Educational Perspectives on Digital Communications Technologies

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ABSTRACT This article examines key issues in how new technologies are impacting upon how we teach, learn and collaborate, and uses an educational research project called GRAIL (Graduate Researcher’s Academic Identity Online) under development to illustrate some fundamental issues in adopting new technologies. A significant challenge to the effective use of new technologies in education is the evolution of social practices around those technologies and the discrepancies between broader social uses of new technologies and how those same technologies can be used in educational contexts. The article describes challenges to design along the dimensions of public/private and individual/collaborative and uses data from a series of project research studies to illustrate the nature of these challenges and possible solutions. The taking up of new technologies in new ways requires the evolution of social practices of use – these practices simultaneously reflect and change our culture, and the evolution of such processes takes time.

Background and Problem Statement

This article looks at key issues in how new technologies are impacting upon how we teach, learn and collaborate, and uses an educational research project under development to illustrate some fundamental directions in this journey. Specifically, I will suggest that the main challenge to effective use of new technologies in education is the evolution of social practices around those technologies and the often significant discrepancies between broader social uses of new technologies and how those same technologies connect with educational contexts.

The background to the problem motivating the educational research project example (the GRAIL project – Graduate Researcher’s Academic Identity Online) is the need to find ways to support graduate students studying at a distance in developing identity as researchers. In our knowledge society, the constant restructuring of the job market requires individuals to engage in life-long learning, and those who teach are no exception. Technology enables non-traditional students – including practicing teachers, medical professionals, instructional designers, corporate trainers, professors, etc. – to pursue graduate study part time and at a distance while still engaged with their professions. While graduate-level education is frequently conceptualized as an apprenticeship in disciplinary research practice (Eisenhart & DeHaan, 2005) this model of learning is difficult to implement when students are not present regularly on campus. In the area of education, graduate students may additionally have limited experience with either the culture of scientific inquiry or the technical aspects of research. Engagement in the culture of research practice may be further hampered by minimal ongoing academic involvement across a program of study, beyond simply taking courses. So, for example, they may engage in fewer research and presentation activities and have generally less experience with the activities of the broader education community of practice (Brett & Freeman, 2005; Freeman, 2008). Lave & Wenger’s (1991) Communities of Practice model (Wenger, 1998, 2000) is thus a useful theoretical starting point for the design of a sustainable graduate student learning environment because it provides a way to consider the process of learning research practice as participation through the notion of
legitimate peripheral participation. Apprenticeship is conceptualized by Lave & Wenger (1991) as requiring legitimate participation in authentic practice and graduate students studying at a distance are challenged by time and space constraints to engage in research projects and other authentic research activities with faculty and peers.

What Do New Technologies Offer Educationally?

Turning now to the broader issue of new technologies’ impact on teaching and learning, I will first define some terms. Web 2.0 is a term currently in wide use. In this article I am referring to Web 2.0 technologies broadly as those that involve Internet-based content characterized by interactivity and interconnectivity. Common examples of these include weblogs (individual online journaling), wikis (collaborative writing environments such as Google Docs), and synchronous (where people communicate in real time) video and chat applications. These interactive features impact significantly on two key dimensions that will underpin the discussion in this article – one is the public/private dimension, and the other is the individual/collaborative dimension. While these dimensions are related, they have differences, particularly in how they are conceptualized in education, and these dimensions play out as important factors in how technology is integrated into learning and teaching contexts.

In the educational context specifically, Anderson (2008) has described a set of features that characterize what he calls Educational Social Software (ESS). These include predominantly ‘sociable’ tools, including presence tools (e.g. who’s there?); notification (e.g. RSS [3] updates); cooperative learning support (e.g. synchronous tools, such as text chat, that allow learners to solve problems and discuss issues in real time); student modeling (e.g. reading other blogs; participant profiles in Facebook or LinkedIn) and documenting and sharing of constructed objects (e.g. videos, discussion entries, wiki documents), to name some of the key features. Such features are largely ‘sociable’ in that they allow greater modifiability and personalizing of learning environments, as well as enabling connections to larger and distributed communities while supporting existing local and focused communities.

A different perspective on the needed direction for educational technologies is given by Scardamalia & Bereiter (2003) who have described the characteristics of Knowledge Building Environments (KBEs) and how these differ from Computer Supported Cooperative Learning (CSCL) environments broadly. They say: ‘A KBE should be distinguishable from CSCL environments by virtue of its focus on processes of knowledge creation and idea improvement and by virtue of its ability to represent the resulting community knowledge’ (p. 5). They propose that the essential characteristics of such environments inhere in how technology supports idea development, idea sharing and idea elaboration and that allows the continuous improvement of ideas in ways that support the evolution of community knowledge goals. Research spanning more than two decades on variations of this environment suggest that a key challenge lies in developing the social practices and approaches to learning in the classroom that can take advantage of the technological affordances of the system (Scardamalia, 2002; Scardamalia & Bereiter, 2006; Zhang et al, 2007). In large part this is because the culture of schools which has to date largely emphasized knowledge transmission differs significantly from the focus on knowledge creation that Scardamalia and Bereiter argue is critical for apprenticeship into the knowledge age.

While the two sets of characteristics offered by these researchers differ in their goals and focus, they each emphasize the fundamental role of the social in online contexts, and point to the discrepancy between typical educational practices and the affordances offered by newer technologies. At a general design level these kinds of principles are important to keep in mind, but the details of how social practices change over time and affect actual use among different groups are still unclear. The project described in this article is engaged in understanding those detailed perspectives with a particular group; graduate students studying at a distance.

Thus, while technologies themselves are rapidly developing (think, for example, of the proliferation of applications one can add now to a Facebook site compared to even a year ago), it is also clear that there is a slower, evolving development of emerging social practices around these technologies. This social evolution process I see as both a barrier and the key to effectively integrating new technologies deeply within educational practice. It becomes a barrier when the
affordances a technology offers conflict with existing social practices within a community, such as a traditional educational setting, yet social practices are simultaneously key because effectively integrated, social practices support learning in a variety of ways (Wegerif, 1998; Henri & Pudelko, 2003).

An example of the separate trajectories between the technical and the social can be seen in the use of weblogs (blogs). Blogs were initially used (in the late 1990s) in the broader social context as a location for the telling of individual, often political, stories, amplifying the claims of the democratizing possibilities of Internet technology (Blood, 2004; Freeman, 2008). These individual stories from inside world events emerged unedited by traditional news sources. The individual entries in addition to blog comments and links to blog entries from other blogs (mutual personal publication) really blended the individual and social aspects of such technologies (Mortensen & Walker, 2002). However, by contrast, in school contexts weblogs were initially utilized as online journals – the electronic equivalent of learning logs (Lujan-Mora, 2006), although they are starting to be viewed as tools for broader literacy goals now (Huffaker, 2005; Glogowski, 2007) as multiliteracies education gains emphasis. Thus the technology offered by blogs initially took on the attributes closest to the obvious offline parallel of the main features of the technology – i.e. written journals. This is reminiscent of the phenomenon of initially naming the car the ‘Horseless Carriage’ – in that it calls to mind existing parallel uses, and not the new possibilities of the emerging technology. In the case of blogs for example, they seem to be predominantly about writing, but in fact their use on the Internet was initially more about reading, and secondarily about writing. In a study of graduate student use of blogs (as part of the GRAIL project to be described shortly), Freeman (2008) found that blog technology supported the following kinds of activities: filtering and annotating resources, note-taking, and personal reflection. However, to establish a suitable environment for mutual personal publication and reading required more than a semester, along with appropriate activities to learn how to see a range of possibilities in the technology and a broader and more established community to provide these extended models of use. In that study an aggregator provided a direct window of access into the blogs of others in the group, and thus provided a degree of modeling across groups. Still, even with that modeling present, existing social practices within the educational context impacted far more on the way weblogs were used than the available models of use outside of the educational context. So, for example, many students did not understand that the blogs were Internet accessible to others as well as themselves (despite being told this repeatedly), others found the idea of sharing ideas in an incomplete form to be very disconcerting, and for others the idea of having any kind of audience for their school work other than the teacher was uncomfortable. Over the term however, most people started to change their views as they experienced writing entries and receiving peer feedback, and by the end of the course many expressed a view that weblogs were a valuable addition to a range of assignment possibilities and offered a unique forum for the combination of self-expression and commentary from others.

**GRAIL as an Illustration of the Social Evolution of a Learning Technology**

The overall goal of the GRAIL project has been to develop a set of social and technical tools that support the formation of an online community to engage graduate students in activities related to educational research across course boundaries and through their degree program. Because the journey of graduate students is a complex one that interweaves particular instantiations of community involvement with an ever-developing ability to find and articulate an independent and personal voice, an effective online environment needs to support both these kinds of processes, the social and the individual, possibly in multiple ways.

The motivation for engaging with research in this group is the growing recognition of the need to improve the graduate training of education researchers, both in the USA and in Canada (Lagemann & Shulman, 1999; Lageman, 2000; Natural Sciences and Engineering Research Council, 2003; National Research Council, 2004). In the USA, such concern has been heightened both by the current emphasis on scientifically based research in education (Eisenhart & DeHaan, 2005) and more generally, by the prevailing need to educate people for the new knowledge economy. Using technology to provide greater access to quality graduate education is increasingly being recognized as an important strategy. As globalization in Canada and the USA becomes more
extensive, and work requirements change, the need for distributed research communities and skilled researchers increases (e.g. Natural Sciences and Engineering Research Council, 2003). An important element of graduate education is the preparation of researchers. However, in spite of the popularity of online learning for course delivery, there is as yet little empirical research on the constraints and affordances of this medium for the broader issue of researcher preparation, and especially what different technologies may offer for particular kinds of social and learning experiences. Accordingly, a design research approach (Brown, 1992; Collins, 1992; Edelson, 2002; Cobb et al, 2003; diSessa & Cobb, 2004) has been used in this project in which iterative, situated and theory-based studies are implemented in order to better understand and improve educational processes.

The technical elements in the environment have been chosen opportunistically to date, with the goal of moving to open-source applications that will evolve over time to meet changing needs. The elements have included: Knowledge Forum [4] as a public discussion environment; social networking and bookmarking tools including weblogs as individual locations for academic journaling; shared RSS feeds to support connections to a more distributed research community; a series of wikis for encouraging and modeling collaborative writing; and a phased approach to developing a coordinating portal which users can modify to suit their own learning needs. Additionally, synchronous tools available through chat tools (modifications of IRC) and Adobe Connect are used to coordinate and make available archives of large research and small group meetings. One challenge continues to be the frame for such tools – we have been using a lightweight container model with hooks into different applications, to allow for prototyping and adaptation, but the transparency and usability of such a frame is a challenge because of the range of experience and needs of the user group. Accordingly, we have been looking at the use of particular applications such as public and private writing environments, their affordances and limitations and using this knowledge to guide successive iterations of design (e.g. Brett & Touzet, 2009), and are moving instead more gradually to a final overarching container design. The GRAIL project differs from other forays into the realm of CSCL in that, rather than seek to create an altogether new environment based solely on theoretical principles, it seeks to create an environment that weaves together a diverse array of extant technologies which each contribute an important communication component around key activities connected to both theory and practice in graduate research. In part this is to make the technology broadly accessible to graduate students connecting largely from their homes. Unlike the opportunities available to research institutions, for example, to use broadband and other powerful technologies, this system has to work for individuals. By approaching the technology in this way, GRAIL allows each technology to shine through as ‘best of breed’. Philosophically, this approach is not altogether different from that which underpins much open-source development: ours is the Bazaar to others’ Cathedrals (Raymond, 2000).

Additionally, the social frame one holds for understanding how communities sustain themselves may influence the design of online components to support them (Brett & Freeman, 2005), and also influences how one perceives the value of collaborative and public locations for knowledge development. Much literature on online community makes particular assumptions about the positive nature of community.

First, it often emphasizes the sharing nature of the interactions and typically takes a consensus-based approach where differences are negotiated. Second, community involvement is often seen as a relatively unitary thing – online communities may have a singular focus – such as the in-service teachers involved in Tapped In (http://tappedin.org/tappedin/) – or are focused on resource-rich contexts, such as that offered by MERLOT (http://www.merlot.org). While we know that community has potential advantages it may also have limitations. A community that provides a sense of safety and in which one feels a legitimate contributor may provide a supportive learning context. However, the degree to which community involvement pushes people towards conformity or stifles discussion because of a subtle press towards adopting community norms needs to be considered. Hodgson & Reynolds (2005), for example, see the challenge of truly participative networked communities as needing to take seriously the inclusion of difference and incorporating the multiplicity of interactive networked communities, thereby avoiding the marginalization that can occur in conventional community structures. Similarly, Noddings (1996) has noted the potentially oppressive nature of communities in cases where dissent is rejected because it may cause a fracturing of community. Again, these considerations differ from a
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traditional educational context where the community and its relations have a more fixed and often hierarchic structure, and offer further challenges for developing a collaborative culture.

Each element in the GRAIL environment highlights particular ways of being – the technology either supports certain kinds of interactions or activities, or these may be augmented in particular ways by the nature of the local group of users. Graduate students are diverse in their work experiences, disciplinary focus and in their ability to engage fully in a full-time, campus-based program of study. This diversity of background and life situation creates a challenge to developing a community sustained through online group discussion, as is often the case in distance education contexts. This learning environment, by contrast, seeks to take a broader understanding of what it means to participate in a community by taking diversity as a point of departure and not assuming that students are being socialized into a single academic community of practice. Rather, we assume students belong before, during and after their graduate studies to multiple communities and that to facilitate their growth as graduate researchers, those contexts need to be clear and evident to faculty and other peers.

**Research Findings to Date**

Some of the findings to date relevant to this discussion follow Table I which highlights the relationship of public/private and collaborative/individual dimensions of GRAIL in relation to some of the individual technologies.

<table>
<thead>
<tr>
<th>Collaborative</th>
<th>Public</th>
<th>Local community</th>
<th>Private/select group</th>
</tr>
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<tbody>
<tr>
<td>Weblogs</td>
<td>Wikis</td>
<td>Wikis</td>
<td>MY GRAIL</td>
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<td>Wikis</td>
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<td>GRAIL groups</td>
<td>Discussion environments</td>
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<td>GRAIL</td>
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<td>Chat</td>
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<td>Archived chat</td>
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<td>Individual</td>
<td>Weblogs</td>
<td>Weblogs</td>
<td>Final course papers</td>
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<td>Discussion environments</td>
<td>MY GRAIL</td>
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<td>GRAIL resources</td>
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Table I. Public/private and collaborative/individual dimensions in relation to the GRAIL environment and component technologies.

Thus the goal of the GRAIL environment is to support whatever location best fits the needs of users at a particular moment, or for a particular task, and assumes that each location has particular affordances. How these dimensions emerged from the GRAIL research studies to date will be discussed next and we will provide specific examples of these dimensions.

Figure 1. The introduction screen from an early version of GRAIL describing the ‘layers’ from public to GRAIL groups to private.

The first finding that suggested particular experiences might be useful for this group of adult, usually part-time, graduate students was that it was hard for them to develop a sense of identity in a developing community. This finding emerged from a survey of 40 recent graduates (registered in years since 1999) and currently registered students who had taken online courses at our institution to examine how they managed their graduate experience. Questions included: What were their
goals for enrolling in the program and how did their goals compare with those of their peers? How much contact did they have with faculty and peers? What did they think educational research involved? Results suggest that students were generally satisfied with their experiences in achieving their professional and academic goals, but had limited interactions with peers or faculty beyond bounded course contexts and supervisory relationships. They were less certain about how their goals compared with those of their colleagues. Although they recognized the value of presenting and publishing in the research process in principle, students were unaware of or unclear about the significance or value of participation in research groups or projects offering collaboration and co-authorship opportunities. Thus the data suggested to us that students might benefit from more elaborated models of how graduate training and research were connected and how the activities of the broader research community of practice – such as conferences and research groups – were relevant to their own courses of study. This finding guided our initial developments of a distributed research group where students participated either locally or by Internet-based video-conferencing and phone as a socially based academic experience to elaborate their understanding of the practice of academic research.

Figure 2. Using tags to identify and aggregate resources at the GRAIL community level.

As well, we focused on an individual, but public, experience of academic writing through weblog use, to support student sense of identity as researchers. This study led us to the second major finding relevant to this article.

The second finding was that individual writing environments to support the development of academic identity were effective for some but the process of making knowledge public raised tensions between public and private knowledge development.

The studies that gave rise to these findings examined how weblogs can be employed as a public and personal writing space to make the culture of research practice more transparent in a graduate program in education (Brett & Freeman, 2005; Freeman, 2008). Weblogs provide a journal-like structure that can be used to add chronologically ordered posts. Weblogs were used by graduate students both within courses and by those involved in research across a program over two semesters to reflect on their learning and research experiences. Additionally, a group of students agreed to monitor their weblog use and collectively develop a conference presentation on the findings (Freeman et al, 2006). The weblogs were publicly available and aggregated, making them easier to access, and students were encouraged both to read each other’s entries and to link to
and build on any other relevant weblogs and websites that they found. Content analysis of the weblogs was used to explore how the technological affordances of web-based journals such as linking, chronological posting, and aggregating using RSS could be used by students. By reading practicing and emerging researchers’ weblogs, and reflecting on their meaning, graduate students had the opportunity to interpret the role of theory in practice and become exposed to the tacit meanings associated with methodological choices made in research. As mentioned earlier however, the problems arose when the familiar two-way academic relationship of student to professor and professor to student changed to a more distributed model with peers also engaged as co-participants along with the professor and sometimes other specialists. While peer review is a central tenet of academic practice, it is not a typical part of most prior educational experiences at the school or undergraduate level for most students, and the sense of privacy around marks extends also to a reluctance to share thinking and ideas as the focus has been in the past more on performance than on generative thought. Experiences with the weblogs thus challenged those beliefs and it took some time and experience for those perspectives to shift. Most students appreciated the thoughtful peer comments received and began to find the public nature of this forum less threatening. For a very few students, weblogs continued to be a very painful and exposing experience, although for that small group, further academic study (at the doctoral level) was not a direction they were planning to take.

As a consequence of these findings (Brett & Freeman, 2005) it was decided to focus more on giving students more social experiences with writing – as this seemed to lend itself to an online location because of the availability of permanent records of the writing process, and wikis seemed a perfect technology to employ for this purpose. This leads us to the third finding of relevance to this article, namely that while wiki technology offered the possibility of distributed and shared authoring, in addition this kind of activity departs significantly from the existing individualistic culture of learning, creating difficulties in adapting to this new environment. Thus this issue for the wiki example was not the public/private dimension that characterized weblog experiences, but rather the individual/collaborative dimension (as described in Figure 1).

In this research strand we looked at ways to use wikis to support academic writing (Brett, 2006; Brett et al, 2006). Academic writing is a complex and multifaceted endeavour, involving a variety of different genres of writing: reviews, journal articles, and research proposals to name but a few. Collaborative writing environments like wikis offer potentially powerful spaces in which to carry out different academic writing tasks. The resulting discourse is available to everyone, and can thus offer writing models, provide feedback and serve, in a distance learning classroom, as an equitable bridging context of academic practice between local learners and distant learners (Hewitt
et al, 2006). The first project involved the development of a group’s annotated bibliography of resources related to constructive learning and online environment design (Brett, 2006; Brett et al, 2006). Students found that aspects of the wiki were unfamiliar and confusing and suggested some changes to organizational features. Many of these changes, like threading and titles and dates for posts, were features of the discussion environment they were also using for the discourse part of the course. However, the changes suggested by the participants reflected both design and learning considerations and suggested directions for further cycles of development to adapt the wiki to different types of collaborative, written academic work – particularly including some richer editing templates for bibliographic entries. The aspects liked least by students were the page ownership and security issues – these of course are the most unfamiliar features and those most discrepant from students’ prior educational experience – and there was much discussion of how to develop social practices and ways of thinking about shared authoring, even in the more constrained editing context of an annotated bibliography.

**Current and Future Directions**

The current phase of work involves a more elaborate design where wikis will be used with a layer of commenting and be linked to synchronous tools (Brett & Touzet, 2009). These will be used with a research group and as part of a year-long course for flex-time doctoral students for the explicit purpose of modeling the process of writing in different academic genres. Students will either be co-authors or readers and be able to comment, question, read and observe comments by the authors and others, and thus see the developmental process of a paper through to completion.

In this next phase of research we will be setting up a larger on-site community with a greater web presence and use the developing applications to build local community with both students and faculty participants, the rationale being that local community will provide a critical mass of models of academic practice for incoming distance students. A general finding from the research to date on the GRAIL project is the extent of the tacit nature of much of the graduate school experience and so facilitating entry into an academic community of practice particularly for education students is a very non-standard experience (Shulman et al, 2006). Through such a community context including the wiki design, students could be exposed to a wider range of academic experiences with which they may identify and this may give the part-time distance students who enter the program with different perspectives and little sense of the culture of research, a more comprehensive picture of at least the local academic community. Rather than the distance students forming a separate group developing a community through working together, as they were in the GRAIL research to date, they would be part of a larger group – a structure more consistent with the notion of how legitimate peripheral participation (Lave & Wenger, 1991) experiences could effectively develop. Having a broader online community will allow us to bring the distance students into that existing community to find locations and colleagues with whom they can work, identify with and explore ideas. In part this will be achieved technically with a portal. This can provide immediate information on degree procedures and other reified aspects of knowledge, and the other more interactive online tools can help provide some apprenticeship and participatory experiences.

Of course, there are also challenges in getting faculty to participate, particularly those who are not as used to having an online presence and engaging interactively online.

Again, this issue reflects the state of current social practice with technology and a cultural shift of practice and use will take time and some demonstration of the value of any change. The goal would be to encourage faculty to participate beyond simply developing static repositories of information online and thereby encourage students to observe and value aspects of process that can be captured by the online affordances. Making these aspects of the research process visible is a marked departure from current practice, even at the graduate level. In essence one would be looking at how other people learned things. Thus, having elements like the wiki environment where people could view manuscript development; having archived traces from online chats and synchronous communications; sharing data repositories and versions of proposal and thesis development could together create a combination of static and dynamic artefacts which could benefit both part-time and on-campus students and potentially make graduate school processes a lot more transparent.
The next design challenge will be to decide upon the most useful technologies for the many different needs of these users, such as how those technologies can provide a community presence and still allow for the development of individual academic identity and expression. The other significant technical challenge is how to integrate component technologies in such a way that movement among locations is seamless and connected – an issue people found difficult with early versions of GRAIL. It is clear that small user issues have a very large impact on people’s sense of comfort and willingness to engage online and thus can inhibit the very evolution of new collaborative practices in a more public space that Internet technologies can afford.

Conclusions

In this article I have tried to illustrate how technology practices emerge within a particular cultural context and then evolve over time through the development of social practices of use. The challenge facing the integration of new technologies into educational contexts is that the social practices associated with the technology in the broader culture can conflict with the more individual and less public culture of most schooling, and the public and collaborative nature of many Internet-based new technologies offers further challenges to traditional directions of communication in education. GRAIL attempts to enable interactions and individual space at many levels, as Figure 1 illustrates, and through the iterative design process social uses can evolve, be observed, and incorporated into the design to support the connections most relevant to the student at any given time.

Change comes about not from the technologies themselves but the development of social practices using those technologies – these practices simultaneously reflect and change our culture, and the evolution of such processes takes time.

Notes

[1] The GRAIL research project has been supported by grants from the Social Sciences and Humanities Research Council of Canada and a grant from the Canadian Foundation for Innovation New Opportunities Fund.

[2] The author would like to acknowledge the members of the GRAIL research team who have contributed to the software and research referenced in this article: Wendy Freeman, Joan Touzet, Nobuko Fujita, Chris Teplovs, Sunir Shah, Seeta Nyary and Mark Hume.

[3] Literally RSS stands for Rich Site Summary, or Really Simple Syndication and allows users to be notified of updates to web locations like weblogs and news stories.


References


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