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## Social Software in Higher Education: The Diversity of Applications and Their Contributions to Students' Learning Experiences

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# Communications of the Association for Information Systems

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## Social Software in Higher Education: The Diversity of Applications and Their Contributions to Students' Learning Experiences

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### Abstract:

Higher education institutions are increasingly using social software tools to support teaching and learning. Despite the fact that social software is often used in a social context, these applications can significantly contribute to the educational experience of a student. However, as the social software domain comprises a considerable diversity of tools, the respective tools can be expected to differ in the way they can contribute to teaching and learning. In this review on the educational use of social software, we systematically analyze and compare the diverse social software tools and identify their contributions to teaching and learning. By integrating established learning theory and the extant literature on the individual social software applications we seek to contribute to a theoretical foundation for social software use and the choice of tools. Case vignettes from several UK higher education institutions are used to illustrate the different applications of social software tools in teaching and learning.

**Keywords:** collaboration systems, collaboration, collective use, interdisciplinary, psychological theory

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## I. INTRODUCTION

The emergence of Web 2.0 demonstrates a shift toward user generated content on the Web and the rise in social software. Social software applications enable users to interact, communicate, and collaborate with each other, thereby creating highly dynamic environments with ever-changing content, structures, and relationships. Early forms of social software tools, such as discussion boards, date back to the origins of the Web and are well-established. Others, such as social networking sites, started only in early 2000, but have quickly gained widespread acceptance. Yet others, for example, social bookmarking tools such as Delicious, are still being discovered by the mainstream Internet user. Overall, social software tools and their core functionality of creating user-generated content have gained significant momentum and popularity on the Internet, with six out of the top fifteen most popular Web pages being social-software-related (according to Alexa.com ranking as of Dec. 5, 2009).

In an attempt to harness the potential of social software, the higher education sector has started to use these applications to support teaching and learning activities. However, despite their widespread adoption, it appears that the choice of tools often lacks clear theoretical motivations, as evidenced by a recent report from the UK Joint Information Systems Committee (JISC) which describes the deployment of social software as "in no way systematic" and "patchy" [JISC, 2009]. Applications are often implemented for the novelty factor they bring to the course instead of a careful consideration and match with the course requirements [Jones, 2007]. While the novelty factor can certainly influence students' perceptions of a course, it is generally a very short-lived benefit [Wong and Tatnall, 2009], raising questions about what else these different social software tools can add to teaching practice and how else they can support the students in their learning. Thus, the primary aim of our review in this paper is to systematically analyze the diverse social software tools and to identify the contributions each of them can provide to teaching and learning. We hope that our analysis will contribute to a better theoretical foundation on the role of social software tools in education and will also provide a more sustainable rationale for the choice of tools. Further, by analyzing social software use in higher education through an Information Systems (IS) research lens, our objective is to introduce this area of social software research to the IS community. To achieve these aims, we integrate research from IS and education to analyze and compare the different social software tools and their potential contributions to education, both in terms of the *capabilities* and actual *usage* of the individual tools. The different forms of usage are illustrated through case vignettes of different UK higher education institutions.

In the next section, we will introduce the role of IS in supporting teaching in the higher education sector. Then, we will describe some of the most popular social software applications and highlight their relevant characteristics pertaining to their use in the higher education context. Next, we introduce the Community of Inquiry (CoI) framework which outlines the elements which are critical for successful online learning. By applying the model, along with references to the extant literature, we systematically analyze how the different social software tools can contribute to a student's educational experience. Finally, we will discuss the findings of our analysis and conclude with a summary of our contributions and potential avenues for further research.

## II. TEACHING AND THE ROLE OF TECHNOLOGY

A detailed discussion on teaching and its various definitions and objectives is highly complex and controversial and dealt with elsewhere [e.g., Mayer, 2004]. In simplified terms, the two major perspectives on teaching are captured by the differentiation between traditional and constructivist approaches. The traditional approach focuses on providing the student with the important information, relevant procedures, and a suitable learning strategy [Kirschner et al., 2006]. In contrast, the constructivist approach highlights the social and active dimensions of learning, and, therefore, focuses on encouraging the students to collaboratively discover or construct the essential information, procedures, and learning strategies among themselves. In practice, however, both the constructivist and the traditional approaches play a role in the design of individual teaching activities, assessment criteria, and the use of supporting technology [Ehiyazaryan et al., 2004].

As early as in the 1970s, educational institutions had started embracing electronic media such as tapes, compact disks, or radio broadcasting as alternative teaching channels, largely to cater for an increasing demand for education and the prospect of overcoming time and place constraints [Gerhard and Mayr, 2002]. The notion of e-learning, which emerged in the 1990s, envisioned new forms of interactive learning through online media [Zemsky and Massy, 2004]. For example, traditional universities noted how the strategic use of online media could add to their teaching portfolio and how online courses or entire online degrees could extend their reach and create new revenue

sources. The initial enthusiasm about the enormous potential and diverse benefits of e-learning has since been replaced by a sense of skepticism as universities have started to realize the difficulties associated with the provision of high quality teaching in online environments [Romiszowski, 2004]. The common lesson learned by higher education institutions around the world is that using the online environment for teaching requires not just a digitization of the face-to-face delivery mode, but a whole new teaching approach.

Most teaching in today's universities is supported by technology, largely through the use of Virtual Learning Environments (e.g., Blackboard, Moodle), where course related content is made available and virtual environments such as discussion forums, blogs, and wikis are provided for student interactions. The degree to which online technology forms part of the overall teaching approach is often related to the institution's format (e.g., distance education), and the skills, interests, and background of the individual educator [Ajjan and Hartshorne, 2008; Nichols, 2008].

### III. SOCIAL SOFTWARE TOOLS

The advent of the social software tools creates a range of opportunities and challenges for higher education institutions as their underlying characteristics enable new forms of participation and collaboration. According to Parameswaran and Whinston [2007], the key characteristics of social software tools are: content is controlled by the users and is highly dynamic with frequent, often unpredictable changes; the content is enhanced by integrating feeds from other applications; the quality assurance is largely peer-based and unstructured; the applications are mostly lightweight, platform independent, and highly portable. Table 1 illustrates how some of these characteristics apply to the social software tools frequently used in the higher education context.<sup>1</sup>

#### Discussion Boards

Discussion boards are arguably one of the earliest social software applications that allow large numbers of individuals to communicate with each other. Today discussion boards are frequently encountered as standalone applications in the form of Internet forums (e.g., macfixitforums.com) or are integrated into other kinds of websites to provide a platform for user engagement (e.g., imdb.com). Discussion board content is generated by individual postings and replies, together creating a threaded form of discourse, which is one of the key features of discussion boards. Among all social software applications, discussion boards stand out for their distinct hierarchical approach to quality control, as appointed administrators ensure the quality of the content and safeguard interactions among the contributors [Arnold et al., 2004].

#### Weblogs

Weblogs (or in short, blogs) constitute a particular kind of website that provides individuals with a convenient platform to publish content on the Web. The content of a blog is usually created by a single "blogger" and often takes the form of online diaries or personal commentary with entries being typically presented in reverse chronological order. Blog applications allow readers to provide feedback for the author through a commenting function. Although each blog is generally maintained by an individual, blogs are often hyperlinked with each other, creating a distributed discourse among bloggers, also called the "blogosphere" [Kumar et al., 2004].

#### Micro-Blogs

Micro-blogging describes a relatively recent derivation of the traditional weblog. In comparison to blogs, which often feature larger pieces of content, micro-blogging applications allow users only a very limited space for content creation and broadcasting, mostly due to technological limitations (e.g., Twitter.com allows messages of up to 140 characters, enabling messages to be sent or received on mobile phones). Any messages or status updates posted by a micro-blogger are broadcast to the subscribers of the micro-blog. The basic functionality of micro-blogs is designed for one-to-many communication, but, as users reciprocally subscribe to each other's postings, these applications enable an ongoing distributed discourse.

#### Pod- and Videocasting Applications

Pod and videocasting applications (such as podcastalley.com or youtube.com) allow users to broadcast voice or video-based content to a large audience via the Web. Users create their multimedia content, which is then uploaded to a common sharing platform, enabling others to view or download the content on-demand. Within most podcasting and videocasting applications, users can rate the content and leave comments for the authors or other viewers. User-based rating systems identify and promote high-quality content, and only in the case of clearly objectionable

<sup>1</sup> The selection of applications is focused on collaborative content-generating tools and does not include communication tools (e.g., chat, e-mail) or 3-D virtual world applications (e.g., Second Life).

material, the application provider removes the content. Pod- and videocasts are frequently integrated into other sites to add multimedia content.

**Table 1: Comparison of Social Software Tools**

Tool	Content	Control of content <sup>2</sup>	Quality assurance <sup>3</sup>	Ease of integration <sup>4</sup>
Discussion boards	Content emerges through interaction of several users.	Individuals retain control over their contributions, but the development of the entire content is determined by the group of users.	Administrators are mostly in charge with limited peer-based quality assurance.	Can be integrated into other applications.
Weblogs	Single user regularly adds content.	Content control generally remains with the user, unless it is a group blog.	Quality assurance rests with individual user. Other users might give feedback as comments.	Can be integrated into other applications.
Micro-blogs	Single user creates content, often with frequent updates.	Content control remains with the user.	Quality assurance rests with individual user. Other users might give feedback.	Can be integrated into other applications.
Pod-/videocasting applications	Single user creates content.	Content control remains with the user.	Quality assurance rests with individual user. Other users might give feedback.	Can be integrated into other applications.
Wikis	Content is iteratively created and refined by several users.	Content control emerges through user interaction.	Peer-based quality assurance due to constant refinement.	Can be integrated into other applications.
Social networking sites	Content is created by a single user, but also emerges and develops through interactions with other users.	Content control largely remains with the user.	Quality assurance rests with individual user. Other users might give feedback.	Currently limited integration, as applications are mostly standalone; integration of other tools possible.
Social bookmarking applications	Content is constantly added and refined by several users.	Individuals retain control over their bookmarks, but the development of the entire content is determined by a group of users.	Largely implicit peer-based quality assurance through aggregated rankings.	Can be embedded/integrated into other websites and applications.

### Wikis

Wikis describe a particular form of user generated website that has become popular through sites such as Wikipedia.org or Wikitravel.org. Wiki applications execute the vision of the read/write Web, as any visitor of these wiki sites can modify the content which has been created earlier, and thereby extend or adjust its meaning. Content creation and quality assurance in wikis is tightly interlinked, as any visitor can add content or modify contributions. Only in rare cases where the peer-based quality assurance breaks down, a hierarchy-based escalation mechanism is put in place to deal with disputes.

<sup>2</sup> Refers to the locus of control for content changes

<sup>3</sup> Refers to the authority which reviews and approves of content

<sup>4</sup> Refers to the straightforwardness of integrating the application (or its content) into other applications (e.g., syndication, aggregation, mash-up)

### Social Networking Sites

In contrast to blogs, podcasts, and wikis, all of which focus on collaborative content creation, social networking sites such as Facebook, LinkedIn, or MySpace are primarily geared at building communities. The generation of content is the byproduct of the various community building activities. To support community building, social networking sites allow their members to create and update individual profiles, share photos, join groups and networks, or receive updates on activities by other members [Dwyer et al., 2007]. What makes these sites so highly dynamic is the fact that the content is created by a large number of individual users and their continuous interaction in ever-changing networks. While many of these sites are for social interactions, sites catering to business and professional networking have also emerged (e.g., LinkedIn.com; xing.com).

### Social Bookmarking Applications

Social bookmarking applications constitute another means for user participation in content generation on the Web. Social bookmarking applications provide users with a convenient way of collecting, tagging, and annotating websites of interest and provide a space where these collections are stored and shared. By sharing their content (the links to websites and annotations), the bookmarks of individuals are aggregated and a social network effect is created, as users can search the common pool of rated bookmarks which is much richer than one's individual collection [Arakji et al., 2009]. Collective tagging further enhances the value of the common pool of bookmarks as "folksonomies" (user-generated taxonomies) can be derived and used for navigating the Web.

Social software applications have not only enhanced communication and collaboration practices, but have led to the emergence of completely new forms of interaction. These applications enable many-to-many interactions and dialogs, thereby enabling the development of online discourse, social relationships, and knowledge artifacts. Further, the characteristics of social software applications, especially the ways in which content is created and controlled and quality is ensured provide distinct opportunities in an educational environment. To identify the value these applications provide for higher education practice, we will, in the next section, review some of the antecedents of learning and identify how the unique characteristics of different social software tools can create specific contributions to teaching and learning.

## IV. CONTRIBUTIONS OF SOCIAL SOFTWARE TO EDUCATIONAL EXPERIENCE

A valuable framework that helps to conceptualize learning and the particular contribution of social software is provided by Garrison et al. [1999] and later reviewed by Garrison and Arbaugh [2007]. Their Community of Inquiry (CoI) framework has received considerable attention in the online learning community, as it describes the potential of information technology to create viable learning environments. Garrison et al.'s framework considers the community as the nucleus of learning and the quality of interaction among community members is thought to directly impact the individual learning experience. Learning media such as social software applications provide an interaction environment which supports the development of the educational experience by providing one or more elements of the CoI framework: social presence, cognitive presence, and teaching presence. We first describe these elements of the CoI framework and then analyze the social software tools in terms of this framework and its elements.

### Cognitive Presence

Cognitive presence focuses on a student's ability to construct meaning through sustained communication [Garrison et al., 1999]. The concept of cognitive presence focuses on both the individual and social exploration of ideas—the iteration between deep reflection and social discourse which allows the individual to develop understanding. Cognitive presence also emphasizes the role of integrating and consolidating the diverse perspectives which have emerged in a social setting. Hence, to support cognitive presence, any tools used in the learning process should allow for the collaborative construction of meaning and understanding, rather than focus on information dissemination and assimilation [Garrison, 2003].

### Social Presence

Social presence describes a student's ability to project his or her personal characteristics into the wider community [Garrison et al., 1999]. By presenting themselves and their identity, individuals can develop critical personal and emotional connections with others. The quality of the relationships which emerge in a learning community and which make the community a resource for socio-emotional support are key in enhancing social presence [Garrison, 2003]. Although IS research has frequently focused on social presence [e.g., Daft and Lengel, 1986], related studies have largely focused on technical characteristics, such as the multiplicity of communication cues (i.e., visual and vocal cues), which are required to convey and support the development of social presence. In the context of Garrison et al.'s framework (and in our analysis presented in this paper) a wider perspective is taken, as the extent of social presence not only depends on the application, but the entire context of the relationship between the participants [Garrison et al., 1999].

## Teaching Presence

Teaching presence integrates two aspects: the design of the educational experience and the facilitation of the educational experience [Garrison et al., 1999]. Educators design an educational experience by selecting and presenting course content and learning activities. The facilitation of the educational experience describes the purposeful directing of the associated discourse, a task which can equally be carried out by the educator and the student. Consequently, a software tool supporting the development of teaching presence should allow an individual (educator or student) to guide or direct the student interaction and to maintain a visibility which conveys his or her authority and role as a facilitator of learning; this aspect is especially important in online learning contexts, where students quickly get the impression of being "left alone" [Anderson and Elloumi, 2008].

We will now apply these three elements of the Col model to analyze how the individual social software tools can contribute to the students' educational experience. By considering these three elements as independent constructs, we simplify the complexity of Garrison et al.'s [1999] framework to some extent. The original formulation of the framework and several of its subsequent applications [see Garrison and Arbaugh, 2007] have highlighted the range of relationships between these constructs and have detailed their interactions with each other. However, considering these three core elements as independent constructs allows us to evaluate to which extent each of these elements can be supported by different social software tools. Unfortunately, by using these elements as independent constructs, we cannot make any claims concerning their internal relationships in the context of social software. However, we concur with Garrison et al. [1999] that any consideration of the contributions of social software cannot be limited to an analysis of the tool's technical characteristics, such as their particular content creation or control mechanisms, as the teaching and learning context in which the tools are used is of equal importance for determining their contribution. Indeed, the core characteristics of social software tools listed in Table 1 (e.g., the mechanisms for content creation, content control, and quality assurance) create specific communication and collaboration capabilities. But their educational contribution can be discussed only in conjunction with the pedagogical context (i.e., learning and teaching activities) in which these tools are used. Consequently, in order to analyze the contributions of social software to teaching and learning, we need to focus on the ways these tools are commonly applied and the associated benefits reported.

The following analysis draws on the literature of social software in the context of the open Web, as well as in the educational context, to identify the dominant forms of use of the tools and their associated benefits. Where available, we draw on research that has directly applied the constructs of Garrison et al.'s framework for describing the particular contributions of individual tools. For some of the tools, a vast amount of related research has been conducted (especially research focusing on the educational value of discussion boards and weblogs). Therefore, for such tools, our choice of supporting literature is purposefully limited to seminal publications. For other tools, however, relevant empirical work is still scarce (e.g., micro-blogging, social bookmarking) and, therefore, emerging research as encountered in various conference proceedings is referred to in our analysis. To demonstrate the different ways social software tools are used in a course environment and to illustrate their contributions, we have integrated case vignettes from different UK higher education institutions. The cases described here were developed as part of a study on the efficient use of social software for teaching and learning, funded by the UK-based *Joint Information Systems Committee*. This study was led by one of the authors of this paper. Background information of the cases, referred to in this paper, is provided in Appendix 1. Details on these and further cases as well as details on the case research methodology used for their development can be accessed online [Minocha, 2009].

## Discussion Boards

The ability of discussion boards to contribute to cognitive and social aspects has been well established in studies focusing on their use on the Web and in the higher education context. Discussion boards facilitate distributed cognition by allowing users to share experiences and perspectives [Hoadley and Kilner, 2005]. Research in the patient-care domain has shown how members in geographically dispersed locations use discussion boards to provide each other social and emotional support [Ebner et al., 2004; Buchanan and Coulson, 2007]. Because discussion boards are one of the earliest social software applications, a considerable number of studies have also investigated and confirmed their contribution to cognitive, social, and teaching presence in the educational context [Garrison and Arbaugh, 2007]. Studies have consistently shown how the discursive content creation process of discussion boards contributes to knowledge construction processes by enabling continuous interaction and dialog focused on clarification, elaboration, and interpretation [e.g., Pena-Shaff and Nicholls, 2004]. By allowing students to socialize and learn about each other, discussion boards directly contribute to the development of social presence among students [Picciano, 2002]. A range of studies have specifically identified how discussion boards allow educators to contribute to the development of the online discourse [e.g., Dennen, 2005], but it has also been shown how students are capable of taking responsibility for the development of online discussions without significant educator intervention and participation [Kay, 2006].

The Digital Photography course at The Open University, UK, provides a good illustration of the contributions discussion boards can provide. Since it is a distance education course, students have little opportunity to critique each other's work in a face-to-face setting. Therefore, it is important for students to learn from the online discourse for development of a deeper understanding of the course. Although students uploaded their pictures to a dedicated photo-sharing website which allowed them to view each other's work, the course tutors found that the commenting feature in the photo-sharing site was rather limited for in-depth discussions which would transcend individual photographs. Hence, a separate discussion board was set up to allow students to maintain a reflective discourse and to challenge each others' techniques and approaches, thereby contributing to student's cognitive stimulation and overall learning experience.

## Weblogs

Bloggng, as a social tool, can provide cognitive and social benefits to the users [e.g., Nardi et al., 2004; Baker, 2008]. When used by individuals, blogs often provide a space for catharsis, an inward directed outlet for reflection and clarification, or a place to provide well-crafted commentary on current events [Nardi et al., 2004]. With the content being created and controlled by an individual user, blogs have also been clearly identified as tools facilitating self-presentation on the Web [Sanderson, 2008]. Additional underlying mechanisms come into play when blogs are employed in the higher education domain. Studies have highlighted the potential for blogs to contribute to social presence not only by providing a platform for self-presentation but also for peer support among students as the blog's hyperlinks and commenting features enable a form of discourse [Hall and Davison, 2007]. These additional features of a blog facilitate both individual reflection and social knowledge creation, thereby contributing to the tool's ability to support cognitive presence [Du and Wagner, 2007]. Hence, blogs support the educational experience by contributing to aspects related to both cognitive and social presence [Kerawalla et al., 2009].

At Nottingham Trent University, blogs were used explicitly to provide social support in a teacher training course. As students in this course are allocated to schools across a large geographical area, they have little opportunity to exchange their experiences with fellow students and to develop a support network. Consequently, students feel isolated and can even consider prematurely leaving the course. To address this issue, students were encouraged to set up their own blogs in which they would introduce themselves and to regularly report on their experiences during the course. Bloggng proved to be an appropriate outlet for the development of social presence as it reportedly contributed to community development, direct support initiatives among students, and even allowed the tutors to intervene when anxieties and concerns emerged in the students' writings. A different illustration focusing on blogs as applications that contribute to cognitive presence is provided by the UK's University of Leeds. Students in a history course were asked to reflect on set tasks in the blogs, with fellow students being invited to read and comment. Students reported that they found the prospect of writing for an audience very challenging. They needed to make significant mental adjustments when writing their blog-entries, since they had to take the diverse perspectives (and comments) of their readership into account.

## Micro-Blogs

As micro-bloggng has only recently gained prominence, little empirical research can be drawn upon to identify the major forms of use and contributions of micro-bloggng. Exploratory studies show that the tool is mostly used for broadcasting information on individuals' daily routines [Java et al., 2007] or personal experiences [Honeycutt and Herring, 2009]. The use of micro-bloggng seems to directly contribute to "one's cyberspace presence" [McFedries, 2007, p. 84], and social support and feelings of connectedness have been observed as benefits of using the tool [Zhao and Rosson, 2009]. A secondary aspect of micro-bloggng is sharing of information and news [Java et al., 2007] as observed in several recent emergency events [Hughes and Palen, 2009]. It seems that micro-bloggng tools are largely geared toward providing a platform for social interaction with very limited capabilities for providing cognitive stimulation. The imposed character limits and the spontaneous nature of the communication seem to inhibit in-depth reflection and careful formulation of arguments.

An illustration of the use of micro-blogs for supporting the development of social presence is provided by Portsmouth University, where Twitter was used to facilitate the community development among students. An educator in the Electronic and Computer Engineering Department started to use Twitter on his own initiative to improve the communication between the educator and students, as well as among the students themselves. The educator was hoping that the use of such an informal and spontaneous tool would help students be more open and direct about any difficulties they were facing and that they would also mutually support each other when encountering similar challenges. Shortly after its initiation, the Twitter network turned into an instantaneous support network by which students would quickly respond to each other's requests for help on course-related issues. In this case study, the educator also used the micro-bloggng tool to instruct students and make announcements, thereby contributing to teaching presence.

## Pod- and Videocasting Applications

The extent to which podcasting and videocasting applications contribute to social and cognitive presence is highly dependent on the way the technology is used. With the creation of content often being an individual pursuit, users develop podcasts and videocasts to introduce themselves to certain media circles and to establish and maintain social networks [Lange, 2008]. However, the fraction of users who actively produce content on those sites is very small in comparison to those who passively consume content [Halvey and Keane, 2007]. For the higher education context, this differentiation between active producers and passive consumers of content is important, as it has an impact on the social and cognitive benefits of the application. Producing multimedia content contributes to critical thinking skills, as it requires students to present course-related content from a new perspective and within the constraints of the applications [Frydenberg, 2008]. But, despite these benefits, it seems that the use of pod- and videocasting applications in the higher education context is mostly limited to passive consumption and as an alternative channel for the delivery of teaching material. However, using podcasts and videocasts for content delivery can still be expected to contribute to the learning outcomes as students receive content via different media [Evans, 2008], and podcasts or videocasts can extend the time students are exposed to the learning materials [Tynan and Colbran, 2006]. While such passive consumption might add to aspects of teaching presence, it does not fully leverage the potential of these applications for supporting cognitive and social presence.

An example illustrating the use of podcasting applications to support the development of cognitive presence is provided by the UK's University of Hertfordshire physiotherapy course. One of the challenges in physiotherapy education is to not only educate students in the technical aspects of their profession, but also to educate them on how to carefully communicate with patients and to convey the necessary expertise and empathy to the patients. To simulate the patient interaction and to enhance communication skills, students were asked to develop podcasts in which they would provide advice on back-pain management as role-playing scenarios. Students had to script the role play, act through it, and record it as a podcast. The podcasts were made available to the peer group for further scrutiny and discussion. By making a judgment on their peers' podcasts and by evaluating their own performance, the students had an opportunity to reflect on their role as therapists and the challenges involved in communicating with patients.

## Wikis

A unique feature which distinguishes wiki applications from other social software applications is the way in which content is created and controlled: large numbers of distributed users contribute to and review each other's content and thereby integrate their knowledge resources and interpretations [Wagner and Schroeder, 2010]. Unlike blogs or even discussion boards, the content in wikis represents the outcome of a shared effort, which cannot be directly attributed to an individual. However, when originally considered in the context of higher education, wikis were often recognized for their ease of use and for enabling people to easily publish for a wider audience [Boulos et al., 2006; Xu, 2007], without considering the knowledge integration capabilities. Increasingly the role of wikis as platforms for integration and negotiation of knowledge and their distinct benefit to the cognitive development in the educational context has become more prevalent in the literature [e.g., Trentin, 2009]. Considering the distinct way in which content is created and controlled, wikis offer little opportunity for self-expression or relational exchanges that are required for the development of social presence.

The role of wikis in contributing to cognitive presence is illustrated in a software engineering course at The Open University, UK. This course specifically employed wiki technology to simulate the software industry practices in software development to provide students with skills required in the workplace and to prepare the students for future employment. The software engineering students were asked to use a wiki application to conduct requirements analysis for a software system and collaboratively develop a document which would systematically capture the requirements from the perspectives of a variety of stakeholders. To carry out the simulated scenario, students were grouped as systems designers and systems owners; over the course of several weeks both parties had to identify and refine the requirements through ongoing negotiations on the wiki document. The scenario not only allowed students to learn the practice of wiki-based collaboration, but also contributed to a better understanding of the intricacies of identifying and negotiating systems requirements.

## Social Networking Sites

Social networking sites provide users with a platform to present themselves and to establish and maintain social relationships [Ellison et al., 2007]. The considerable effort individuals invest into creating and displaying their online identity indicates the extent to which social networking sites facilitate the establishment of social presence [Boyd, 2006]. Hinduja and Patchin [2008] even describe social networking sites as an "avant-garde participatory culture which enables people of all ages to represent themselves online in a creative way, and keep in touch with (and involved in) each others' lives" (p. 131). Despite the fact that students are the key target group for the providers of social networking sites, empirical research on how these applications can support the educational experience is

sparse. Few existing studies focus on these applications as the dominant locus for student's social activities [Golder et al., 2007; Ellison et al., 2007]. Universities have started to capitalize on these benefits of social capital building and institutional affiliation by creating their own groups to interact within these social networking environments.

The case of the English Department at Birmingham City University illustrates how social networking sites can support the development of social presence. Recognizing the difficulties the transition from the school to a university environment can create for students, staff at the English Department set up a dedicated group on Facebook to support incoming students in their pre-induction stage. In its original conceptualization, this group was set up as a communication channel to inform students on emerging issues and deal with upcoming questions, but it was soon recognized that the Facebook group contributed to the social cohesion among students. Being members of the same group allowed students not only to present themselves through their profiles to future classmates, but also enabled them to identify classmates with shared interests. The Facebook group facilitated the development of off-line contacts, helping students to overcome the relative anonymity during the first few weeks of the course start.

### Social Bookmarking Applications

Our review has indicated the limited ability of social bookmarking applications to directly contribute to the educational experience. The core value of social bookmarking applications lies in the aggregation of individual indexing efforts. The applications provide limited opportunity for community development or more complex identity presentation, making the application unsuitable for the development of social presence. Although creating bookmarks, tags, and summaries supports learning, the annotations are rather limited and are unlikely to contribute to the development of cognitive presence. Consequently, literature discussing social bookmarking in the context of higher education does not draw on the cognitive or social contributions of the applications, but on their practical benefits of facilitating the identification and sharing of valuable resources [Bryant, 2006]. Hence, unlike other social software tools which directly contribute to learning experience, social bookmarking contributes indirectly by facilitating the management of resources.

An example highlighting the strength of social bookmarking as an information management tool is provided by Sheffield University. Students in a first year history course were asked to identify course-related Web resources which would be bookmarked, ranked, and annotated in preparation for their classes. The bookmarks were then shared within the class, allowing other students to identify alternative resources for their studies. While social bookmarking applications allow students to search, collect, and share relevant sources, such a form of use does not directly contribute to social, cognitive, or teaching presence.

Table 2 summarizes the theoretical analysis of the social software tools and displays how their characteristics and common ways of usage can contribute to the development of social, cognitive, and teaching presence.

Comparing the contributions of the social software tools provided in Table 2 shows how the tool characteristics and also the specific context in which the tools are employed provide varied opportunities for the creation of social presence, cognitive presence, and teaching presence. Blogs and social networking sites especially allow individual users to be in control of the content creation process, thereby providing them with opportunities for developing online (virtual) identities. These online identities and presence facilitate social and emotional online connections. In a wiki-context, on the other hand, a single user is not in control, which renders this tool less appropriate for the creation of a virtual identity. Instead wikis provide ample opportunities for the establishment of cognitive presence when used in a context in which students interactively refine each other's contributions.

The specific characteristics of the individual social software not only provide opportunities for the development of social and cognitive presence, but also create different avenues for the educator to guide the learning process (teaching presence). In the case of blogs where the content is "owned" by an individual user, the educator involvement is often limited to providing feedback and comments. In contrast, in discussion boards where content is created in a discursive way, the educator has the opportunity to actively facilitate the interaction. However, as with cognitive and social presence, the different applications provide opportunities for the creation of teaching presence, but the extent of teaching presence will depend on the individual teaching and learning contexts, particularly the learning activities these tools are supporting.

**Table 2: Potential Contributions of Social Software**

Tool	Cognitive Presence	Social presence	Teaching Presence
Discussion-boards	<p>Potential contribution: High</p> <ul style="list-style-type: none"> <li>• Topic-centered discourse in a thread encourages focused exploration.</li> <li>• Diverse posts promote reflection on different perspectives.</li> </ul>	<p>Potential contribution: High</p> <ul style="list-style-type: none"> <li>• Opportunity for individual expression allows for establishment of an online identity.</li> <li>• Direct and focused exchanges allow for building of supportive relationships.</li> </ul>	<p>Potential contribution: High</p> <ul style="list-style-type: none"> <li>• Educators can directly moderate or facilitate the discourse through contributions on the discussion board.</li> </ul>
Weblogs	<p>Potential contribution: High</p> <ul style="list-style-type: none"> <li>• Focused content creation stimulates individual reflection.</li> <li>• Comments from readers help to create meaningful exchanges from diverse perspectives.</li> <li>• Hyperlinking creates a discourse network.</li> </ul>	<p>Potential contribution: High</p> <ul style="list-style-type: none"> <li>• Individual freedom in content creation allows for self-presentation.</li> <li>• Commenting features allow for social discourse amongst peers and eliciting expressions of support.</li> </ul>	<p>Potential contribution: Medium</p> <ul style="list-style-type: none"> <li>• Educators can provide feedback by posting online comments; otherwise their role is limited to designing the learning activities.</li> <li>• Educators can use their own blogs to present learning materials to the students.</li> </ul>
Micro-blogs	<p>Potential contribution: Low</p> <ul style="list-style-type: none"> <li>• Limited content space inhibits the development and exchange of reflective arguments.</li> <li>• Spontaneous patterns of interaction hinder meaningful discourse within the micro-blog but may trigger discussions to take place subsequently via email or other mechanisms.</li> </ul>	<p>Potential contribution: High</p> <ul style="list-style-type: none"> <li>• Broadcasting short messages permits self-presentation to a wide audience of followers.</li> <li>• Frequent status updates help to maintain a community between the readers/subscribers of the micro-blogs.</li> </ul>	<p>Potential contribution: Low</p> <ul style="list-style-type: none"> <li>• The role of educators is limited to contributing to intermittent discourse and the educators have little/no control in guiding or moderating the discourse.</li> <li>• Educators may use their micro-blogs to send their status updates and other news items related to the course or program to the students.</li> </ul>
Pod- and videocasting applications	<p>Potential contribution: Low to Medium</p> <ul style="list-style-type: none"> <li>• Content creation process encourages focused and critical reflection.</li> <li>• Passive content consumption provides only limited opportunities for reflection and sustained communication.</li> </ul>	<p>Potential contribution: High</p> <ul style="list-style-type: none"> <li>• The freedom in creating content provides ample opportunities for self-presentation.</li> </ul>	<p>Potential contribution: Medium</p> <ul style="list-style-type: none"> <li>• The role of educators is limited to designing the learning activities.</li> <li>• Educators can use podcasts and videocasts to present learning materials to students.</li> </ul>
Wikis	<p>Potential contribution: High</p> <ul style="list-style-type: none"> <li>• Content creation and revision provides cognitive stimulation.</li> <li>• Integration of diverse perspectives contributes to the development of shared understanding.</li> </ul>	<p>Potential contribution: Low</p> <ul style="list-style-type: none"> <li>• Creating content collaboratively limits the opportunities for individual self-expression.</li> <li>• The focus on content creation instead of discourse hinders relational exchanges.</li> </ul>	<p>Potential contribution: Low</p> <ul style="list-style-type: none"> <li>• The peer-based hierarchy-less mode of content creation often limits the role of the educator to designing the learning activity.</li> <li>• Educators can, however, comment on the content and provide feedback.</li> </ul>
Social networking sites	<p>Potential contribution: Low</p> <ul style="list-style-type: none"> <li>• Spontaneous form of interaction limits focused and reflective discourse among users.</li> </ul>	<p>Contribution: High</p> <ul style="list-style-type: none"> <li>• Creating and maintaining an individual profile directly targets the creation of an online identity.</li> <li>• Sites facilitate community building.</li> </ul>	<p>Potential contribution: Low</p> <ul style="list-style-type: none"> <li>• The role of educators is limited to setting up groups or facilitating some interactions.</li> </ul>
Social bookmarking applications	<p>Potential contribution: Low</p> <ul style="list-style-type: none"> <li>• Activity is limited to content collection (rather than creation), which provides only limited cognitive stimulation.</li> <li>• Opportunity for creating commentary is limited, and does not facilitate deep reflection.</li> </ul>	<p>Potential contribution: Low</p> <ul style="list-style-type: none"> <li>• Aggregation of individual contributions limits opportunities for self-expression.</li> <li>• Lack of discourse prevents the creation of relationships among contributors.</li> </ul>	<p>Potential contribution: Low</p> <ul style="list-style-type: none"> <li>• The role of educators is limited to designing the associated learning activity.</li> </ul>

## V. DISCUSSION OF THE USE OF SOCIAL SOFTWARE IN HIGHER EDUCATION

Web-based social software tools have enabled new forms of interaction, communication, and collaboration. Social software tools support and encourage individuals to learn together while retaining individual control over their time, space, presence, activity, identity, and relationship [Anderson and Elloumi, 2008]. Integrating these tools into teaching and learning and using the unique characteristics of these tools to enhance the educational experience is one of the core challenges for higher education. Wiki applications, for example, derive their core value from enabling large numbers of users to collaboratively create and continuously refine content. It is the rewriting and negotiating of the content which contributes to the development of cognitive presence of the learners as illustrated in the requirements analysis task at The Open University, UK (discussed above). By using wikis merely as a convenient tool to upload and present content [e.g., Boulos et al., 2006; Xu, 2007], the core value of the wiki technology is not leveraged and its contribution to cognitive presence is limited. Similarly, podcasting and videocasting can significantly enhance the educational experience by allowing students to present themselves and by encouraging them to produce multimedia-content for an audience as shown in the physiotherapy course example. However, in educational settings the use of podcasting and videocasting is often limited to being alternative channels for distributing lectures. Such examples clearly show that while social software applications have the *potential* to significantly contribute to the educational experience, realizing actual benefits depends on the way these tools are implemented in a learning context.

For several social software tools the contributions to the educational experience have been well established, and research is now starting to explore the risks and downsides they create in a higher education context. In the case of blogs, for example, the process of “writing for an audience” clearly contributes to the development of writing skills [Downes, 2004] and enhanced reflections on a topic [Du and Wagner, 2007]. The same process of public writing, however, may also create considerable anxieties among students, especially when lacking blogging experience [Salen, 2007]. Similarly, the use of social networking applications for academic purposes has caused privacy concerns as particularly unruly online self-presentations of students have been taken by universities as grounds for disciplinary actions [Cain, 2008]. Some authors interpret social networking sites as self-organized student-centered communities where formal academic involvement could be considered as a form of intrusion [Chu and Meulemans, 2008], and using such sites in a learning context may not be considered appropriate by the students. While the current discourse on social software is largely enthusiastic about the potential of these tools, their widespread use for teaching and learning might also create issues that need to be considered in the overall adoption decisions.

Given that social software tools derive their value from decentralized peer-based contributions, their introduction to the higher education environment has interesting implications for approaches to teaching and their underlying philosophies (i.e., traditional versus constructivist). These tools offer students opportunities to learn from each other, to self-direct the learning process, and to integrate their diverse areas of expertise in a group. Considering these contributions, social software tools seem to specifically support a constructivist teaching approach which favors self-directed learning over the plain provision of content. Indeed, some authors even consider social software applications as constructivist teaching tools [McLoughlin and Lee, 2007; Dalsgaard, 2006]. The systematic introduction of social software tools in higher education curricula might not only contribute to interactive and collaborative learning but, in fact, help to create further positive changes in the teaching and learning approaches in higher education institutions.

Our analysis has shown that the introduction and use of social software has direct consequences for teaching and learning practices and the role of the educator. Social software applications are highly flexible regarding the way they can be used and the range of tasks they can be used for, and it is the role of the educator to match the application and its use with the learning objectives of a course. But even more delicate is the question on the role the educator should take in the use of the social networking application and the level of influence he or she should exhibit. Garrison et al [1999] consider the teaching presence as one of the important elements contributing to the educational experience (next to cognitive and social presence). The level of teaching presence is not determined by the choice of applications, as they largely allow the educator (or another individual) to explicitly or even implicitly guide or direct the interaction taking place through the application. However, to which extent the involvement of the educator influences the success and sustainability of the different applications is not yet clear. On the Web, social software applications are based on egalitarian principles (e.g., decentralized contributions, peer-based quality control). It is not clear to which extent these principles can be transferred to the educational context, given the small number of participants, the goal oriented nature, and limited time-frame of an university course. To which extent the widespread introduction of social software has an impact on the role of the educator will need to emerge from the experiences which are currently being gained in the various initiatives and pilots being conducted in higher education institutions.

## VI. CONTRIBUTIONS AND MAPPING A FIELD OF RESEARCH FOR THE IS COMMUNITY

In this paper, our aim was to investigate the contributions of social software to higher education teaching and learning. We identified a range of applications and systematically analyzed their core characteristics. To highlight the key elements that influence the educational experience of a student, we introduced Garrison et al's [1999] *community of inquiry* framework which focuses on cognitive presence, social presence, and teaching presence. By drawing on research that identifies the predominant ways the different social software applications are used and the benefits they create, we evaluated the potential contributions of the applications to each of these elements of Garrison's framework. Further, we provided case vignettes from various UK higher education institutions, to illustrate how the different social software tools can be used, and their diverse contributions leveraged.

Our analysis contributes to IS research in three distinct ways. First, we have identified the individual characteristics of various social software tools. Social software is often discussed as a coherent group of tools and applications as they share a large number of defining characteristics [Parameswaran and Whinston, 2007]. Despite their common characteristics, however, different tools exhibit diverse capabilities and enable distinct contributions. By focusing on their individual ways of use and analyzing their specific contributions to teaching and learning, we hope to have added to a more differentiated discussion on the educational use of social software, which takes the individual strengths and opportunities of these tools, but also their drawbacks and challenges, into account.

Second, we have contributed to a better theoretical foundation for the role of social software in education. Social software use in the higher education context is often motivated to stimulate student interest due to the novelty factor of the tools [Jones, 2007] or to cater to student expectations which they have built through their other communication practices [Thompson, 2007]. By drawing on an established learning framework, a wide range of research findings, and illustrative cases, we have shown that the different social software tools can provide significant contributions to the educational experience that are arguably more valuable and sustainable than introducing these tools to capitalize on their novelty factor. By systematically analyzing the tools, we have provided theoretically motivated arguments for the choice and adoption of these tools.

Finally, we have introduced the issues related to social software in the higher education context to the wider IS community. The systematic integration of social software tools has the potential to create a significant impact on higher education and particularly the teaching process, which is at its core. By illustrating the issues and indicating the potential of social software, we hope to create interest among IS researchers to engage in this research domain and to contribute to this field. Much of the current IS research focuses on the use and impact of information technology on business organizations; however, while business organizations are an important area for research, it is in the domain of education (and higher education in particular), where information systems can have important *societal* impacts. Exposing students to information systems in general, and to social software in particular, can significantly aid in educating individuals in the successful and responsible use of these tools in educational, social, and work place contexts.

### Scope for Further Research

The integration of social software into teaching and learning in higher education institutions constitutes an emerging phenomenon which offers significant potential for further research. In particular, the application of the community of inquiry framework opens up interesting opportunities as it allows researchers to draw on and test established theory in a new context. To date, most investigations on cognitive, social, and teaching presence are based on the use of discussion boards where it has been clearly shown how social relationships and educational guidance contribute to a student's ability to construct meaning [Garrison and Arbaugh, 2007]. Our review has shown that the characteristics and context of use of the other social software tools are sufficiently different from those of discussion boards; to which extent the research on discussion boards applies to the context of other tools such as wikis, blogs, or social networking sites is not clear. Clarification is required if we want to be able to use the insights from the community of inquiry framework to improve future teaching and learning scenarios. We have made an initial attempt in this direction in this paper.

Opening up the community of inquiry framework to a wider range of social software tools also raises important questions concerning the opportunities of using a portfolio of different tools to support teaching and learning. The social software research to date has largely focused on a single tool, however, as educators are applying a combinations of tools [McLoughlin and Lee, 2007] it would be a very promising and timely research endeavor to focus on how these tools complement each other. For example, using wikis for collaborative authoring and perhaps using blogs or micro-blogs (tweets on Twitter) for discussion on a student group project.

Another promising area of research focuses on the appropriation of social software during the use in an educational context. Social software tools, in general, offer a high degree of flexibility allowing the user to ultimately decide on the individual form of use. For example, wikis offer a high degree of flexibility in content presentation and structure of the Web pages, and are specifically designed to exhibit as little structure as possible [Mader, 2008]. Research could focus on the different ways students use these tools and how these tools are appropriated for different purposes. Of particular interest would be the question about how the usage of the different features of these tools to support the educational experience develop over time.

A fourth area for future research would be to investigate how the emergent and dynamic design features that characterize the internet-based open social software tools could be incorporated into dedicated university-based virtual learning environments (VLEs). Today's VLEs have tools such as discussion boards, wikis, and functionalities allowing users to create their individual profiles. But, by and large, these tools have not received the enthusiasm which has been observed with the use of tools in the public domain, and are instead considered monolithic and hierarchical [Dron, 2006], with their design focused on the needs of the institution instead of the learner [Severance, et al., 2008]. Research should focus on how to allow the users (that is, students and educators) to integrate external content or even integrate entire applications into these static environments, and thereby create personalized learning and teaching environments. Such developments would bridge the boundaries between University-based VLEs and the social software tools in the public domain, and would more directly support the actual learning patterns of today's student.

## VII. CONCLUSIONS

Social software is a highly interesting phenomenon, particularly when taking into account the diversity of applications, their unprecedented uptake, and the large range of uses and benefits. In the education domain, these tools can contribute to new teaching practices or even facilitate new ways of learning. While some of these tools have been very successful for social interactions on the Web, this does not guarantee their widespread adoption, sustained use, and success in the higher education domain. A better understanding of the different ways these tools are used and their range of possible contributions to student's experience is likely to help higher education institutions to realize the same benefits and sustainable forms of using social software tools that characterize their success on the Web.

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*Editor's Note:* The following reference list contains hyperlinks to World Wide Web pages. Readers who have the ability to access the Web directly from their word processor or are reading the paper on the Web, can gain direct access to these linked references. Readers are warned, however, that

1. these links existed as of the date of publication but are not guaranteed to be working thereafter.
2. the contents of Web pages may change over time. Where version information is provided in the References, different versions may not contain the information or the conclusions referenced.
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## APPENDIX

Case Vignette	Description of the Social Software Initiative
Digital Photography at The Open University, UK	A photo-sharing site is used in a digital photography course to allow students to present and critique each other's work. The initiative started in 2007 and involves more than 1000 students in each presentation.
Blogging at Nottingham Trent University, UK	Blogs are used in a trainee teacher program to provide students with the opportunity to reflect on their experiences of being in school placements and to encourage socialization among the students. The initiative started in 2006 and involves 80 postgraduate students.
Blogging at University of Leeds, UK	Blogs are used by postgraduate students in a history course for self-reflection and for set tasks. The initiative started in 2007 and involves 10–15 students in each presentation.
Micro-blogging at Portsmouth University, UK	Twitter was introduced in a electronic and computer engineering course to create an informal communication channel between the lecturer and students to support students in their semester-long projects. The tool has been used since early 2008.
Podcasting at University of Hertfordshire, UK	In this initiative, the students on the physiotherapy course create a podcast of patient advice on back pain management (in a role-play scenario) which simulates interaction with patients. The initiative is being carried out since 2007 with around 80 students each year.
Wiki use at The Open University, UK	Wikis were used in a postgraduate software engineering to provide the students with the opportunity for small group collaboration in a distance-learning environment and to emulate software engineering practice. The initiative started in 2006 and involves 80–100 students in each presentation.
Social networking at Birmingham City University, UK	The social networking site Facebook was used to create an induction environment for first year BA English students to help establish social networks prior to the course start. It is an ongoing initiative which is in its second year with around 120 students participating.
Social bookmarking at Sheffield University, UK	Social bookmarking tool was used to encourage first year history students to identify, catalogue and share relevant web-sources and reflect on their insights throughout the course. The initiative started in 2007 and involves around 20 students.



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