Finding Synergies: Web 2.0 and Collaboration Support Systems

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Abstract The prevalence and success of Web 2.0 applications in fostering collaboration raise the question whether or not traditional *Collaboration Support Systems* are still the tools of the trade when it comes to supporting collaborative work. In this paper, we argue that rather than replacing Collaboration Support Systems by Web 2.0 applications mechanisms from both domains may complement each other advantageously. By highlighting differences between the domains and commenting on prototypical implementations, we show possibilities for meaningful recombinations. The paper concludes with a brief outlook on the potential influence Web 2.0 may have on next generation Collaboration Support Systems.
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1 Web 2.0: Major Upgrade or Substitute for traditional Systems?

During the past years, we have experienced the rise of so called Web 2.0 applications, in which a large number of users voluntarily engage in collaborative work. The characteristics of **Web 2.0** can be best described an "architecture of participation" [11] which includes *simplicity of usage*, immediate *feedback* on UI and structural level and *valuing each user's contributions* [3], [6]. Web 2.0 orchestrates available technology in a way that encourages users to participate actively as its architecture of participation helps to balance effort and benefit even in work-related settings[1]. The success of these applications – e.g. wikis, word processors on the web or social tagging systems – raises the question *if we still need* traditional **collaboration support systems (CSS)** known from Groupware and CSCW research and practice or if we should just stick to Web 2.0 applications.

Looking at the state of CSS in practice, the idea of turning to Web 2.0 applications becomes even more tempting. Though such applications are common in both business and science, they oftentimes lack adoption by users [4], [7]. This can be attributed to two major issues: First, as Grudin puts it, there is a "disparity between those who do the work and those who get the benefit" [4]. Second, integration of Groupware into everyday's work practices as well as tool interoperability and availability have to be

[1] See [10] for an example on how social bookmarking services can be applied to improve search for information sources and social navigation in a corporate environment.

improved to allow for easy access and frictionless transitions between personal and group work [1]. These characteristics apply to Web 2.0 applications, in which contributors benefit most and access is possible ubiquitously.

But this is only half the truth. Besides the hype on Web 2.0, there is also a downside to such applications: features known from CSS are missing in most applications and therefore problems resurrect, resulting in poor support for e.g. awareness and sophisticated authentication and authorization, all being indispensable requirements for enterprise-grade applications. This lack, in turn, can be taken care of by features known from CSS.

Regarding both advantages and disadvantages of CSS and Web 2.0 applications as described above, we state that Web 2.0 mechanisms show a great potential to overcome existing problems in CSS and vice versa. In this paper, we demonstrate how this can be done by showing two practical approaches to improve collaboration support systems by combining them with mechanisms found in Web 2.0 applications.

In what follows, we will first discuss differences and overlaps between the domains of CSCW, Groupware (subsumed by CSS in this paper) and Web 2.0: these considerations presented in section 2 can be interpreted as a conceptual starting point for our efforts. Next, in section 3 we describe two cases of combining collaboration support systems and Web 2.0 applications. We illustrate our considerations on the potential outcome of these combinations by showing prototypical extensions to an existing CSCW environment. Drawing from our experiences in designing and implementing these extensions, in section 4 we develop a vision for future collaboration support systems based on flexible (re-)combinations of web 2.0 and CSS functionality. The paper concludes with comments on further research questions.

CSCW, Groupware and Web 2.0: Similarities and Synergies

In the current discussion of Web 2.0 phenomena and their impact on Groupware and CSCW, there is often no distinction between applications subsumed under any of these categories. This lack hinders the convergence of concepts known from these domains. However, there cannot be a *selective* distinction on the level of applications, and providing it is not what researchers in these fields should aim at. Instead, we should focus on finding *conceptual* synergies between these domains: deriving differences and similarities from the usage and purposes of applications and processes of each domain is crucial to identify synergies that may help to overcome existing shortcomings in each domain.

Fig. 1 provides such a distinction. It is based on three major characteristics present to a different extent in each domain: *goal or work orientation*, *communication and coordination* among peers in groups and *playfulness and user experience.* Considering CSCW, the driving factor for this domain is work or goal orientation. Taking document management or intranet portals as typical examples of this domain, communication is another but minor goal. Playfulness and user experience play a subordinate role. For Groupware, in general communication and cooperation among peers has to be seen as the major characteristic. Applications in this domain may serve different goals or no goal at all, as can be seen by typical examples such as instant

messaging or chat. There is also an emphasis on user experience, but aspects like playfulness and individual adoption are not as important as in Web 2.0 applications, which mainly focus on that. Examples like Wikis or Tagging communities show that in such applications there is no need for a particular goal. In applications such as Tagging communities, communication support varies and thus cannot be considered a major or decisive factor for this domain.

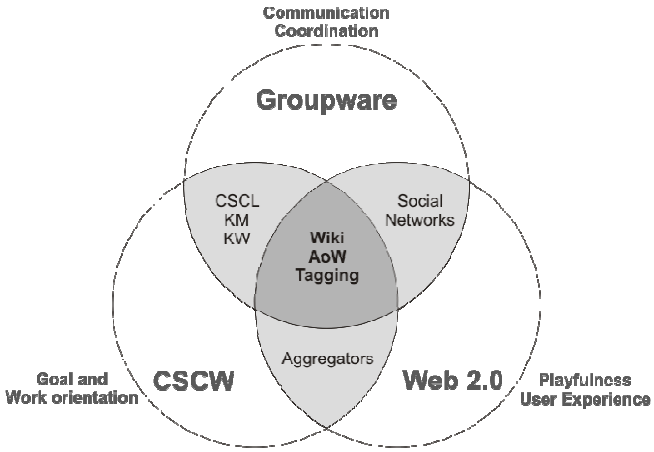

Fig. 1: Differentiation of CSCW, Groupware and Web 2.0 applications

Besides differences in the main aspects of each domain, there are also overlaps. For collaboration support, synergy potential can be found in the overlap between all domains. As can be seen in Fig. 1, it is made up by Wikis, Applications on the Web (AoW) and Tagging applications. These applications all share a focus towards certain goals, a strong emphasis on communication and coordination as well as rich user experiences and playfulness in their usage. Therefore, learning from underlying principles of these applications, user motivation in them and design principles provide strong potential for improving collaboration support systems. The other way round, comparing these applications to CSS applications provides a good opportunity to improve applications present in the Web 2.0.

Therefore, our work focuses on implementing and evaluating these synergy potentials of Web 2.0 applications and collaborations support systems.

Integrating Web 2 and Collaboration Support Systems

In the previous sections, we argued that challenges related to collaboration support systems and Web 2.0 applications can be overcome by finding synergies between these domains. Here, we exemplify this idea by commenting on two prototypical implementations, extending a typical collaboration support system: Kolumbus 2 [14]. It should be noted, however, that our work is based on the notion that the integration of Web 2 and Collaboration Support Systems should always aim at complementing mechanisms by each other rather than replacing existing mechanisms.

Integrating Online Word Processors

Collaboration support systems still heavily rely on secondary tools to e.g. produce the content that is managed by them. Unfortunately, most of these systems lack proper application interoperability. This imposes an additional usage burden, as for creating and editing this content a switch of applications is necessary, which in turn reduces users' experience. On the other hand, so called Applications on the Web (AoW) such as Google Docs & Spreadsheets have become very popular recently. They provide functionality originally known from desktop applications in a web browser, resulting in ubiquitous availability of content creation and editing. Consequently, the integration of AoW into collaboration support systems may provide a solution to the lack of application integration mentioned above. We therefore designed and implemented the Kolumbus 2 *Co-Writer* [12] to support students in collaborative learning as well as professionals in science and business in collaborative writing. The implementation is based on the integration of an open source web-based word processor into Kolumbus 2. To ensure proper support for content creation in Kolumbus 2, the word processor was implemented to complement the existing system and adapted to its characteristics (see Fig. 2).

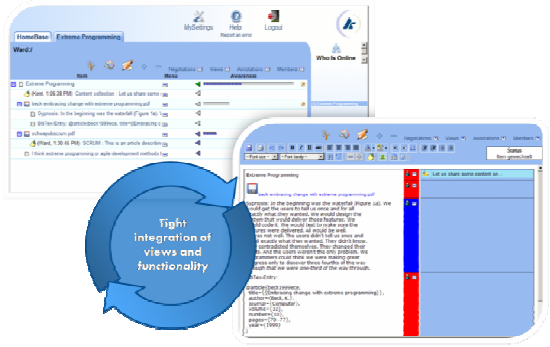

Fig. 2: The co-writer extension

Whereas online word processors usually do not divide content into separate paragraphs that can be edited and owned by different users, the Co-Writer uses the fine-granular item structure of Kolumbus 2 and therefore enables multi-user support in asynchronous editing, including authentification mechanisms allowing for this. Furthermore, as shown in Fig. 2, the word processor is implemented to be one of the different content views Kolumbus 2 provides. This way, users can decide whether to e.g. browse content or edit it.

User feedback shows that the Co-Writer provides a convenient way to produce, edit structure and format textual content while tackling AoW shortcomings like lacking awareness or collaboration support. From an implementation point of view, time and effort for integrating such applications can generally be said to be moderate.

Tagging Metadata for Collaboration Support

Finding content and making individual perspectives on it visible is still a problem in collaboration support systems [9]. Metadata is widely accepted to be the remedy for this problem. However, existing approaches using pre-defined metadata have shown poor user acceptance due to an imbalance of work and benefit [4], and usually result in trivial descriptions that could also have been extracted automatically [5]. Other approaches use formal semantics such as ontologies. While these mechanisms describe content properly, they impose and additional cognitive effort on users and may therefore be doubted to provide a solution to the problem [2], [3].

Considering the shortcomings of these approaches, unrestricted content description by so called (Social) Tagging applications appears to be a promising alternative. These mechanisms have become very popular on the internet recently. Their foremost strengths can be seen in serving different user purposes [8] and in the low usage barrier they provide [2]. Moreover, they provide meaningful content descriptions [2] and are capable of managing different content types [13], increasing the navigation of internal and external information sources. Taken together, tagging mechanisms provide a playful and powerful mechanism of describing content.

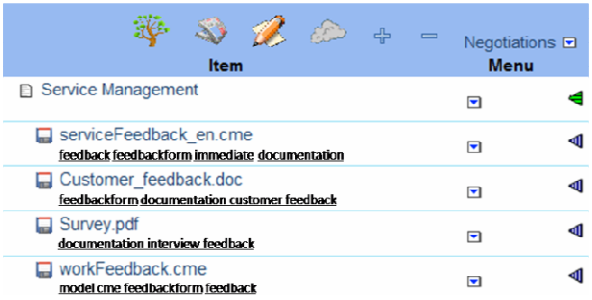

Fig. 3: The tagger plugin

To explore the benefits of using Tagging mechanisms in CSS, we have integrated such a feature into Kolumbus 2: its *Tagger* plugin aims at improvements for accessing, organizing and sharing different content types on a group and personal level. It was designed to complement the existing content structure, meaning that existing structures like folder hierarchies can be used parallel to Tagging.

Like the integration of a web-based word processor described above, the Tagger plugin provides an additional view on Kolumbus 2 content as shown in Fig. 3. Besides this view, the plugin includes a tag cloud [16] showing existing tags linked to content in the system. Furthermore, to foster the usage of tags, it is integrated in all system dialogues, thus motivating users to tag content while e.g. editing the name of a new content unit.

Preliminary explorations of the system have shown that the integration of a Tagging mechanism has enriched the means to structure and contextualize content in the system and accounts for personal and group related content description. Content can now be browsed via folders and tags, resulting in a richer user experience. The other way round, the Tagging mechanism also benefits from functionality already

present in the system: not only can tags be contextualized by folder structures but also do mechanisms like awareness support and contextual communication enrich Tags.

Discussion: Collaboration Support Systems as Mashups

The complex demands of collaboration support and the different contexts it is used in impose a huge amount of different requirements on collaboration support systems. Therefore, it is unlikely that the full potential of Web 2.0 enhanced collaboration support can be offered by extending a single application. Consequently, we regard the examples of e.g. integrating Tagging mechanisms or web-based word processors into collaboration support systems provided in section 3 as feasibility studies and therefore as a first step towards the intertwining of such mechanisms.

While our efforts provide a good point to start from, we suggest thinking of next generation systems as a network of applications or services rather than of stand-alone environments. In these networks, each service can be specialized in supporting a specific task and can be re-used in several other networks. For example, the Tagging mechanism discussed in section 3.2 would be implemented as a service. Based on demands imposed by collaboration scenarios, this service can then be combined with any other service such as Kolumbus 2 content management. Using such an approach, different settings can be supported by providing a network of services suitable for the respective setting. To accomplish this, architectural concepts and their implementation that allow for individual orchestration of services and the construction of new mashups from existing services have to be developed. Such efforts can draw from the field of service-oriented architecture providing support for service orchestration and architectural styles like e.g. REST [15], which is widely accepted in the domain of web 2.0 mashups. In addition to these technical requirements, organizational support providing guidelines for building beneficial service networks and their deployment is needed.

Further Work

There remain further research questions for web 2.0 enhanced collaboration support systems. First, we have argued that the architecture of participation Web 2.0 applications promote may reduce the gap between efforts and benefit that hinders the adoption of common collaboration support systems. Future research should aim to verify this assumption and identify further characteristics enhancing collaboration support systems. Second, the idea of collaboration support systems as mashups raises questions that transcend the level of architectural styles. For instance, with vendors offering specialized services whose integration into customer-specific networks may be subject to charges, there is also a promising economic perspective requiring suitable service level agreements, payment models and security concepts.

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