

Effectiveness and Issues of the Communication System Researched and Developed by a Venture Company Incorporated by a University With Industrial Collaboration

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Abstract: The research group consisting of the author et al., established a venture company incorporated by a university with industrial collaboration, and has researched and developed an interactive communication system. In the past we have conducted experimental tests mainly at a university, with use of the system as a lecture management system in mind. The system has a school register / attendance registration function, questionnaire function, quiz function, and message distribution function, and it mainly uses the mobile phone e-mail function. In this report, we discuss the effectiveness and issues of the system jointly researched and developed through collaboration between industry and academia, centered on the result of the experiment on the system concerned.

Key words: Venture company incorporated by a university with industrial collaboration, Lecture management system, Mobile phone e-mail, Interactivity

1 Introduction

In Japan, with the protracted economic slump, the importance of collaboration between industry and academia, aiming to create and expand venture businesses using universities' intellectual resources and to activate existing industries, has been widely recognized, and various measures have been implemented. In the "Plan for the Creation of New Markets and New Jobs (Hiranuma Plan)" put forward in 2001 by Minister Hiranuma, Minister of Economy, Trade and Industry, the "Plan for Creating 1,000 Venture Firms Sprung From Universities" was presented, which also contributed to a rapid increase in the number of joint researches between universities, etc., and private companies, etc., which is one of the indexes of industry-academia collaboration activities.

In such an environment, our research group has also implemented industry-academia collaboration activities since fiscal 2004, and conducted industry-university joint research and development regarding an interactive communication system using the mobile phone e-mail function, for about three and a half years up to this day. In this report, we discuss the effectiveness and issues of the system researched and developed by a venture company incorporated by a university with industrial collaboration, which we established (hereinafter referred to as "System A").

2 Development Plan

In 2004, our research group concluded an industry-university joint research contract with two private companies, and began research and development on the lecture management system. In this research and development, our goal was to develop a system that is easy and convenient for both the faculty and students, is low cost in introduction and maintenance, and also supports the creation of class space based on real-time interactive communication. In this system, the e-mail function of mobile telephones - which almost all of the students use - is utilized, as packet charge is inexpensive. The functions we planned to develop include a school register registration function, attendance registration function, questionnaire function, quiz function, and drill function, pertaining to functions used in class; and an assignment function, self-E-Learning function, and message distribution function, pertaining to functions used outside class.

As for the quiz function, we assumed the “one question / quick style” in which a professor sets questions and sometimes gives answer choices on the spot during class, instead of preparing a test in advance, and students answer those questions. On the other hand, for the drill function, we assumed the “preset form,” in which a substantial quantity of questions are prepared in advance. The assignment function, which is similar to the drill function, is based on the assumption that review items from class are assigned for outside of school hours. With the drill function, therefore, test questions are distributed during class or projected using a projector, etc., while with the assignment function, distribution of questions is also a premise. The self-E-Learning function aims at self-study support, unlike the quiz and drill functions by which a professor gives questions to students. As for the questionnaire function, we planned to use the “one question / quick style” and “preset form,” much like the idea for the quiz function / drill function.

3 Outline of System A

3.1 Basic composition

This system is composed of a professor’s PC or mobile phone and students’ mobile phones, e-mails that are received and sent through them, a server that processes the database, and a program. Respective functions are operated via e-mails, and this system is also equipped with the function to display some of the information stored in the database on the Web. Authentication is conducted using an e-mail address and a password.

3.2 Loaded functions and functions that have not been loaded

Presently, System A is equipped with the school register / attendance registration function, quick-style questionnaire function, quick-style quiz function, and message distribution function. In the quick style, only one question is asked, but this function can be used as many times as needed in a class, so as a result, multiple questions can be asked. The questionnaire function comes in three types: choice style, description style, and choice / reason description style; and the quiz function comes in four types: choice style, description style, choice / reason description style, and number entry style. However, the description-style quiz is not equipped with a right or wrong judgment function. The drill function, the assignment function, the self-E-Learning function, and the preset-style questionnaire function, which we initially planned to load to the system, could not be loaded due to lack of manpower, because the development team was of small scale, consisting of only five people in total (including two engineers).

3.3 School register / attendance registration function

The flow of attendance registration is as mentioned below.

- (1) Professor: registers “today’s keyword” in advance, and sends e-mails to start attendance registration to students.
- (2) Professor: notifies “today’s keyword” in the classroom.
- (3) Student: sends the notified keyword (one e-mail) and his / her password (one e-mail).
- (4) Distribution: An attendance registration completion e-mail is distributed to the students who completed registration correctly. To the students who made a mistake in operation, an e-mail reporting the error state (cause of the mistake, etc.) is sent back, and the students re-do registration according to the instruction in the e-mail.
- (5) Professor: sends attendance registration closing e-mails.
- (6) Distribution: An e-mail on the overall attendance state is sent to students and the professor.

A professor can request the attendance book by e-mail or see the book on the Web. On the Web, individual students’ attendance registration times, etc., are also displayed. Dishonest registration from outside classroom is restricted to some degree through professors’ notifying of “today’s keyword” for each lecture in classroom, and setting up start and end of registration. Initially, the school register registration function was independent, but in the present system, the first attendance registration (a student registers his / her name, student ID number, and a password by e-mail only during the first time) serves also as school register registration .

3.4 Questionnaire function

The flow of questionnaire is as mentioned below.

- (1) Professor: sends an e-mail notifying the start of a questionnaire.
- (2) Distribution: An e-mail to select a question form is distributed to the professor.

- (3) Professor: sends an empty e-mail to a designated address of either the description style or choice style (2 to 9 choices).
- (4) Distribution: For the description style, an e-mail that prompts the professor to limit the number of characters (up to 200 characters) is sent. For the choice style, an e-mail that prompts the selection of either without reasons for the choices, or requiring reasons for the choices, for which a limitation of the number of characters needs to be set up, is sent to the professor.
- (5) Professor: The questionnaire starts when e-mails are returned according to the e-mail instruction in (4).
- (6) Distribution: An e-mail that encourages answering the questionnaire is sent to the students who finished attendance registration. Furthermore, an e-mail that notifies the start of a questionnaire and the content of the e-mail distributed to students, is sent to the professor.
- (7) Professor: announces questions, etc., in the questionnaire in the classroom.
- (8) Student: sends answers according to the instruction in the e-mail mentioned in (6).
- (9) Professor: sends questionnaire closing e-mails.
- (10) Distribution: The totalization result is sent to students and the professor.
Students' individual answers and graphs, including descriptions, are displayed on the Web, so they can be shared with students by displaying them on a projector.

3.5 Quiz function

This function is loaded with four types: "choice style," in which only choice numbers are answered; "choice / reason description style," in which choice numbers are answered and reasons for the choices are described; "number input style," in which the calculation results, etc., are entered; and "description style," in which answers are described. Operation is almost the same as that for the questionnaire function, except for the need to set up right answers on choices and numbers. To the students who gave right answers, instant ranking is also distributed.

3.6 Message distribution function

By sending the subject of a message and the message to the system by e-mail, the message can be distributed simultaneously to all registered persons. Further, the degree of publicity of the information can be known according to the state of return of confirmation e-mails from students.

4 Experimentation result

For three years since October 2004, we have conducted experimental testing on this system for multiple subjects at Osaka University, Ehime University, Hannan University, Matsuyama University, Osaka Seikei University, and Osaka Seikei College. In this process, we have repeatedly added functions and changed versions. We will introduce mainly the result of the experiment of the latest version of this system, which was conducted at Hannan University, as below.

4.1 School register / attendance registration functions

In the case of a large lecture, it is necessary to distribute an attendance card to each attendant and collect the cards, in order to accurately check attendance. For a class of approximately 200 students, for example, the process took over 15 minutes from time for teaching. Introduction of this system however has enabled checking of attendance in approximately three minutes. Further, a professor can see the list of attendants immediately after closing registration, so he / she can use it to call on students during class. In addition, it became possible to use a huge amount of time spent for transferring the collected attendance cards to the attendance book, for improving education service instead. On the other hand, students can accurately register attendance through their own operation and check their histories of attendance at anytime.

4.2 Questionnaire function

Needless to say, it has become possible to grasp students' opinions and levels of understanding in real time and to reflect them in class, and it has also become possible to promote improvement of students' enthusiasm to study, through a questionnaire as mentioned below.

Example of implementation of a questionnaire regarding sense of purpose

Date of implementation: April 26, 2007

University / Faculty that implemented the questionnaire: Hannan University, Faculty of Management Information

Subject, professor in charge: "Introduction to Accounting I", Yae Fukushige

Respondents: 41 persons who attend Class F

Question: What is your purpose of taking this class?

Choices: 1. Passing Grade 3 of the Official Business Skill Test in Book-Keeping

2. Acquisition of a credit with grade A 3. Only acquisition of a credit

Result: This questionnaire was conducted soon after the start of class during the first semester, and at least in this stage, no student chose the answer "3." On the other hand, 25 students(62.5%)selected "1," and 15 students(37.5%)selected "2." It became clear that students had high-level goals. In addition to the intended functions of this system, an unexpected result was shown that students actively answer questions by raising hands in every class hour.

4.3 Quiz function

When a quiz is conducted in a large-scale lecture, it takes a huge amount of time to grade and analyze answers, and it is not possible to grasp students' level of understanding in real time. It is needless to say that these problems have been improved through introduction of this system. On the other hand, instant ranking, which is returned when students give a right answer, seems to be an encouragement for them. Due to motivation to give a quick and right answer, many students now tackle questions with more focus without talking. Further, asking students who gave a wrong answer why they made a mistake in a questionnaire, after implementing a quiz, promotes their self-analysis, while the professor can understand the causes of students' errors.

4.4 Message distribution function

There is a predicted concern that if information is distributed to students outside class hours, students tend to not attend class or to establish a passive attitude. However, this function is effective in increasing a sense of connection with students, through such creative operations of the system as promoting communications by distributing comments according to choices to the students who answered the questionnaire asking "Can you keep up with class?," which was conducted after class.

5 Consideration

System A has various advantages, such as real-time grasping of attendance state, class that immediately reflects students' levels of understanding, convenient access through enriched Web display, effective class through the use of a projector, creative authentication, certain preventive measures against dishonest registration and unauthorized use, reduction in development, introduction, and communications costs through e-mail use, and potential of popularization due to multi-purpose design and arrangement of documents. With the respective positive features of mobile telephone and PC combined, this system is considered to enable a real-time interactive class, which was the intended purpose.

Further, in this system an e-mail carries one piece of information, and e-mails are repeatedly exchanged using a method similar to filling such forms as internet check boxes and text boxes, so both students and the faculty only need to operate according to the instructions in the received e-mails. System A therefore can be operated without a manual, though it has much more functions than a similar system. When a mistake is made in operation, the system is designed to let the person who made the mistake know about the mistake via a returned e-mail. When an e-mail address has changed, or a password is forgotten, necessary operation can be done easily by following e-mail instructions. Thus, creative considerations are made in various ways also in terms of user interface. As such, in the "Introduction to Accounting I class (professor in charge : Yae Fukushige)" in the Faculty of Management Information at Hannan University in fiscal 2007, this system was operated by simply informing users of some cautionary items, without using a manual at all, but there were no problems in particular.

On the other hand, System A requires attendance registration each time for implementation of a questionnaire or quiz, which imposes significant restrictions in operation. Specifically, a questionnaire or quiz cannot be started until attendance registration is completed, so it is necessary to have students register attendance even for class that requires no attendance confirmation. Also, when a questionnaire or quiz needs to be done immediately after starting class, attendance registration must be closed early, and students who come after the closing of registration cannot participate. Of course, it is extremely difficult to use a questionnaire or quiz outside class hours (though it is not impossible if combined with the message distribution function).

In addition, because the preset-type questionnaire function and assignment function are not loaded, a professor still

needs to send a command e-mail during class, even if he prepares a command e-mail in the send folder in advance. Students today are used to repeatedly exchanging empty or short e-mails, but more than a few professors have difficulty with such operations.

Considering these points, it is an important task to complete the functions that have not been loaded as soon as possible and to make improvements to make the system more flexible.

6 Conclusion

This system has remarkably high effectiveness compared with similar systems in terms of ease of operation, interactivity between users, economical efficiency, and educational effects, in which we can see effectiveness of industry-university joint research and development. However, other issues related to industry-university development fund and development management capability have come up, and professors expressed some resistance against use of mobile phones, which prevented this system from having been widely diffused.

With these issues in mind, we consider it necessary to further go into the social significance of the system concerned, by exploring its use in actual society, while continuing its development as a platform to enhance lecture management effects in the future. Due to popularization of mobile equipment in various fields, this system is considered to have latent potential of being applied also in medical and marketing fields, in addition to education, and we would like to implement industry-university joint research and development in these fields as well in the future.

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