

# Design of Collaborative Web System: Based on Case Study of PBL Support Systems

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**Abstract**—This paper describes the design and implementation of web system for continuable and viable collaboration. This study proposes the improvement of the system based on a result of a certain practice. As contemporary higher education information environments transform, this study highlights the significance of university identity and college identity that are formed continuously through independent activities of the students. Based on these discussions, the present study proposes a practical media environment design which facilitates the processes of organizational identity formation based on a continuous and cyclical model. Even if users change by this system, the communication system continues operation and cooperation. The activity becomes the archive and produces new activity. Based on the result, this study elaborates a plan with a re-design by a system from the viewpoint of second-order cybernetics. Systems theory is a theoretical foundation for our study.

**Keywords**—Collaborative work, learning management system, second-order cybernetics, systems theory, user generated contents, viable system model.

## I. BACKGROUND

IN the information-society of these days, groupware and Social Networking Service (SNS) spread. With the development of SNS and Web2.0, User Generated Contents (UGC) was enabled. In these web based systems, Content Management System (CMS) and Learning Management System (LMS) are used in the construction of the web system generally.

In this research, we investigated the problem when using such groupware and proposed further improvement. Generally, many studies paid attention to the activity of a relatively short period in the study of groupware and the collaboration and some studies were often gave its attention to synchronic group dynamics [1].

In this study, we paid our attention to continuity and the durability and regarded the communication system which regenerated a system as important. Such a viewpoint is based on systems theory and cybernetics [2]. Such a system is discussed as viable system model (VSM). VSM is one of the cybernetics system models with the secondary observation and it is a kind of self-organization model. This is not a simple equilibrium model, but an emergence system. As for such system, a creative role of the management in the second observation of the system is emphasized as well as adaptation relations with the environment.

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## II. DISCUSSION AND IMPLICATION

Recent studies have discussed usage of the groupware in the contents production of the Project-Based Learning (PBL) class of the university student [3], [4], and it suggests the system which supported the workflow of a plan and the video shoot of the university student. The concept and case are as follows:

While there are a variety of areas in which student participation is assumed, there is a need to develop a certain communication forum to stimulate the learning and consultations between the students (and between the projects). A support site for the video production will be established using CMS. It is expected that the CMS will allow the e-learning materials based on instructional design to be used effectively while the primary purpose is to support group work. Temporary group-ware will be used to facilitate collaborative work among students who participate in various stages of the video production activities. Each group must discuss and decide on a minimum posting format and launch one thread per project enabling each group to develop plans, report on progress, and have discussions (Fig. 1).

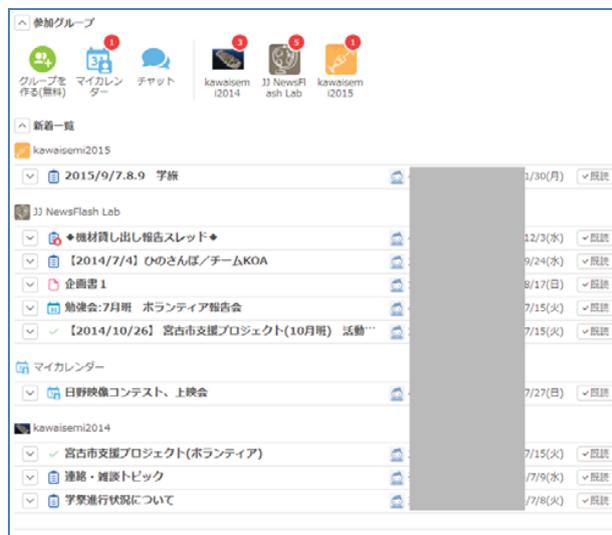


Fig. 1 Team management per 1 thread unit

In Fig. 1, the display is in category view with a “timeline/category display” format while other general CMS formats include notice boards, To Do lists, shared folders, and event notifications. Among the threads in the category display, a thread beginning with [month/day/year/event/plan name] shows a production team.

Within the thread, the workflow, such as planning, location

scouting, scene lists, pre-rough editing worksheets, rough edits, caption insertions, BGM preparation, editing finalization, and video checking (and checking with the faculty and staff in charge of the events on that day) are recorded [3]. Threads not only function as progress management but can be practical instructions for new projects.

During the production, process management activities are dominant but when the thread is complete, it can function as learning content for new participant students. This practice focuses on the student acquisition and formation of organizational identity (OI) through the process of making their own university PR video which looks at the distinctive traits of the university organization [5]. When considering these challenges, future investigation is required to find out whether there is a need to offer the special group-ware features. The features are going to be groupware for the video production. Therefore, it is necessary to investigate these groups. The above is a summary of the practice.

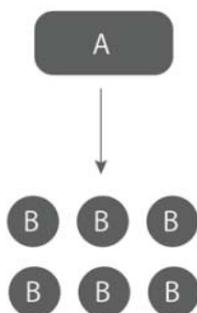


Fig. 2 Formation of OI: Top-down model

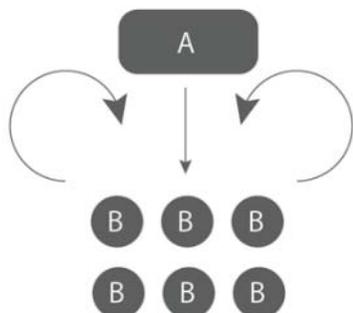


Fig. 3 Formation of OI: Bottom-up model

### III. DISCUSSION AND IMPLICATIONS

First, this practice focuses on the student acquisition and formation of OI through the process of making their own university PR video which looks at the distinctive traits of the university organization.

If we assume that conventional OI theory includes top-down communication as in Fig. 2, then this practice has a bottom-up aspect as shown in Fig. 3 and it is expected that communication will continue to be cyclically regenerated (A denotes the university authorities and B denotes the students).

Second, with respect to active information literacy

cultivation, current ICT commoditization and networking technology support this initiative. Use of technology, such as non-linear HD and the recording and editing of 4K videos, is not unusual and is becoming common. Networking technology brings together the fundamentals of ubiquitous technology and cloud technology. Such elements allow for a different perspective of the work environment as being a nomad work style or co-working space. Needless to say, the learning environment of the university organization itself is explored as a learning space and a style is developed to be able to respond to an open work style, as seen in PBL and active learning, far removed from conventional uniform PC labs.

While recognizing the challenges imposed by modern education, the development of activities must go beyond mere technological trends and should be seen as an opportunity to restructure the relationships between students, faculty, and staff.

One of the challenges is the extracurricular nature of the practice. Activities which are part of the extracurricular activities are often voluntary, therefore to ensure continuity, it is important to consider what incentives can be offered to motivate active student participation. (However, when managing such activities in a regular curriculum, the production period becomes uniform and activities during long vacations are out of the scope of the “performance evaluation”).

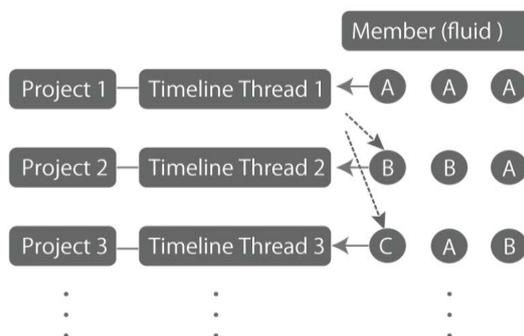


Fig. 4 Members can refer to the old project thread

A second challenge is the development of a strong connection between the students, teachers, and staff (especially the person in charge of PR or internal campus events) for transmission of the production footage outside the university through local CATV and WEB. While this paper is focused on the use of video production to develop student OI, when targeting PBL or local student collaborations, there is scope to examine these types of activities for staff development purposes.

The third challenge is the need for coordinators to facilitate the collaborative work. In terms of the production process, because of the widespread use of smartphones, there seems no real lack of confidence among students, except for good acoustics and lighting. Moreover, it is expected that using group-ware sharing, problems can be successfully resolved. On the other hand, unlike everyday video shooting, a certain lack of familiarity with the production process in which students

make plans and create video edits in a small group is often observed. However, when collaborating, the usage of group-ware alone cannot ensure the voluntary and proactive activities by the students.

The fourth challenge is the location of the organization. In the University, which is implementing the activities, the university land was divided into two campuses this year; the Shibuya campus and the Hino campus. In the past, three departments (the Departments of Letters, Human, and Social Sciences, and Life Sciences) had been operating on a single campus. However, since the Faculty of Letters, Human, and Social Sciences was moved to Shibuya, it appears as follows: “Shibuya = Humanities and Social Sciences” and “Hino = Natural Sciences” (Collegization). In the future, the type of practice activities may differ depending on whether the project is continued as a cross-campus practice that overcomes the geographical distance (university type) or whether each activity will be independent of each other.

Finally, when considering these four challenges, future investigation is required to find out whether there is a need to offer the special group-ware features. What is the features of this *special group-ware*.

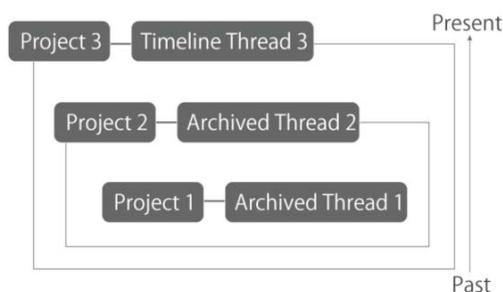


Fig. 5 Reference Model of the self-organization

When we design a system to support such PBL, what are the requirements to be required? We are based on the problem peculiar to an example in this section and consider it. Generally, many studies paid attention to the activity of a relatively short period in the study of groupware and the collaboration and these studies were often paid its attention to synchronic group dynamics. Particularly, the formation of OI takes long time. The project as PBL is over in several months, but it is necessary to continue a communication system by connecting such a project.

In addition, the Project Base Learning spends time on one of activity itself, and what they spend long time on about record and media production is not realistic. A lot of reflection through the experience is included in individual projects as well as general technique about a record and the photography, too. For example, the importance of windshield microphone really has many students to realize by photographing it outdoors. We can learn these by an archive. It becomes important how we build a communication system for such a collaboration by the project of the university which a member is often changes (as shown in Fig. 4).

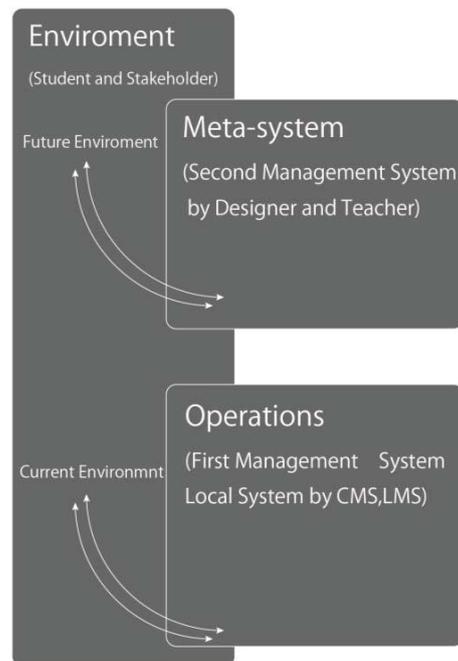


Fig. 6 Activity as VSM

Fig. 6 illustrates these systems. The system develops in its environment. This communication was practiced in the operation of first management system and current environment in the practice of PBL. Whenever PBL is repeated, as for this, communications are archived. In this case, the system is only made merely routine. However, in cybernetics and VSM, secondary observation is regarded as important. In the upper part of Fig. 6, the secondary observation is described as a “Meta-System”. Generally, “feedback system model (FSM)” is a equilibrium model, but the meta system is not in charge of only sustenance of the simple operation in its system.

The meta-system has a role to build future environment in itself while interpreting probable environment. This is management itself in the management organization study. The meta-system contributes to emergence of system in itself.

#### IV. CONCLUSION

In this study, we paid my attention to continuity and the durability and regarded the communication system which regenerated a system as important. Such a viewpoint is based on systems theory and cybernetics.

We recognize it as VSM that Beer proposed such a system and can develop it [6], [7]. What is the viability? In a VSM, it is not a human being to constitute a system. Communication constitutes communication for self-reference, and a system continues operating as a self-organization (as shown in Figs. 6 and 7). This model is recognizable as the second order cybernetics. The second-order cybernetics observes a target system by secondary observer. As for this, the observer is equivalent to the recognition of administrator and designer in the web system.

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