REVIEWING THE E-COLLABORATION MARKETPLACE
A Survey of Electronic Collaboration Systems

Bettina Schauer, Michael Zeiller and Doris Riedl

Information Technology and Information Studies, University of Applied Sciences Burgenland
Campus 1, Eisenstadt, Austria

Abstract: Electronic collaboration systems that support and enable communication, coordination and collaboration between people in shared projects, processes and teams within organisations and for cross-organisational use have significantly changed under the influence of Web 2.0 technologies and social software. The electronic collaboration marketplace is made up of numerous systems that offer a large variety of features. A classification approach is presented that classifies electronic collaboration systems and thus structures the diverse collaboration marketplace. Collaboration systems are evaluated and compared using a set of evaluation criteria that allow for the assessment of all major collaboration tasks. Thus completeness of systems as well as the main focus of applicability of individual collaboration systems is determined.

1 INTRODUCTION

Web 2.0, social software and Enterprise 2.0 are major trends that shaped information technology throughout the last years. Collaborative software has also been massively influenced by those concepts and technologies. Tools previously denoted under the terms *Computer Supported Cooperative Wor*k (CSCW) or *groupware* gained new momentum. The market of CSCW and groupware changed and converted to a marketplace of various kinds of electronic collaboration systems.

The appearance of social software – briefly defined as "software that supports group interaction" (Shirky, 2002 in Allen, 2004) – was one of the major driving forces in the change of the collaboration marketplace. In 2006 McAfee coined the term Enterprise 2.0 in his trend-setting paper "Enterprise 2.0: The Dawn of Emergent Collaboration" pointing out how companies can benefit from Web 2.0 technologies to support their knowledge workers (McAfee, 2006a). McAfee (2006b) defines Enterprise 2.0 as "... the use of emergent social software platforms within companies, or between companies and their partners or customers". However, the most important application of social software in the enterprise is to support group interaction and group collaboration.

Due to this impact of social software new tools and new vendors appeared on the market of collaborative software. Renowned "groupware" vendors reorganized their portfolio and introduced new social software features in their products. A number of open source solutions appeared as well. This led to a marketplace of high complexity and diversity containing a lot of different kinds of electronic collaboration systems.

In this paper we present an approach to classify electronic collaboration systems and thus to structure the entire marketplace. Collaboration systems are evaluated and compared using a set of evaluation criteria. Criteria are chosen that cover the entire range of collaboration tasks and interaction processes (the 4Cs communication, cooperation, collaboration, connection; supplemented by cross-sectional features). We focus on complete solutions of collaboration systems that support multiple kinds of social interaction.

In section 2 we narrow down the group of electronic collaboration systems we want to discuss and present related market studies and classification schemes. Section 3 introduces our approach of evaluating E-Collaboration systems and specifies a set of evaluation criteria. In section 4 the evaluation approach is demonstrated by comparing the results on a number of collaboration systems. Section 5 concludes this paper.

2 ELECTRONIC COLLABORATION

Electronic Collaboration - short: E-Collaboration or eCollaboration – is operationally defined by Kock (2005) in a general way as "collaboration using electronic technologies among different individuals to accomplish a common task". According to Kock (2005) research on Electronic Collaboration should include research on *Computer-mediated Communication* as well as research on *Computer Supported Cooperative Work* (CSCW) (Wilson, 1991). However, we will focus on computer-supported Electronic Collaboration with the help of E-Collaboration systems.

2.1 e-Collaboration Systems

Riemer (2007) describes E-Collaboration systems as "software for supporting communication, coordination and cooperation between people processes in groups". Several synonyms are often used interchangeably for this category of information systems: groupware, CSCW systems, collaborative software, cooperation systems. Riemer's definition is based on the basic types of social interaction that can be found in CSCW systems and groupware: communication – coordination – cooperation (Teufel et al., 1995). In a similar way Cook (2008) uses four primary functions to classify social software: communication – cooperation – collaboration – connection.

Communication allows people to converse with others and exchange information with the help of synchronous (e.g., chat, conferencing tools) and asynchronous (e.g., email, weblog, microblogging) communication tools (Riemer, 2009; Cook, 2008). Communication can be differentiated by medium – chronology – group of people.

Coordination allows a temporal or issue-related matching and agreement on tasks and resources. Typical operations of coordination support team members in coordinating appointments, processes and tasks in projects, plus surveys and ad-hoc workflow management.

Collaboration is a working practice whereby individuals work together on a non-routine cognitive task to achieve a common purpose (Austin and Burton, 2004; AIIM, n.d.). Collaboration encourages people to work with each other on particular problems, with shared commitment and goals (Cook, 2008). Collaboration tools encompass for example wikis and whiteboards, application sharing and

desktop sharing. Collaboration takes advantage of the services of communication and coordination.

Cook (2008) adds another primary function to social software and Enterprise 2.0 tools: connection. Networking technologies enable people to make connections with and between both content and other people. Social networking is the most prevailing technology for connection, but there are also a number of enabling technologies like people profiling and people search.

In terms of this market analysis E-Collaboration systems are defined as software for supporting and enabling communication, coordination and collaboration between people in shared projects, processes and teams within organisations and for cross-organisational use (following Riemer, 2009). Tasks in Electronic Collaboration can be assigned to one of the primary interaction processes (the 4Cs):

- Communication
- Coordination
- Collaboration
- Connection

Complete E-Collaboration systems have to support all four types of social interaction.

2.2 Classification of e-Collaboration Systems

There exist several scientific and commercial market studies on E-Collaboration systems that structure and organize available software packages into system classes and categories and set up descriptive criteria. Riemer (2007) provides an in-depth analysis of E-Collaboration systems using cluster analysis. Riemer's catalogue of classification criteria is made up of six categories: group processes (communication, coordination, collaboration), usage of system (continuous, situational), role for group (primary, secondary), types of communication (e.g., text/voice/video messages, email, voice/video call, text/voice/video conference), shared resources and features (e.g., forum, surveys, application sharing, group calendar, whiteboard), awareness (informal, group structural, social, workspace). Using a cluster analysis Riemer identifies five system classes: everyday systems, integrated systems, coordination systems, meeting systems and specialized tools.

Illik (2009) structures E-Collaboration systems into five categories that are arranged in layers:

- Live communication (top)
- Extended team communication
- Basic team communication
- Team repository

- Knowledge management (bottom)

Essential features are located at the bottom. Higher layers increase effectiveness and efficiency in teams.

The Forrester Wave™: Collaboration Platforms, Q2 2009 evaluates 11 vendors against more than 60 criteria that are arranged in three major groups: current offering, strategy, market presence (Koplowitz, 2009). The biggest group is *current offering* that is made up of seven groups: collaboration platform, language support, architecture and administration, monitoring and reporting, security, cross-platform support, information workplace readiness.

In contrary to theses studies our evaluation approach focuses on complete E-Collaboration solutions only (i.e., similar to integrated systems according to Riemer, 2007) that have to cover collaboration, coordination, communication and connection features to a certain extent. To allow for an objective evaluation of E-Collaboration systems the evaluation criteria and their weighting is based on a standardized reference use case that represents typical collaboration tasks. For specific scenarios this approach can be easily adapted (especially using individual weights, see section 3.3) to meet the particular needs of the customer.

3 EVALUATION OF E-COLLABORATION SYSTEMS

The evaluation of E-Collaboration systems involved the following three steps.

1) **Selection of e-Collaboration Systems.** Potential candidates for evaluation were selected according to predefined criteria which each tool had to fulfil in order to be defined as a complete E-Collaboration system. The result of this step was a list of E-Collaboration systems for evaluation.

2) **Definition of Evaluation Criteria.** The features and functionalities offered by E-Collaboration Systems were assigned to the four categories of social interaction processes – the 4Cs communication, cooperation, collaboration, connection. This step resulted in a feature list grouped by the 4C categories.

3) **Assessment.** Each E-Collaboration system was evaluated according to the functionalities belonging to the four categories. The result of the evaluation process was an assessment of E-Collaboration systems comparing their strengths and weaknesses

according to the 4C categories complemented by supporting categories.

3.1 Selection of e-Collaboration Systems

In a first step before the actual evaluation, tool candidates for the assessment had to be selected. This step involved defining criteria a tool had to fulfil to be regarded as an E-Collaboration system.

Each tool had to provide at least some functionalities to support all four types of social interaction summarised as the 4Cs. Thus the support of information processing, communication as well as coordination were defined as "must have" criteria. Collaboration software had to offer information processing features as well as communication facilities (at least asynchronous communication services like email) as well as coordination features, e.g., a group calendar, to be regarded as a complete E-Collaboration system. Furthermore an E-Collaboration system should offer functionalities for information sharing as well as synchronous live communication.

The reason for this pre-selection was that the assessment should contain complete systems for E-Collaboration that cover a variety of features instead of specialised solutions like just a wiki or a weblog. The selection process resulted in a list of about 40 software packages that qualified for the assessment. Among these tool candidates were the products of common vendors like Microsoft Office SharePoint Server 2007, IBM Lotus, Oracle Beehive and Oracle Collaboration Suite as well as open source products like for example Zimbra Collaboration Suite, phpGroupWare, OpenGroupware, Novell Open Workgroup Suite or Alfresco Share. The review also included systems of the visionaries as defined by the Gartner survey (2009) like Jive, Telligent or Socialtext Collaboration Platform.

3.2 Evaluation Criteria According to the 4Cs of Social Interaction

Based on reviews from literature, analysis of case studies and related market studies of E-Collaboration systems a feature list of all typical functionalities offered by such systems was established. In order to assess the E-Collaboration systems according to their strengths and weaknesses for certain applications these functionalities were grouped into the four categories of social interaction depending on their primary support (see section 2.1):

- Communication

- Coordination
- Collaboration
- Connection

The category *communication* (16 features in total) was split into the sub-categories synchronous communication (instant messaging, conferencing functionalities, telephone, etc.), asynchronous communication (email, blogs, comments, etc.) and social presence. The category *coordination* covers features (18 in total) for task management, project management, workflows, organisation of meetings and appointments. Features for shared content production such as wikis or whiteboards and for content administration like shared folders, shared documents, versioning or tagging were assigned to the category *collaboration* (25 features in total), see Table 2 (section 4). These features were complemented by supporting technologies for shared content production like social tagging, social bookmarking and social cataloguing and by administrative services. The category *connection* comprises functionalities (7 in total) such as e.g. social networks, people search or people profiling.

In addition to these 4C categories some more characteristics of E-Collaboration systems were considered to be important for the evaluation. These criteria included functions that do not belong to one of the 4C categories but support all of them. Such functionalities (16 in total) include e.g. newsfeeds, personalisation, alerts, configurable areas, mashups, search, filtering, rating, documentation, (online) help and the support of handheld deliveries. Administration of E-Collaboration systems was also an important aspect of the evaluation in addition to the 4C criteria. Some of the administrative features assessed (10 in total) were user management, scalability, configuration, integration into existing systems and backup or recovery.

3.3 Assessment of e-Collaboration Systems

For the assessment the features of the various categories were weighted according to their importance within the category. The weights were assessed for a standard team collaboration scenario. In case of a specific application the weights have to be adjusted according to the particular needs. Each E-Collaboration system was assessed according to whether it supported a feature or not. In case the feature was supported the weight of this feature was added to the score of the E-Collaboration system in the respective category, in case the feature was not supported it did not increase the score.

The assessment resulted in a score for each category with a maximum of 100% per category as the evaluation was not undertaken for a specific use-case and thus all 4Cs were supposed to be equally important. Thus it is possible to compare E-Collaboration systems according to their suitability for supporting the 4C categories. The total of 100% per category was split up into scores representing the relative importance of the subcategories. The scores of the subcategories were again split up into scores for each functionality – see Table 2.

In addition to the quantitative assessment qualitative data was collected for each E-Collaboration system. The data included facts about the system like name, vendor, version and which operating systems, browsers or databases are supported as well as a valuation of the general strengths and weaknesses of the E-Collaboration system.

4 RESULTS

In the following, due to space restrictions, the results of five examples out of the 40 E-Collaboration systems evaluated in November & December 2009 are presented, deliberately not including the market leaders Microsoft and IBM.

- **Alfresco Share** an open source tool for enterprise content management by Alfresco Software Ltd
- **Socialtext** an enterprise social software by Socialtext Incorporated
- **Zimbra Collaboration Suite** an open source collaboration application by Zimbra
- **Jive Social Business Software** an enterprise communication and collaboration platform by Jive Software.
- **PHProject** an open source groupware suite by Mayflower.

Table 1 shows the scores that each system achieved in the categories communication, coordination, collaboration and connection as well as cross sectional functionalities and administration out of 100% as the total score for each category.

Socialtext offers an intuitive user interface combined with a lot of functionality that is highly integrated into the features offered by this suite. It provides new technologies like microblogging or mashups. Thus the strengths of Socialtext lie in the categories communication and connection. The main focus is on the social aspect by transparently connecting people with the corresponding content.

Table 1: Evaluation of five E-Collaboration systems.

	Alfresco Share	Socialtext	Zimbra	Jive SBS	PHPro-ject
Communication	18%	74%	63%	55%	51%
Coordination	29%	25%	65%	30%	83%
Collaboration	70%	69%	59%	51%	61%
Connection	50%	86%	58%	78%	58%
Cross sectional functionalities	59%	95%	51%	76%	55%
Administration	66%	87%	67%	76%	72%

Zimbra offered most functionalities in supporting coordination activities and provides an easy to use interface with a familiar look and feel. Its strengths are extensive search options, tagging for all sorts of content and the synchronisation with handheld deliveries. Webservices can be integrated into the workspaces by so called Zimlets. Zimbra offers good support for collaboration in small teams but it lacks on overview of the whole organisation and all corresponding projects.

Jive SBS´s strength is the category connection. It offers many features for building employee communities using social networking concepts. Personal information about authors can be found throughout the entire collaborative content environment. Coordination features (e.g. no workflow support and only average project management support) are not among the strengths of this suite. However, a lot of additional cross-sectional and administrative functions depict Jive SBS as a technologically mature platform rated by Gartner (2009) as one of the market leaders.

PHProject got the best evaluation in the category coordination. This is no surprise as PHProject was designed as a groupware tool for project management. It offers standard project management features such as task and resource management as well as the coordination of schedules and the administration of meetings. PHProject also allows managing multiple projects. A weak spot of the system is little functionality in the category connection.

Alfresco Share was the most extensive tool for collaboration. Its specific strength is the administration of shared content. All features offered by Alfresco are highly integrated. Communication is the weak spot of the tool as email is not supported. Alfresco is an open-source E-Collaboration system and thus offers high adaptability. It is recommended for the collaborative work of small teams because for larger teams one quickly loses track.

Table 2 shows the results of the evaluation of Alfresco in the category collaboration. For each functionality Alfresco got the according score if the feature was supported (●) or not (○). In the future this score will be replaced by a more precise evaluation providing information not only if a feature is supported but in addition how well it is supported. This will be symbolised on a five level scale also using quarter, half or three-quarter circles (not included in Table 2 yet).

Table 2: Functionalities and weights of the category collaboration – scores for *Alfresco Share*.

Category Collaboration	Total Score 100,00	Supported	Alfresco Share Score 70,25
Shared Content Production	20,00		10,00
Wiki	10,00	●	10,00
Whiteboard	3,00	○	0,00
Synchronously Shared Documents	4,00	○	0,00
Shared Ideas / Brainstorming	3,00	○	0,00
Working together on the same objects	15,00		12,75
Social Tagging	6,75	●	6,75
Social Bookmarking	6,00	●	6,00
Social Cataloguing	2,25	○	0,00
Administration of shared content	50,00		47,50
Document Sharing	7,50	●	7,50
Image Sharing	2,00	●	2,00
Video/Audio Sharing	2,00	●	2,00
Restricted Access for Content	4,00	●	4,00
Restricted Access for Folder	2,50	●	2,50
Check in/Check out	5,00	●	5,00
Up & download	5,00	●	5,00
Versioning	4,00	●	4,00
Archiving	2,50	○	0,00
Folder / Shared Folder	7,50	●	7,50

Table 2: Functionalities and weights of the category collaboration – scores for *Alfresco Share* (Cont.).

Category Collaboration	Total Score 100,00	Supported	Alfresco Share Score 70,25
Shared Content Production	20,00		10,00
Content Tagging	4,00	●	4,00
Folder Tagging	1,50	●	1,50
Personal Site	2,50	●	2,50
Creating Documents out of the Shared Workspace	15,00		0,00
Textdocument	5,25	○	0,00
Calculation	1,50	○	0,00
Presentation	1,50	○	0,00
Graphics	0,75	○	0,00
…using MS Office	6,00	○	0,00

Figure 1 provides an overview of the assessment results for the five sample E-Collaboration systems in the basic categories depicting the strengths and weaknesses of these tools.
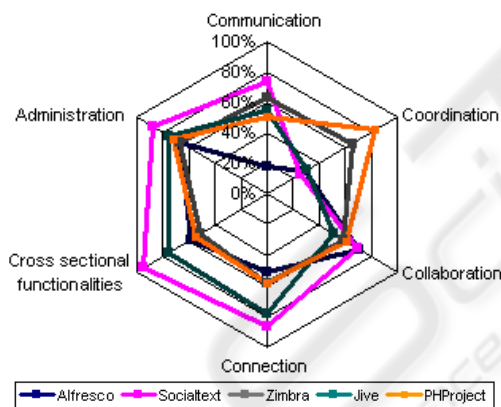

Figure 1: Overview of the assessment of five example E-Collaboration systems.

5 CONCLUSIONS

This market review presents a software evaluation approach adjusted to the special requirements of the steadily changing E-Collaboration market. Practitioners and IT-experts will find a set of evaluation criteria and an easy to adopt evaluation approach that provides an overview of the strengths and weaknesses of available software products. It can be easily adjusted to evaluate and select E-Collaboration systems for specific application scenarios. In this case, our set of features and

functional criteria provides an excellent basis that can easily be supplemented by technical criteria (e.g., concerning integration issues), financial criteria (e.g., licensing and distribution model) and vendor criteria (e.g., ability to execute).

This market review focuses on E-Collaboration systems that cover all aspects of social interaction. Therefore only software products have been tested that support all 4Cs of electronic collaboration: communication, coordination, collaboration and connection. The huge market of software products that cover only a fraction of functionality and provide specialised features in a smaller application segment has been excluded deliberately (for general market studies see e.g. Hinchcliffe, 2007; CMS Watch, 2009; Gartner, 2009). However, companies and institutions that want to implement or enhance a comprehensive electronic collaboration strategy will need to look at complete E-Collaboration packages.

Assessment of E-Collaboration systems based on the presented approach will continue on a continuous basis leading to a periodic report on the E-Collaboration marketplace. Ratings on the analysed software packages will be available in an online database in the future.

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