. Tools make it easy to subscribe to feeds, aggregate feeds and filter feeds.

In addition to asynchronous communication via weblogs, synchronous communication in instant messaging and other conferencing applications has drawn distributed research teams closer together. It has become easier to maintain the awareness and connectedness needed for successful collaboration over distance.

3.2.3 Networking

Direct communication and the collaborative work on documents and in general on collections of information is completed by support for finding experts and for staying in contact.

The tool covering this area is SNSs. SNSs were defined by Boyd and Ellison (2007) as "web-based services that allow individuals to construct a public or semi-public profile within a bounded system, articulate a list of other users with whom they share a connection, and view and traverse their list of connections and those made by others within the system".

SNSs are application systems that (1) offer users functionalities for identity management (*i.e.*, the representation of a person, *e.g.*, in the form of a profile) and (2) enable users to keep in touch with other users (and thus, the administration of one's

own contacts). In this context, one can distinguish between open SNSs that are available for everyone's use in the WWW and closed SNSs that are used by a rather closed user group, *e.g.*, within the intranet of an organisation.

The important functionalities of SNSs are (Richter and Koch, 2008):

- *Expert search* – Computer-Supported Cooperative Work (CSCW) research has already dealt extensively with the use of expert search as a possibility to identify implicit knowledge (cf. *e.g.*, Ackermann *et al.*, 2003). In this context, one has to distinguish between the possibility to search the network according to different criteria (*e.g.*, name, interests, company) and the possibility to proactively receive recommendations of interesting contacts by the SNS. Search boxes are an example of the functions enabling expert search in SNSs.
- *Context awareness* – Context awareness is the awareness of a common context with other people. This can be information about common contacts, common interests, the same university one has visited or the same company one has worked in. Context awareness contributes a lot to creating common trust among users, which is essential for successful collaboration (cf. *e.g.*, Kramer, 1999). Moreover, according to Soonhee and Hyangsoo (2006), "knowledge sharing requires the dissemination of individual employees' work-related experiences and collaboration between and among individuals, […] and organizations". Examples of functions enabling context awareness in SNSs include the 'how you're connected to…' box.
- *Network awareness* – Awareness of the activities (and/or the current status and changes of the latter) of one's contacts in his/her personal network is also supported by functionalities. These functionalities enable indirect communication via awareness. Examples of functions enabling network awareness in SNSs include news feeds and 'birthdays' box.

General SNSs like Facebook, LinkedIn or Xing are already used by researchers to stay in contact with other people and partners from industry. In addition to these services, there are new services popping up that are particularly targeted at researchers, *e.g.*, Academia.edu,[2] SciLink,[3] ResearchGATE[4] and Scholarz.net.[5]

The paper of Richard Lackes, Markus Siepermann and Erik Frank shows an example of online social networks helping connect business people and map business relations. Their prior assumptions are that employees use social web services to coordinate tasks and manage projects. However, their study shows that online social networks for research teams or scientific communities are not used to the same extent. The authors conclude that the problem could be that the existing solutions do not meet the requirements of the research community. Hence, they propose a conceptual design for the enhancement of online collaboration in the academic field.

4 Conclusion and outlook

At the end of this contribution, we would like to take up the question of whether Web 2.0 is making a difference in academia again. The paper illustrated how Web 2.0 affects a social shift. From the sociological point of view, new forms of interaction (*e.g.*, technology enhanced human interaction, communities), communication

(*e.g.*, microblogging like Twitter) and forms of social structures of groups (*e.g.*, new balance between informal and formal structures) are emerging – at least we can observe such new forms in the society, for example in public communities and services. But has Web 2.0 also made a difference in *academia*? As with many interesting questions, the answer to this one is both yes and no.

The 'no' part is due to the fact that none of the developments currently on the way is due to the existence of Web 2.0 applications alone. The development towards learner-centric and active learning and towards distributed teams in research has been there for a long time.

However, social software and the availability of web access from anywhere at any time has magnified the developments and made it easier to engage students in learning communities and link weakly coupled teams in research. The technical applications affect a social shift and might support educational change. So, one could say that the availability and growing use of new applications and the growing diffusion of new concepts like participation make ways of doing teaching and research possible that have not been possible before.

The availability of easy-to-use and easy-to-integrate services for supporting participation at least extends the possibility to bridge space and time and include the weak ties of partners (with regard to the advantages of social networks also supporting the weak ties) for all disciplines.

To conclude, Web 2.0 might become a good vehicle to analyse, change and reconstruct research as well as teaching and learning communities at universities by using and supporting the flow experience and the opportunity to make learning and research more attractive, funny and creative than ever before. Thus, Web 2.0 can make a difference.

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Notes

1 See http://news.elgg.org/pg/blog/Dave/read/66/elgg-at-harvard-an-interview.

2 www.academia.edu

3 www.scilink.com

4 www.researchgate.net

5 www.scholarz.net