Computer Science, Department of

Technical Reports-Computer Science

Texas State University *Year* 2009

ActionItem: Collaboration through Commitment and Social Tasking

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Report Number TXSTATE-CS-TR-2009-11

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2009-09-10

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***Abstract*—The relentless growth of global organizations and businesses require collaboration among virtual teams that can be formed on-demand and cross institutional, geographical and cultural boundaries. In this paper, we propose ActionItem - a Web 2.0 collaboration tool that fosters cooperation by leveraging the idea of commitment, social tasking and parallel blogging. We describe the prototype implementation of ActionItem and give a quantitative and qualitative evaluation of this collaboration management tool in terms of collaboration provenance, efficiency and quality through case studies. The concept of social tasking for collaboration has been used successfully in many social networking sites. However, social networking tools do not manage the collaboration in a team and nor do they provide a collaborative model for objective measurement of how people work together. The workflow-based collaboration management tools have extensive management capability, but typically are only built for collaboration among a static group of participants with clearly designated roles within a fixed organizational structure oblivious to any form of social networks. Our results show that ActionItem is a nimble, inexpensive, and effective tool to support the collaboration required for loosely coupled virtual teams who do not share the same time and space.**

I. Introduction

The advent of the Internet and its proliferation have transformed the way businesses are being conducted in this 21st century. Companies are moving their businesses online and using the Web to automate relationships between trading partners as well as on-line users at an ever increasing rate. To remain competitive in the global economy, companies are also increasingly outsourcing their non-core businesses or move their operations to a lower cost geographic place. A newly released NSF report [1] on Science and Engineering indicators shows that there is a 60%-70% growth in employment of major corporations overseas as compared to the mere 30% in their operations in USA. Moreover, in the global economy, enterprises are also increasingly pressured to deliver products and services faster and cheaper than their competitors. The distributed nature of business operations and its distributed workforce result in complex interactions within a team that typically goes across organizations, geographical and cultural boundaries. The need for an ad-hoc and on-demand collaboration management tool is thus become increasingly important in order to generate durable competitive advantages as echoed by Johnson in [2] for globally-based cooperation.

Collaboration management involves capturing the list of actions or agendas for a project, coordinating the actions of participants from anywhere and at any place and communicating the collaboration information in a timely manner to any relevant participants to act on so as to achieve the overall goal[1]. The list of agendas can change dynamically over the course of collaboration. Many of the existing technologies and software products that have been developed to support collaboration [3], [4], [5], [6] have problems in either being too costly to deploy, too complex to use or too rigid to support the dynamicity and the variety of tasks needed for a global team.

The current ubiquitous collaborative tools used by majority of people are still a collection of isolated tools such as emails, group calendar, NetMeeting software, and excel spreadsheets. Using email for collaboration results in large in-boxes and large archives which are hard to manage and keep track of, especially when a person is involved in multiple collaborative projects simultaneously. For example, even with an email client that does keep track of conversation threads (such as Google's Gmail), it is still difficult to manage the collaborative effort (joint decision, tracking of progress, evidence of participation etc). In summary, using email as a collaboration tool has two main disadvantages: 1) it is not possible to model and track each participant collaboration effort; 2) all collaboration knowledge is locked in personal archives and cannot be reused or shared.

In large organizations, workflow-based tools have been embraced as collaboration tools to enhance pro-

[1]In the context of ActionItem, participants are restricted to human collaborators

ductivity. The workflow concept has existed since industrialization and is the direct result of the effort to increase efficiency by automating and coordinating routine aspects of work activities by human and computer. Workflow technology has matured over the past decade and there are many commercially available products [7], [8], [9], [10], [11] that can support various workflow types ranging from ad-hoc, administrative to production. The administrative and production-based workflows are targeted towards collaboration that involves repetitive and predictable processes with statically defined coordination rules and team members. These systems have high price-tags and require prior training as well as installation of softwares before they can be deployed and used effectively. Moreover, most of the workflow-based systems were developed prior to Web 2.0, thus they are oblivious to the concept of social tasking.

ActionItem is a Web 2.0 online collaboration tool that fosters cooperation by leveraging the idea of commitment, social tasking and parallel blogging. As compared with existing collaboration tools, it offers the following advantages:

- It enables a virtual team to be built ad-hoc and on demand and be changed quickly by leveraging the Web 2.0 social networking capability.
- It has a built-in collaboration performance model. That is, the collaboration tool itself can automatically reward participants for accepting a task and commit to complete it.
- It supports flexible project plan and execution and allows team members to dynamically change tasks or agendas.
- It stores all the documents associated with the collaboration effort in a central repository which can be accessed in any place and time.
- It can be accessed with a lightweight Web browser from anytime and anywhere with no prior training or installation of any software.
- It can archive the historical list of tasks completed in an action item and reuse that as a template for future collaboration of similar project.

The remainder of this paper is organized as follows: Section 2 discusses the architecture of ActionItem including the key components that facilitate collaboration. Section 3 gives an overview of the collaboration behavior model. Section 4 focuses on the quantitative evaluation of ActionItem in terms of collaboration provenance. Section 5 describes the related work. Our conclusions and future extensions are discussed in Section 6.

II. Architecture of ActionItem

A. Overview

ActionItem is written in the Ruby programming language, using the Ruby on Rails open source web framework. Ruby on Rails is becoming the framework of choice for development and deployment of Web 2.0 applications. We chose Ruby on Rails as it allows rapid prototyping and development, enforces the Model-View-Controller (MVC) architecture, and works with a variety of operating systems and databases. ActionItem uses Apache 2.2 as a front end for a cluster of Mongrel HTTP servers. ActionItem uses 256-bit SSL encryption on all transactions after user login.

B. Application Description

The primary resource in the application is an *Action Item*. Each user in the system has the ability to create Action Items. An Action Item serves as a virtual private meeting room for all users that participate in an Action Item. The user that creates an Action Item is called the *moderator*. All other users on an Action Item are *participants*. Each Action Item can contain: *Tasks*, *Messages*, and *Documents*.

Tasks are the main unit of work in ActionItem. A Task is assigned to at most one person. Anyone who participates in an Action Item can create Tasks, provided that Task Locking is not turned on. In that sense Action Item allows transparency in the collaboration process between users that are participating in the Action Item.

Messages are normally associated with Tasks, but can also be associated with an Action Item. If a message appears in a Task, it is intended to contain information relating to that Task.

Documents are text, spreadsheet, PDF, or other types of files that can be associated with an Action Item. Documents are uploaded into an Action Item and are accessible by anyone within the Action Item.

C. Participation Description

All participation in Action Items is by *invitation*. To quickly build a team on an Action Item, a user will *invite* others to participate in the Action Item by sending an invitation. Invitations are received by email and are also available on application when a user is logged in. A user's email address is used as a handle to invite someone to participate in an Action Item. Once a user accepts an invitation, he becomes a participant in the Action Item. Participants in an Action Item can simply view activity as it progresses, without having to work on any Tasks.

No work can be directly by one user to another user in the ActionItem application. Users must always request

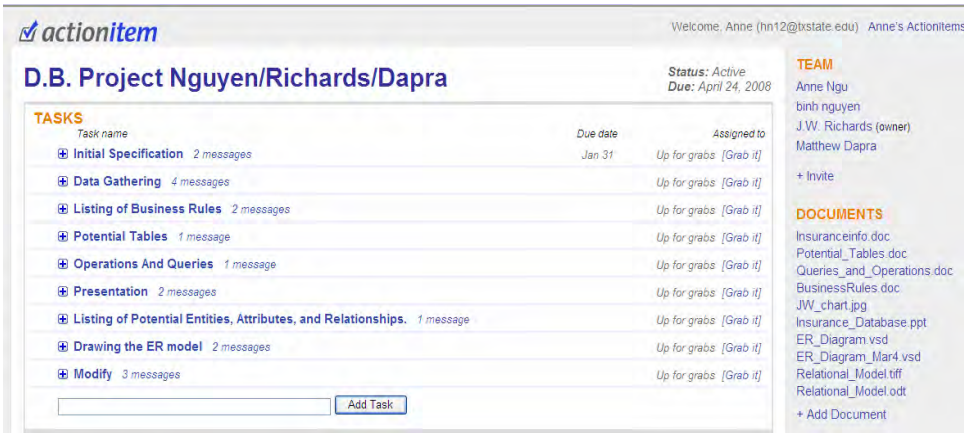

Fig. 1. Snapshot view of an Action Item

that another user take on work. Since a Task represents a unit of work in an Action Item, assignment of work is managed through Tasks. To request that someone else takes on a Task, an Assignment Request is sent to a user. The user that receives the *Assignment Request* can accept or decline the ownership of the Task.

Once a user accepts an Assignment Request for a Task, that user must either complete, give up, or reassign the Task. When a user finishes a Task, he or she can mark that Task as *Complete*. However, if the user cannot finish a Task, then that Task must be completed by another person on the Action Item. If possible, the user should try to find someone else to finish the Task, and so issue an Assignment Request to someone else, either currently on the Action Item or someone new. If a user cannot find anyone else to take on the Task, then he or she can *Give Up* the Task, which causes ownership to revert to the Moderator.

Figure 1 is a snapshot view of an user's ActionItem page. The name of the displayed action item is "D.B. Project Nguyen/Richards/Dapra". This action item has nine tasks and four team members. J.W. Richards is the owner of the action item. None of the team member grabs any of the tasks. However, all tasks had some messages associated with it. This means that team members have worked on the tasks. There were ten documents associated with this action item.

III. Collaboration Behavior Model

A common problem with collaboration tools is measuring project success after the work is done. Schedules were met on time, but why? Or, schedules were missed multiple times, but why? Action Item contributes to overall performance reporting by starting with how individuals respond to individual tasks. Past performance may be used as information to make choices on who will participate in future tasks. In this prototype implementation, performance is measured for each task, with each task having equal weight over time. We divide our collaboration behavior model into commitment-based and communication-based sub models. Commitment-based model is used for tracking collaboration behavior for a particular user over all his/her action items over a period of time. Communication-based model is used to track collaboration behavior of a particular user for a single action item.

A. Commitment-based model

A user in the system will be in one of the following states, once he or she has been invited to participate in a Task within an Action Item:

1. Invited
2. Accepted
3. Declined
4. Completed
5. Reassigned (through Assignment Request)
6. Gave Up
7. Active (still in progress but not overdue)

Given the defined states, we can now define metrics for our commitment-based performance model as follow:

1. Accepted/Invited
2. Completed/Accepted
3. Reassigned/Accepted
4. Gave Up/Accepted
5. Active/Accepted
6. Successful Handling

For example, Table I is a hypothetical history for a given user over a period of time in ActionItem. In this

example, a user was invited to 100 Tasks, and agreed work on (or Accepted) 95 of them. The user complet 79, reassigned 8 and is still active on 5 tasks. Lastly, t user Gave Up 3 Tasks.

TABLE I
A HYPOTHETICAL PERFORMANCE DATA FOR A USER

Invited	**Accepted**	**Completed**
100	95	79
Reassigned	**Gave Up**	**Active**
8	3	5

From a performance measurement perspective, we a only concerned with the Tasks that the user accep Once a user accepts a Task, we want to encourage user to successfully handle that Task. That means tha the Task is either completed or actively act upon by that user, or that user takes the responsibility to reassign that Task to someone else who will complete it. The above example data results in the following quantitative metrics (Table II) for the user.

TABLE II
COMMITMENT-BASED COLLABORATION BEHAVIOR OF A USER

	Metric	**Result %**
Accepted/Invited	95/100	95
Completed/Accepted	79/95	83.1
Reassigned/Accepted	8/95	8.4
Gave Up/Accepted	3/95	3.2
Active/Accepted	5/95	5.2
Successful Handling	(79 + 8 + 5)/95	96.8

This user has a Successful Handling score of 96.8 percent. With each Task having equal weight within an Action Item. The relationships between different states are shown in Figure 2. The states that are linked by solid arrow line contribute to Successful Handling score.

We believe in the axiom that "what you model is what you get." That is, the collaboration tool itself should guide the behavior that we want to encourage. In this case, we want to encourage commitment-based behavior among the team as they enter a project. When a user knows that a behavior model is an organic part of the collaboration tool and understands the model, then they know in advance that they are developing a portrait of how others will view their willingness to work together. We believe this advanced knowledge (successful handling) will affect how users will accept work and will positively affect how they ensure their work gets completed.

B. Communication-based model

The commitment-based model is useful for measuring individual participant performance over a period of time

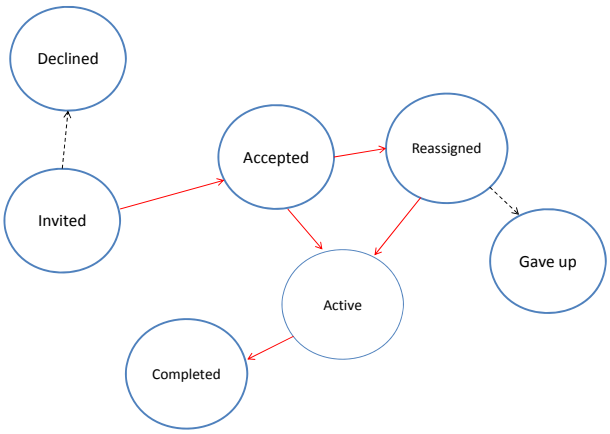

Fig. 2. Relationships between states in ActionItem

and over multiple action items. However, commitment-based model is not useful when a user only participates in a single action item over a period of time. We propose the following metric for measuring the communication-based collaboration effort within a single action item:

- Number of messages posted/Total number of messages posted
- Number of document uploaded/Total number of uploaded documents
- Collaboration effort

Suppose there are a total of 20 messages posted and 10 documents uploaded for a particular action item. A particular participant posted seven messages and uploaded 5 documents. Table III shows the performance of this user measured using the communication-based model. This particular user has a collaboration effort score of 40%.

TABLE III
COMMUNICATION-BASED COLLABORATION BEHAVIOR OF A USER

	Metric	**Result %**
$\frac{Messages\ posted}{Total\ messages}$	7/20	35
$\frac{Document\ uploaded}{Total\ uploaded\ documents}$	5/10	50
Collaboration effort	(7 + 5)/30	40

IV. EXAMPLE OF COLLABORATION

The beta release of ActionItem is available on http://www.actionitem.com since May 2007. There are currently 200 active users on the system. ActionItem has been used for a variety of tasks/work units among human collaborators. Below are some sample collaborations that have been accomplished via ActionItem: 1) System status meeting; 2) Event planning; 3) Project planning and review; 4) Complex document reviews (e.g., Contract

Review); 5) Joint grant proposal writing; 6) Student Group Project.

We will outline our initial study on the use of the commitment-based collaboration model for measuring the collaboration behavior of the existing 200 ActionItem users as well as an experimental study on ActionItem for student group work in the following section. The purpose of this study is to evaluate the effectiveness of ActionItem for group collaboration as well as to validate the effectiveness of the ActionItem's proposed collaboration model for quantitative evaluation of collaboration performance.

A. Experimental Study on Group Project Collaboration using ActionItem

All students enrolled in the introductory database class at Texas State University during spring 2008 were required to participate in a group database design project. The project requires students to come up with a conceptual model of a relational database needed to manage the core business of a big insurance company such as Geico. Students can form a group with either three or four group members. Each group must work closely together to complete the following tasks in four weeks:

- Analyze the data requirement for an insurance company via online websites or interviewing insurance agents.
- Produce an Entity Relationship (ER) model for the insurance application.
- Document the ER design (this should include the overall queries and transactions supported, the assumptions made for the design, the business constraints supported as well as those that cannot be modeled using the ER model).
- Document the processes used to map the final ER model to relational tables.
- Create a set of slides for in class presentation. This must include the main ER diagram and the main relational schema.

ActionItem was demonstrated to students for ten minutes once in the classroom and students formed among themselves, then elected a group leader to set up a team in ActionItem. A credit of one point out of the seven total points is allocated for using ActionItem to coordinate the group project. A successful collaboration is defined as the ability to complete the design on time and give an above average class presentation on the project. All groups were also required to invite the instructor of the class to participate as a group member. This allows the instructor to track the progress of collaboration among the group members from time to time.

At the conclusion of the group project, all group members must submit a one page peer evaluation document which documents his/her view on the collaborative effort of other members within his/her group. Each peer document is manually analyzed by the instructor to come up with a score from one to ten points for the quality of collaboration of each group member. The peers score is compared with the score obtained from ActionItems communication-based performance measurement. If there is a high correlation among the two scores, it will demonstrated that ActionItem's performance metric is useful for quantitative evaluation of group member's collaboration.

B. Experimental Result

The communication-based model is used for evaluating the collaboration behavior of each group member. This is due to the fact that most students will only have time to participate in one action item during the study period. Moreover, it was noted that students just did not bother to accept tasks although they don't mind participating in any tasks. Since they do not accept tasks, this means they also do not complete tasks nor do they reassign tasks. Using commitment-based model will not give any useful insight into their collaboration effort in this case. This study involves 19 students (one was legally blind) that spread among six groups. The collaborative effort for each student in all the groups were calculated using the metric in Table III.

In order to compare the collaborative effort score obtained from ActionItem with peer evaluation score, the highest collaboration effort score within a group in ActionItem is normalized to a value of 10 and the other collaborative effort scores are scaled accordingly.

Our study showed two categories of students, who like to collaborate and who do not. Category-1 students, who wanted to collaborate, often had face-to-face meetings, while Category-2 students just used ActionItem to communicate with their team members and complete their projects. Table IV shows that the two categories of students have significantly different peer evaluation scores ($p < 0.05$). The students who had face-to-face meetings have much higher peer evaluation scores with Mean 1, while the other students have lower scores with Mean 2. Apparently, students who had face-to-face meetings are more willing to contribute to their team projects and thus got better scores from their peers.

Our study also showed that the ActionItem scores are correlated to the peer evaluation scores in linear regression (LR) analysis ($p < 0.05$). The analysis data is summarized in Table V. Nevertheless, the two categories of students have different correlations between the two

TABLE IV
ANOVA ANALYSIS OF PEER EVALUATION SCORES

Mean of Category-1	9.5		
Mean of Category-2	7.2		
Main Effect	Mean Square	F-value	p-value
Face-to-face meeting	23.9234	7.3040	0.0151

TABLE V
LR ANALYSIS OF ACTIONITEM SCORES (A) AND PEER EVALUATION SCORES (P)

LR of Category-1	$P = 0.1886 \times A + 8.2954$		
LR of Category-2	$P = 0.4604 \times A + 4.4928$		
	R-square	F-value	p-value
Category-1	0.8227	27.8455	0.0019
Category-2	0.4922	8.7246	0.0161

scores. Category-1 has a more substantial correlation between the ActionItem scores and the peer evaluation scores, as its p-value is much less and its R-square is more close to 1. This result indicated that when students are more likely to collaborate, their ActionItem scores will be more consistent with their peer evaluation scores. We believe this is because Category-1 students were using ActionItem better to reflect their progress to their team members and thus ActionItem can in turn assess their performance more precisely.

On the contrary, for Category-2 students, although the correlation still exists, it is more likely the ActionItem score does not match the peer evaluation score (as R-squre is only about 0.49). As we discussed in the previous section, students may not really update their progress in ActionItem by accepting or completing tasks. We found that this often happened when students were reluctant to collaborate, which explains the correlation for Category-2 students.

In general, students have positive experiences in using ActionItem for the project. Here are quotes from some of them:

"Without the use of ActionItem, I do not think our group could have succeeded as efficiently. Luke and I are on campus for our classes many hours per week, while Josh and Abdel are either in class or working. As such ActionItem allowed us to communicate effectively by assigning tasks and allowing for unlimited suggestions and contributions."

"ActionItem was decent to work with, although in some ways we would have preferred to meet our group instead. Meeting was not very convenient, however, so ActionItem served its purpose."

"ActionItem was used mostly to send out messages to let everyone know of what was going on and to post up our documents for the project."

"ActionItem actually worked really well for me. All of the postings people left were visible. The different categories seemed collapsed or hidden until clicked on, which worked real well with my screen reading software. The upload and download worked fine for me as well." This quote is from a legally blind student.

TABLE VI
ANOVA ANALYSIS OF ACTIONITEM SCORES OF STUDENTS AND GENERAL USERS

Main Effect	Mean Square	F-value	p-value
Category-1	0.2717	4.1745	0.0560
Category-2	0.4589	6.6625	0.0174

C. Commitment-based performance measurement for all users

As illustrated in our experiment with students, commitment-based performance measurement in ActionItem is more suitable and consistent for measuring the performance of participants who intend to collaborate. We also examined whether or not the commitment-based performance measurement model is suitable to general users in ActionItem. We investigated 12 anonymous users who are currently enrolled in ActionItem and have completed at least one task and accepted at least five tasks[2]. We compare these users with the students in our previous experiment. Table VI shows that general users in ActionItem are more similar to Category-1 students ($p > 0.05$) and are significantly different from Category-2 students ($p < 0.05$). Therefore, we believe the commitment-based performance measurement is suitable for general users in ActionItem.

V. RELATED WORK

In this section we briefly survey some important commercial software tools related to our work.

Electronic mail is one of the most popular ways for information exchange and collaboration. E-mails are simple to use. Most email servers simply implement SMTP (simple mail transfer protocol) and ESMTP (Extended SMTP) and provide email delivery services. There are diversified email clients such as Microsoft Outlook or various web based e-mail systems that provide friendly GUI user interfaces. However, for collaborative projects e-mails clearly lack some important features needed in collaborative projects. There is no easy way to keep track of communications pertaining to a particular project. Enforcing project deadlines is almost impossible.

[2]Since ActionItem has only been released for a short period of time, most registered users only have ongoing tasks rather than completed tasks. This eliminates many of the existing users for being used for analysis

TABLE VII
COMPARISON OF RELATED COMMERCIAL PRODUCTS

Name	Platform dependent?	Web based?	Complexity	Deadline enforcement?	Probabilistic scheduling?	Cost	Performance Measurement?
Email	No	Yes	Low	No	No	Low	No
MS Project	Yes	Yes	High	Yes	No	High	No
MS Sharepoint	Yes	Yes	High	Yes	No	High	?
IBM Lotus	No	Yes	High	Yes	No	High	?
Discussion Forums	No	Yes	Moderate	No	No	Moderate	No
WorkZone	No	Yes	Moderate	Yes	No	Moderate	No
Liquid Planner	No	Yes	Moderate	Yes	Yes	Moderate	No
Yahoo & Google Groups	N/A	Yes	High	No	No	?	No
ActionItem	No	Yes	Low	Yes	No	Low	Yes

Microsoft Project [12] is part of the Microsoft Office suite and is perhaps the most well known project management software. As stated in its release notes, MS Project intends to facilitate communications and management of projects and improve productivity. However MS Project is expensive. It is complex and presents steep learning curves for beginners. It is an "over kill" software for many small to medium size projects. Besides it is tied to Microsoft Windows and hence is platform dependent.

Microsoft Sharepoint [13] is a relatively new Microsoft software tool that intends to beef up the entire Microsoft software lineup. As stated in its release notes the primary purpose of the Sharepoint server is to "allow teams to work together effectively, collaborate on and publish documents, maintain task lists, implement workflows, and share information through the use of wikis and blogs.". Sharepoint also allows users to create a personal portal for information sharing, to perform sophisticated information search within a business, to create and manage document and web contents, and to create workflows and e-forms. It is clear that Sharepoint is very different from Microsoft Project. The latter is purely project oriented. The former is much broader in its purposes with a focus on project/team collaborations. Microsoft has also integrated its Office suite with Sharepoint so that users can easily prepare document and presentation material based on information obtained from Sharepoint. As with any software tool from Microsoft, Sharepoint is "heavy" and "expensive". It is an "over kill" for many small- to medium-sized collaborative projects. It is platform dependent as it is a Microsoft Windows based software tool. Although Microsoft always claims that its software tools are easy and intuitive, our initial testing showed that there is a steep learning curve for using Sharepoint effectively.

IBM LOTUS [11] is another well-known commercial software for project collaboration and management. Similar to Microsoft Project, LOTUS provides a host of impressive features including role-based work environments deployment, support of e-mail, calendaring, and many collaborative tools. Lately LOTUS has added instant messaging and web conferencing. LOTUS is a strong competitor of Microsoft Project. Although IBM claims that LOTUS is a software for small to medium business its complexity and costs are often prohibitive for many small business that mainly deal with small size projects. LOTUS does have versions for Windows and Linux as well.

Various web-based discussion forums present another mechanism for Internet based project collaboration. Most discussion forums are mainly for information dissemination only. A user posts a topic and other users interested in the topic follow up by posting their views, understanding, and experiences of the topic. There is no easy way of enforcing collaborative requirements such as deadline monitoring, task assignment and verification, among others.

YAHOO Groups [14] started around the later 1990s. According to Yahoo Groups' web page, Yahoo Groups "is where people with a shared interest meet, get to know each other, and stay informed.". So essentially it is a social network tool where people share various types of information. Google Groups [15] started around 2002. It's essentially another social network tool. Google groups also incorporated USENET news groups. From a project management point of view both Yahoo Groups and Google Groups have very limited value.

Various other project management applications have been developed. Due to space limit only two of them are discussed here. The first one is "WorkZone" [16]. WorkZone is web based and is designed specifically for simpler "project management and document shar-

ing" than Microsoft Project. WorkZone allows allow an external client to communicate with a project team. It also features internal collaboration that allows multiple collaborators and contributors. After a careful study we concluded that ActionItem supersedes WorkZone in several aspects. Both external communications and multiple collaborators/contributors have been possible from beginning on ActionItem. Another interesting software is Liquid Planner [17]. Liquid Planner is also web based and provides several interesting and potentially useful features for project management. It allows "ranged estimation" to create project timelines. It provides "probabilistic scheduling" that helps prevent project-killing delays. While these two features are unique and potentially useful, ActionItem has features that are comparable to them. ActionItem provides both flexible project scheduling and deadline treatment.

Table VII summarizes features of the software tools discussed in this section.

VI. Conclusions and Future Work

In this paper, we proposed ActionItem - a Web 2.0 collaborative tool that fosters cooperation by leveraging the idea of commitment, social tasking and parallel blogging. The tool is designed to effectively support ad hoc, on-demand and cross boundary collaborative efforts which are in need for distributed business operations. Different from existing collaborative project management tools, ActionItem is the first that integrates social networking, project management, dynamic group support, tracking of progress functions in one web service. ActionItem is also the first collaboration tool to have a built-in collaborative behavior model for measuring the performance of participants in a collaborative task. Since ActionItem records the activities of participants for tracking collaboration, it indirectly also provides the data for measuring the quality of contribution of each participant.

A running beta release of ActionItem is available online (http://www.actionitem.com) since May 2007. We conducted experimental collaborative group projects in ActionItem during Spring 2008. The results showed that ActionItem effectively helps coordinate group projects in terms of task assignment, group member communication, group meeting, group message distribution, collaboration tracking and task assessment. Corroborated by peer assessment results, the proposed quantitative collaborative behavior model in ActionItem well captures the actual quality of contribution of group members.

As a future work, we will explore how to use collaborative performance results for member selection when forming new groups to accomplish new tasks and for predicting the possibility of the success of a project. The proposed quantitative collaborative behavior model in fact assigns a credit to each participant in ActionItem according to his or her past activities. The credit can be used as a reference when a coordinator searches for new group members. We will study the patterns that predict the performance of a participant in a new task based on his or her credit history. With the selected members and their known past credit histories, we could possibly evaluate the chance of successfully completing a task before the task officially launched.

The other future work is on information sharing. The current implementation of ActionItem shares all documents to all participants in an Action Item. This may not be a good choice, because documents associated for a specific task may not be needed by a different task within an Action Item. Because ActionItem is designed to support collaboration cross organizational boundaries, security and privacy concerns of sharing documents may intimidate the willingness of organizations to use this software for collaboration. Furthermore, ad hoc and on-demand work flow and information flow in ActionItem disqualify most traditional access control mechanisms as they are designed for prior known work flow and information flow. We will explore new access control approaches in ActionItem to provide security and privacy preserving information sharing.

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