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Usage of blogging software for laboratory management to support weekly seminars using research activity reports

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Abstract

This paper reports the design and use of blogging software in laboratory management to support weekly seminars, in which activity reports are an important resource for checking participants' research activity. The software has three basic functions to support seminars: a report editing, comment, and chat. In order to support knowledge management, we added an evaluation function corresponding to each seminar report and a To-Do-List function to support driven objects as sub-goals. The blogging system was installed in a laboratory seminar, in which a teacher, a doctoral student, and seven students pursuing their master's degree participated over the course of five months. Results show that seminars conducted using the blogging software were evaluated more highly than paper-based seminars. However, only a few participants used the comment function, and the chat function was minimally used.

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Keywords: laboratory management; knowledge management; blog software ; evaluation; To-Do-List

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1. Introduction

Knowledge and creativity are being recognized as important resources in a society dominated by the spread of information. Creativity is especially important in preserving the competence of any organization. Many people have helped to develop techniques that can help us individually to foster our creative capacity. In the 1950s, for example, Alex Faickney Osborn invented brainstorming and proposed that every person has the creative power to develop original ideas[1]. A decade later, in Japan, Tadao Umesao proposed an intelligent productive technique that should be taught to everyone[2]. These thinkers spread the notion that creativity is not a myth; it is a central part of human development, and is especially attractive in the field of education.

When Umesao proposed his technique, he introduced a A6-sized card system for memorizing ideas, anywhere and anytime[2]. This card system has been improved with a seminar system named Remote Wadaman[3]. The seminar system was applied to research activity in laboratory education with weekly activity reports. Later, the system was further improved with groupware to support the SECI model[4], a famous knowledge management model for laboratories by adding groupware for idea generation[3]. However, these systems do not support databases and therefore, they cannot offer an easy access environment for network users.

In this paper, we propose a research activity support system with a blogging software. Next, a blogging software as a prototype system is described. Further, results of its usage and evaluation with a questionnaire are explained.

2. Related works

2.1. Research activity support system

A research activity support system was developed as a creativity support tool for weekly seminar activities[5]. The system focused on the “operation” component of Guilford’s model of human intelligence.

The system emphasizes on supporting the “evaluation” component of the model by attaching a value tag to research data. Creative thinking support systems for divergent and convergent thinking do not commonly support data evaluation. Using the research activity support system showed that data evaluation can be useful for drafting a research summary. Moreover, it can be useful in assessing the effectiveness of the research data.

2.2. Knowledge dynamics and GUNGEN-SPIRAL III

The model for knowledge creation has been proposed and advanced by Nonaka and his colleagues, and it is called the SECI model [4]. Based on the interviews with many Japanese workers in the late 1980’s, this model is considered an ideal model that was founded on investigation of successful products from Japanse manufacturing. The model is well known in knowledge management systems.

SECI was considered practical and effective in knowledge firms[6]. Various novel conceptions for organizational management were added to the model to promote the practice of knowledge management. Such innovations include: vision management with driven objects, dialogues in knowledge interaction, and sharing or storing information.

The design for a groupware system for laboratory management, named GUNGEN-SPIRAL III, was proposed later[7]. GUNGEN-SPIRAL III is designed as a collection of web services, that includes a service for idea generation that uses a cooperative KJ method, a service that provides an activity report system, and a service for collecting ideas. However, the system remains at the design level and has yet to be implemented.

In this research, the prototype of the activity report system, containing the evaluation function and a To-Do-List function for knowledge management, was designed and implemented in six months.

3. Design of the weekly seminar support system

The weekly seminar support system (WSSS) has been designed as a system to support a knowledge spiral with web service systems. The knowledge spiral is refining knowledge by iterating a knowledge creation process. It was designed referring to the knowledge creation process or knowledge dynamics described in section 2. This system is

used in weekly seminars to report research activity, and to edit or upload a research report prior to a seminar. In the seminar, the students can then explain their report orally.

3.1. Basic functions

The support system has been instrumental in producing weekly activity reports for tutoring by supervisors or for team discussion. The seminar is depicted in Figure 1. The three functions used to support team activity are a report function to view or edit an activity report, a comment function for each active report, and a chat function for text communication. The system configuration for the WSSS is summarized in Table 1.

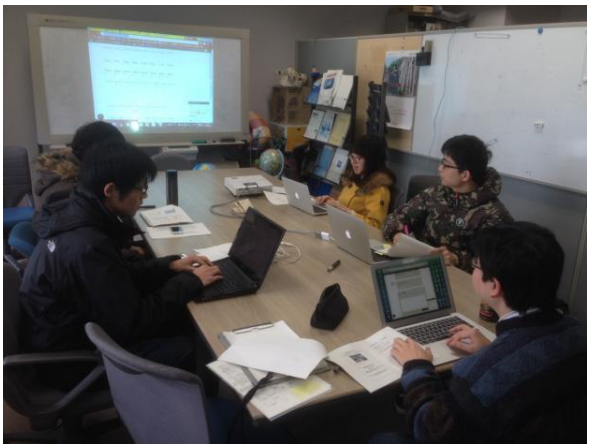

Figure 1. Weekly activity report seminar.

Table 1. System configuration of the weekly seminar support system.

Items	Description
Basic functions	
Report function	For editing and sharing a weekly activity report
Comment function	For commenting on a weekly activity report
Chat function	For text communication with parallel inputting
For knowledge spiral	
Web service	For "*Ba*" in human-human interaction, anywhere and anytime. ("*Ba*" is explained in 3.2(a).)
Evaluation function	For adding individual values to each report in preparation for the externalization of the SECI process.
To-Do-List function	For visual management by setting sub-goals to encourage completion of tasks.

3.2. Considering the knowledge spiral

We have considered a knowledge spiral support system with the web service systems by referring to the knowledge creation process and the knowledge dynamics described in section 2.

(a) "Ba" as web: interactive environments

Ba is defined as a dynamic context, in which knowledge is shared, created, and used[6]. Moreover, Ba is not spatial, but it appears with multiple interactions. Thus, human-human and human-knowledge interactions are

necessary. The web-based application is considered as an infrastructure essential for supporting human-human accessibility, anywhere and anytime.

(b) SECI model: action process for knowledge creation

We plan to support the SECI model as follows. In the socialization stage, participants evaluate one another's activity reports and add either semantics or value data, which is externalization of value by participants. In the next stage, the externalization stage, knowledge is acquired by comparing data values to judge their difference or similarity.

Thus far, previous versions of the laboratory activity support system treated the evaluation function as a crucial function to support knowledge creation[5]. In the service industry, the addition of value to knowledge is recognized as important for meaning of knowledge for users. Thus, the evaluation function is important for connecting knowledge with practical value.

(c) Vision management

A vision for leadership is recognized as an important element in knowledge management. However, the driven objects as sub-goals for promoting the practice are necessary for achieving this vision[6]. In order to manage the driven objects, the To-Do-List function assesses the progress rate. Research in the social sciences demonstrates that a To-Do list is important for encouraging one to achieve their goals. Thus, this management module is a central function for supporting the long-term knowledge spiral.

4. Blogging software as a prototype system

The weekly seminar support system has been developed with WordPress[8], an open-source blogging software suite. WordPress was developed using HTML and PHP. WordPress allows customization using the two languages or by using extension modules, called plugins. Thus, WordPress has a flexible design for system development. To realize all functions in Table 1, 12 plugins were installed.

4.1. User interface

The user interface of the prototype system is similar to any ordinary blogging software. After a user logs into the system, the laboratory page appears on the screen, as shown in Figure 2. The weekly activity report is submitted with the blogging interface. An example of a seminar report is shown in Figure 3. An instant-messaging function is used for chatting, as seen in Figure 4. The user can write comments and reply to reports. These appear as a blog entries, shown in Figure 5, at the bottom of the weekly activity report.

This interface supports the three basic functions described in section 3.2. The blogging software has web accessibility for participants, which is required, as the Ba environment executes over the Internet.

The user interface for the evaluation function is created using a plugin named "GD Star Rating" is shown in Figure 6. Members evaluate research activity reports on a scale of five points based on novelty, effectiveness, and correctness. These evaluations s help in assessing the value of each report. Members evaluate reports in terms of their relationship with one another. The evaluation of this relationship can support an understanding of their interests. This function is expected to support the externalization of the SECI process described in section 3.2.(b). In addition, previous research activity support systems only supported a five-point rating scale in terms of value.

The To-Do-List function is created using a plugin named "Cleverness To-Do List," is added to support vision management described in section 3.2.(c). This user interface and an example of sub-goals are shown in Figure 7. Users can input sub-goals and then decide a rating for each attempt. This interface is not shared, and therefore, other users, including supervisors, cannot see the state of completion.

Figure 2. Screen shot of the blogging software for laboratory management.

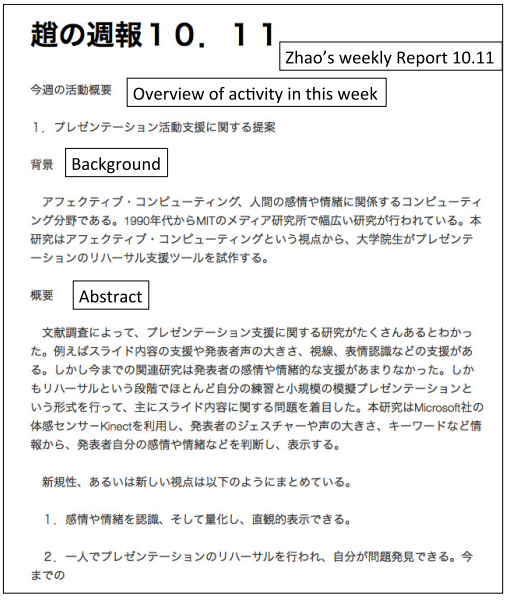

Figure 3. Example screen-shot of a weekly activity report.

Figure 4. Chat function

Figure 5. Comment function

Figure 6. Function for multi-point evaluation

4.2. System usage scenario

Consider the following scenario: A student decides on a research goal, divides the research goal into sub-goals, and types them out using the To-Do-List function of the WSSS. A student then writes an activity report on the WSSS prior to a weekly seminar.

Following this, the student attends the weekly seminar. In the seminar, the student discusses the report with a supervisor and a laboratory member. The supervisor and laboratory member write comments using the WSSS. Further, they evaluate the report using the evaluation function. Then, the student reads the comments and views the ratings. Then, he can reflect on the status of the research goal. If the student recognizes that some change in the sub-goals is required, the student changes the attempt-rate of the sub-goal or adds a new sub-goal with the To-Do-List function.

As mentioned above, the student is required to conduct his/her research, report the progress on a weekly basis, and discuss the results with the laboratory member. These weekly activities are checked-off using the To-Do-List function in view of the research goal. This process is expected to promote student research activity while recording it in a research log.

Figure 7. To-Do-List function

5. Prototype usage and evaluation

5.1. System usage

The prototype system with WordPress has been used since August 2013. Between then and March 2014, we held 20 seminars.

To evaluate the prototype, we compiled a table listing the number of participants, the number of research activity reports, and the corresponding comments. They were obtained from the results of 15 seminars held between September 20th to January 10th, and are shown in Table 2. The participants included one teacher, one doctoral student, seven students pursuing their master's degree. And the one doctoral student and the five students were Chinese. Basic communication between participants was carried out in Japanese.

The result showed that the average attendance at the seminars was 10.5 (70%), the average number of reports was 9.8, and the average number of comments was 33.9.

However, participant attendance was not consistent. Students B and C attended most seminars and made several comments. Teacher A wrote 74% of the comments. The number of comments by teacher A was 228; comments by student B totaled 26; and that by student C was 25. Thus, almost all of the student activity at the seminar related exclusively to reporting their research. On the other hand, the activity of the teacher pertained to discussing the report with the students and making comments regarding research advice.

Two months after introducing the prototype system into the research activity seminar, the participants answered seven-scale questionnaires about both the blog-based seminar and the paper-based seminar. The questionnaires about the paper-based seminar were answered from experience before introduction of the prototype system. The comparison results are shown in Table 3 with a statistical Mann-Whitney U test analysis.

Table 2. Result data from participants in attendance.

	Number of attendance	Number of reports	Number of comments
Teacher A	15	-	228
Doctor Student B	15	14	26
M2 Student C	14	14	25
M2 Student D	10	11	0
M2 Student E	10	9	16
M2 Student F	8	7	1
M2 Student G	5	5	0
M1 Student H	10	10	0
M1 Student I	8	8	9
Average	10.5	9.8	33.9
Total	-	78	305

Table 3. Evaluation of seminar activity

Questions	Blog-based seminar (N = 7)	Paper-based seminar (N = 7)	P-value
Have you increased your opinions?	5.7**	4.3	0.01
Do you feel comfortable with the seminar atmosphere?	3.6	3.4	0.06
Do you read other's participant reports?	6.0*	5.8	0.03
Do you read each other's comments?	6.5	6.1	0.07
Do you reply to comments?	6.6*	5.3	0.02
Did you understand the teacher's comments?	6.5*	5.8	0.02

Mann-Whitney U test: *P<0.05, **P<0.01

Although participation at the seminars was unbalanced, the blog-based seminar was evaluated higher than the paper-based seminar. Participants felt that the number of opinions increased, and they read more of one another's reports, replied more to comments, and better understood the teacher's comments in comparison to the paper-based seminar. Text comments were likely helpful to the Chinese participants, because Japanese is their second language.

5.2. Evaluation of the questionnaires

After the introduction of the To-Do-List function in the middle of November, participants answered the seven-scale questionnaire about each function. The results are shown in Table 4. At the same time, the participants answered the seven-point questionnaire about using the system. Those results are shown in Table 5.

Table 4 shows that the report-evaluation function, the text-search function, and the To-Do-List function were given high values in the evaluation. The effectiveness of the comments was given an acceptable value, as seen in Table 3, but this particular function was not evaluated quite as highly. The comments did not appear without reloading, and therefore, new comments took longer to appear. This was inconvenient for interactive communication. The chat function was not given an especially high value, but this is because voice communication was preferred in the seminar.

Table 5 shows the usefulness of the system, the usability of the respective functions, and the expectation for future system use. Each of these received high values. The understandability of the system interface was given a worse evaluation than expected, suggesting that our user interface should be improved.

Table 4. Questionnaire results on the effectiveness of functions

Items	Average value (N=7)
Report evaluation function	6.0
Text search function	6.3
Comment function	4.3
Chat function	4.8
To-Do-List function	6.5

Table 5. Questionnaire results on using the system

Items	Average value (N=7)
Usefulness of the system	6.0
Understandability of the system interface	3.2
Usability of functions	5.8
Expectation of system usage in the future	6.5

5.3. Discussion

Existing systems offer support for software development. Trac[9] supports project management and a ticket system to support bug tracking. GitHub[10] supports SNS functions. Furthermore, there are many options in blogging software and SNS systems. Such systems have the potential to support similar laboratory management.

To realize a sufficiently effective “Ba” in laboratory management systems, the operation and interaction is should be easy and effective. Interaction is important for using such systems in the context that appears on the current screen for supporting awareness. Trac and GitHub do not support screen customization directly, such as a graphical user interface. This makes it difficult to consider interacting designs. OpenPNE[11] is a SNS development software that can be customized similar to WordPress. In any case, these should all be considered in designs for “Ba.”

6. Concluding remarks

This paper reported the design and usage for blogging software in laboratory management with weekly activity reports. The system has three basic functions to support seminars: a report-editing function, a comment function, and a chat function. In addition, an evaluation function and To-Do-List function were added to support concepts in knowledge management.

The blogging system has been applied in our laboratory seminars since August, 2013. We investigated participant attendance and evaluated its performance with seven-point questionnaires. Our results showed that seminars conducted with the blogging software were evaluated higher than those conducted with paper. However, the usage of system was centralized among few participants. Moreover, the system's user interface should be improved in future work to make participation easier.

In future research, we plan to further develop the web service. We shall avoid SNS in programming for the web because its components restrict collaboration, and we plan to enhance communication features in seminars by improving the sharing function. Finally, we shall install and test the system in our laboratory.

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