EXPLORING THE EMERGENCE OF SOCIAL NETWORKS IN COLLABORATIVE SOFTWARE DEVELOPMENT THROUGH WORK ITEM TAGGING

D. Khadar Hussain[*]

Dr. S. Vasundra[**]

Abstract-

Developing software in collaborative environment needs certain mechanisms and formal communication processes to be successful. Generally work items are used in such environment for coordinating tasks being done by development team. Tagging was explored by Treude and Storey to share matters of concern among team members. Their study proved that tagging is effective in collaborative software development. This paper designs and implements a prototype web application that facilitates work item Owners, work item authors and Tag authors to have collaborative communication that include findings tasks, tagging, and formal information exchange. Moreover this paper explored the emergence of social networking in collaborative software development environment. It finds the emergence of social networks in software development among the collaborative team members. The empirical results revealed that the proposed application could provide better tool support for collaborative software development.

* M.Tech Student,CSE Department,JNTU College of Engg, Anantapur

** Professor, CSE Department, JNTU College of Engg., Anantapur

1. Introduction

Software usage has become increasingly prevalent in all walks of life. Software developments the profession in which very complicated tasks are performed by human beings [1]. Software development teams use specific software process model such as spiral model, prototype model, agile model etc. in order to develop software in a systematic way. They also make use of many tools tool support them in order to work effectively. They tools may include CASE Tools.

The tools help in smooth communication with other team members with respect to software development. The tools thus used may help teams to work efficiently. However, it is evident in the software industry that software is not being developed by individuals. It is almost always developed by team of developers. The effectiveness of the team developers on their effective coordination and communication

Among the members of team [1]. The people involved in development may be located in different countries as well. This is made possible through a process known as collaborative software development. There are many tools that came into existence in order to cooperate the teams to work in a better ways. For instance Jazz [2] is a tool from IBM that focuses on certain concerns and INCOME/START are groupware available [3]. These tools help in a great deal to make the development process smoothly. However, these tools ignored emergent work practices which are pertaining to social aspects [4]. Thus there is the need for software development community to have better tools that support both. Such tool supports both formal and informal communication among the team members. As the software development process throws certain challenges, the tools help in solving them property and in timely fashion. The tool support is exploited by software development teams in order to work efficiently and effectively. Lightweight tagging is the social lightweight phenomenon supported by Jazz tool. It supports having work items which are divided into tasks. Tagging is also supported on work items

for collaborative computing. Its activities are associated with the database. The Jazz tool was explored and experiments are made to know how it helps in collaborative development [5]. Our main contribution in this paper is that we implemented a web based prototype tool for overcoming communication concerns of collaborative software development. Moreover, it also

explores the emergence of social networking among the users of the tool such as work item owner, work item author and tag author. The experimental results revealed that the proposed application gives better tool support for collaborative software development. The rest of this paper is structured as follows. Section 2 reviews related literature. Section 3 focuses on Jazz tool as described in [5]. Section 4 provides information about the proposed design and implementation of web based prototype. Section 5 presents the experimental results while the section 6 concludes this paper.

2. Prior Work

This section reviews literature pertaining to work item tagging and collaborative computing. It also focuses on the possible social dimensions of the collaborative development. Software development is challenging and it is such endeavor by humans [1]. The software development is done by teams of people but not by individuals generally. To develop software people also use various process models. However, software development is something that is more than just developing some programs. There is much articulation work involved in the development process. There is much communication process in the development process [6]. Articulation helps in bringing about coordination among the team members [7]. In the literature it is found that there are many challenges pertaining to social aspects and cultural aspects [8]. Sometime colleagues are found in diffident countries and development takes long time for years [9] which demands a tool that can help the people to communicate in a collaborative fashion. The success of projects also depends on proper communication mechanisms [10], [11]. Sometime configuration management tools also provide some kind of communication medium with which people can have conversation and resolve communication concerns [12]. Bugzilla is one of the popular bug tracking system where it visualization of tasks and bugs. Such tools can help developers to do their job well [13]. In addition to social dimension, tagging is also a light weight social computing phenomenon. It helps in collaborative software development. There are complete social networking web sites like Face book, Cite U Like, YouTube, etc. Tagging is used in many software tools that help developers to have technical communication in their work. Developers can have controlled communication that eliminates communication concerns in

collaborative computing scenarios [14]. Annotating [15] is also used in many software products for additional and essential communication. Tag SEA [16] is a recent tool that helps in tagging for software engineering activities being performed by a team of developers in a collaborative landscape. Tools like Concern Graphs [17] can also be used in collaborative software development.

3. JAZZ Tool EI Case Studies

This section provides the observations made in Jazz and EI case studies. These are the tools that provide collaborative software development teams some sort of support to overcome communication concerns. Integrating tasks across the lifecycle of a project is possible with Jazz. It is an organizer of work items of various categories. Jazz has better tool support that helps in collaborative software development. EI is another care study tool which supports collaborative software development. It also supports work item tagging besides technical communication among the collaborative team members. Table 1 shows the data extracted from various sources.

Table 1-Data Extracted from Repositories

Case	Data Object	Amount
Jazz	Work Item Tag Instance applied to work item Tag instance removed from work item Numbers of unique tag keywords	65,268 27,252 2.452 1,184

The Jazz tool data extracted from repositories is shown in table 1.It shows the count of work items, tag instances applied to work items, tag instances that are removed from work items, and the number of unique tag key words. Table 2 shows tag keywords and number of instances with respect to Jazz tool.

A Monthly Double-Blind Peer Reviewed Refereed Open Access International e-Journal - Included in the International Serial Directories
Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A.

International Journal of Management, IT and Engineering
http://www.ijmra.us

449

Table 2 - frequency of tag instance of Jazz tool

Tag Keyword	# instances
Polish	966
Svt	870
Ux	668
Tvt	636
Testing	565
Globalization	442
Usability	441
Maintaincecanditate	436
Error handling	431
Must fix	421

As seen in table 2, the frequency of tag instances of Jazz tool is presented in descending order by the cont of tag instances. Table 3 provides tag keywords that are most frequently shared in Jazz tool.

Table 3- Most Frequently Shared Tag Keywords in Jazz

Tag Keyword	#instances	#distinct users
Performance	413	46
Globalization	442	45
Tvt	636	45
Polish	966	43
Maintaincecanditate	436	40
No code	197	40
Error handling	431	38
Usability	441	38
Beta2candidate	308	35

| Rc4candidate | 133 | 33 |
| Ux | 688 | 33 |

As seen in table 3, it shows tag keywords, the number of instances and the number of users who used those tag instances.

4. Proposed System

The proposed system is based on the tagging concept describe in [5]. It designs and implements a prototype web application tool that helps the software development team to have collaboration irrespective of their location. The tool supports work item tagging besides exploring social networking phenomena

Among the users of the tool such as work item owners, work item authors and also the tag authors. The communication concerns are overcome using the tool that helps the team to have collaborative communication. The prototype also facilitates social networking aspects that help the team members to have informal communication that can help in maintaining smooth relationships and have social communication as well. This will make the proposed web application to provide better tool support to the development team. When compared with Jazz, the proposed application has additional features that explore the emergence of social networking possibilities among the team members who involve in collaborative software development. Figure 1 shows the schematic overview of the proposed application.


Fig. 1 – Schematic Overview of the Proposed System

As can be seen in fig. 1, it is evident that the proposed application allows sharing work, tagging work items, and has collaborative software development besides supporting social networking phenomena such as chat, messaging to have informal communication as well.

A Monthly Double-Blind Peer Reviewed Refereed Open Access International e-Journal - Included in the International Serial Directories
Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A.

International Journal of Management, IT and Engineering
http://www.ijmra.us

451

5. Experimental Results

The environment used for the tool implementation includes a PC with 2GB of RAM and Core 2 Dual processor. JDK 1.7 and Tomcat 7.0 and Net Beans are used for the development of the tool. First of all Jazz and EI tools were studied before implementing the proposed application. The results of observations are presented in fig. 2, 3 and 4.
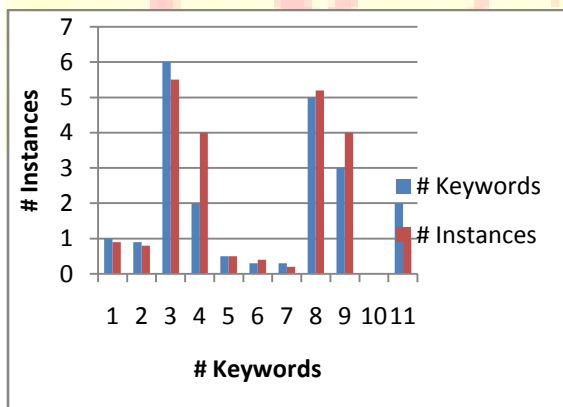
Fig. 2 – Distribution of Tag Instances to Work Items with respect to Jazz
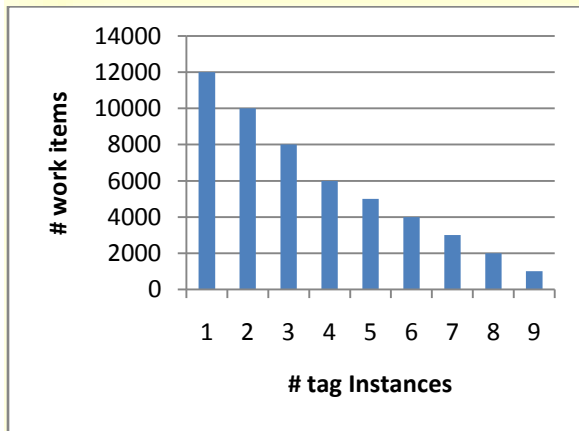
(Here # represents number of counts)

As can be seen in fig. 2, it is evident that the horizontal axis represents tag instances while the vertical axis represents number of work items. As the work items are increased the tag instances are also increased.

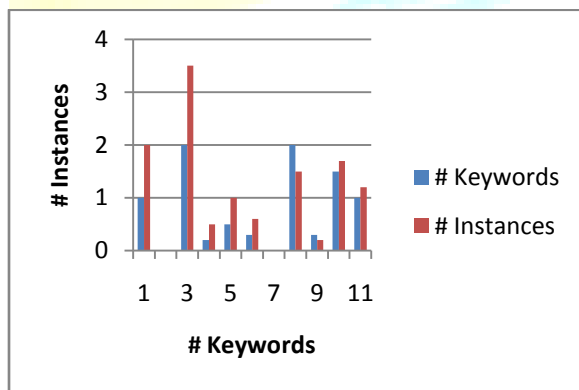**Fig. 3 – Number of instances and tag keywords (Jazz)**

(Here # represents number of counts)

   As can be seen in fig. 3, it is evident that the horizontal axis represents number of tag keywords with respect to architecture, collaboration, component, cross-cutting, documentation, environment, idiosyncratic, planning, testing, tooling and unclassified while the vertical axis represents number of tag instances. As the work items are increased the tag instances are also increased.

Fig. 4 – Number of Instances and tag keywords

 (EI)

(Here # represents number of counts)

  As can be seen in fig. 4, it is evident that the horizontal axis represents number of tag keywords with respect to architecture, collaboration, component, cross-cutting, documentation, environment, idiosyncratic, planning, testing, tooling and unclassified while the vertical axis represents number of tag instances. As the work items are increased the tag instances are also increased.

6. Conclusion

This paper presents a web based prototype tool that helps in collaborative computing by enabling a team of developers communicate technically. The communication takes place among work item owners, work item authors and tag authors. This tool will resolve communication concerns in a collaborative development environment. The application also explores the emergence of social networking phenomena which will help the developers to have informal social activities as

well within their organization. Tagging and social networking features together will help teams to have both formal and informal communication mechanisms and articulation work. The experimental results revealed that the proposed application is useful in the real world.

7. References

[1]. C.R.B. de Souza, D. Red miles, and P. Dourish, "'Breaking the Code', Moving between Private and Public Work in Collaborative Software Development," Proc. Int'l ACM SIGGROUP Conf. Supporting Group Work, pp. 105-114, 2003

[2] R. Frost, "Jazz and the Eclipse Way of Collaboration," IEEE Software, vol. 24, no. 6, pp. 114-117, Nov./Dec. 2007.

[3] S. Golder and B.A. Huberman, "Usage Patterns of Collaborative Tagging Systems," J. Information Science, vol. 32, no. 2, pp. 198-208, 2006.

[4] H. Kagdi, J.I. Maletic, and B. Sharif, "Mining Software Repositories for Traceability Links," Proc. 15th IEEE Int'l Conf. Program Comprehension, pp. 145-154, 2007.

[5] Christoph Treude and Margaret-Anne Storey, "Work Item Tagging: Communicating Concerns in Collaborative Software Development", IEEE TRANSACTIONS ON SOFTWARE ENGINEERING, VOL. 38, NO. 1, JANUARY/FEBRUARY 2012

[6] T. Ostrand and E. Weyuker, "A Tool for Mining Defect- Tracking Systems to Predict Fault-Prone Files," IEE Seminar Digests, vol. 2004, no. 917, pp. 85-89, 2004

[7] M. Cataldo, M. Bass, J.D. Herbsleb, and L. Bass, "On Coordination Mechanisms in Global Software Development," Proc. Int'l Conf. Global Software Eng., pp. 71-80, 2007.

[8] J.D. Herbsleb and D. Moitra, "Guest Editors' Introduction: Global Software Development," IEEE Software, vol. 18, no. 2, pp. 16-20, Mar./Apr. 2001.

[9] J.D. Herbsleb, A. Mockus, T.A. Finholt, and R.E. Grinter, "An Empirical Study of Global Software Development: Distance and Speed," Proc. 23rd Int'l Conf. Software Eng., pp. 81-90, 2001.

[10] S. Faraj and L. Sproull, "Coordinating Expertise in Software Development Teams," Management Science, vol. 46, no. 12, pp. 1554-1568, 2000.

[11] C. Gut win, R. Penner, and K. Schneider, "Group Awareness in Distributed Software Development," Proc. ACM Conf. Computer Supported Cooperative Work, pp. 72-81, 2004.

[12] S. Sen., S.K. Lam, A.M. Rashid, D. Conley, D. Frankowski, J. Osterhouse, F.M. Harper, and J. Riedl, "Tagging, Communities, Vocabulary, Evolution," Proc. 20th Anniversary Conf. Computer Supported Cooperative Work, pp. 181-190, 2006

[13] J.B. Ellis, S. Wahid, C. Danis, and W.A. Kellogg, "Task and Social Visualization in Software Development: Evaluation of a Prototype ,"Proc. SIGCHI Conf. Human Factors in Computing Systems ,pp. 577-586, 2007.

[14] C. Treude and M.-A. Storey, "How Tagging Helps Bridge the Gap between Social and Technical Aspects in Software Development," Proc. 31st Int'l Conf. Software Eng., pp. 12-22, 2009.

[15] A.E. Hassan and R.C. Holt, "Using Development History Sticky Notes to Understand Software Architecture," Proc. 12th Int'l Workshop Program Comprehension, pp. 183-192, 2004.

[16] M.-A. Storey, J. Ryall, J. Singer, D. Myers, L.-T. Cheng, and M. Muller, "How Software Developers Use Tagging to Support Reminding and Refinding," IEEE Trans. Software Eng., vol. 35,no. 4, pp. 470-483, July/Aug. 2009.

[17] M.P. Robillard and G.C. Murphy, "Concern Graphs: Finding and Describing Concerns Using Structural Program Dependencies,"Proc. 24th Int'l Conf. Software Eng., pp. 406-416, 2002.