

A Campus-based Information Sharing and Communicating System for Collaborative Design and Decision Making

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ABSTRACT

A campus-based information sharing and communicating system has been newly designed and implemented to realize network-based smart community like domain-oriented SNS for collaborative design and decision making in a relatively short period. For the sake of building large-scale poster for college promotion and the publicity of entrance examination, we must build up such a poster by means of the above information sharing and communicating system. We have taken some photos for candidates of poster, put them on exhibition with our system, and shared them with the determining committee's members on the system. This paper reports our system configuration and its application to real task of poster design. The system can play a role of such a design bed and communicating environment of collaborative design and decision making. With our system, we can perform the real collaborative design for poster creation in a short period. Its performance let the collaborative design and decision making more fruitful.

Keywords: Collaborative Design and Decision Making, Information Sharing and Communicating, SNS

INTRODUCTION

Social networking system (i.e. SNS) is one of powerful tools for effective and efficient information sharing and communicating. Many users, who already belong to some kind of affiliation such as company, society, school and so on, almost always access the SNS and obtain several opportunities to perform information sharing and exchanging in a real world. And some kinds of applications for collaborative design and decision making have been practically achieved by means of such SNS not only in Japan but also anywhere in the world.

Some people say that SNS is a relatively closed community but it is just like a kind of the goose that lays the golden egg. Because that information is now becoming more and more important and valuable, such a useful community can provide many suggestive resources and knowledge at the light speed as well as without special effort to bear up time-consuming tasks. And SNS is a foundation to perform information sharing and to prepare communicating media among the users who hold interests and value judgment in common. We have had also such very similar experiences to utilize SNS in order to achieve collaborative design in a few years (Imai, Imai and Hattori, 2013a). That was a very exciting and creative experience for us and we have had many fruitful results.

This time, we have newly designed and implemented a campus-based information sharing and communicating system to realize network-based smart community like domain-oriented SNS for collaborative design and decision making in a relatively short period. For the sake of building large-scale poster for college promotion and the publicity of entrance examination, we have taken some photos for candidates of poster, put them on exhibition with our information sharing system, and shared them with the determining committee's members on the system.

This paper reports our system configuration and its application to real task of poster design in a relatively short period. The system can play a role of such a design bed and communicating environment that performs information collecting, shows the design process, displays manipulating/transforming procedures, provides condition for decision making and shares final results through the collaborative design.

In this paper, we describe our related works of collaborative design and decision making at the next section. We are willing to introduce our system outline and explain its functions for collaborative design just like SNS as well as information sharing system in the third section. The real task to build poster by means of our system will be illustrated in the fourth section which shows the practical process of proposing original figure, decorating documents and explanation, fixing alternative comments and generating final figure of poster. And finally the summary will be concluded in the fifth section.

RELATED WORKS

Collaborative Design

Mark Klein of MIT and his co-researchers in their paper (Klein, Sayama, Faratin, and Bar-Yam, 2003), described "Almost all complex artifacts nowadays, including physical artifacts such as airplanes, as well as informational artifacts such as software, organizations, business processes, plans and schedules, are defined via the interaction of many, sometimes thousands of participants, working on different elements of the design. This collaborative design process is challenging because strong interdependencies between design decisions make it difficult to converge on a single design that satisfies these dependencies and is acceptable to all participants. Current collaborative design approaches are as a result typically characterized by heavy reliance on expensive and time-consuming processes, poor incorporation of some important design concerns (typically later life-cycle issues such as environmental impact), as well as reduced creativity due to the tendency to incrementally modify known successful designs rather than explore radically different and potentially superior ones."

Kathryn Merrick of University of New South Wales Australian Defence Force Academy described and her co-researchers in their paper (Merrick, Gu, Niazi, and Shafi, 2011) "Collaborative design is characterised by small-scale, carefully structured, professional design teams. The increasing popularity of social computing and mass communication supported by cyberworlds suggests there is now also a strong possibility of design through mass participation, beyond small-scale, collaborative design scenarios. However, to achieve collective intelligence in design, there is a need to motivate large groups of users to contribute constructively to design tasks. This paper studies different types of cyberworlds to classify the motivation profiles of their user bases. We compare these motivation profiles to those required for the emergence of collective intelligence and develop a list of technological requirements for cyberworlds to support collective intelligence and design."

J. Steimle of Technical University of Darmstadt, Germany and his co-researchers presents CoScribe, a concept and prototype system for the combined work with printed and digital documents, which supports a large variety of knowledge work settings (Steimle, Brdiczka, and Muhlhauser, 2009). And they said, "It integrates novel pen-and-paper-based interaction techniques that enable users to collaboratively annotate, link and tag both printed and digital documents. CoScribe provides for a very seamless integration of paper with the digital world, as the same digital pen and the same interactions can be used on paper and displays. As our second contribution, we present empirical results of three field studies on learning at universities. These motivated the design of CoScribe and were abstracted to a generic framework for the design of intuitive pen-and-paper user interfaces. The resulting interaction design comprising collaboration support and multiuser visualizations has been implemented and evaluated in user studies. The results indicate that CoScribe imposes only minimal overhead on traditional annotation processes and provides

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for a more efficient structuring and retrieval of documents."

Collaborative Decision Making

Nikos Karacapilidis and Dimitris Papadias of University of Patras, Greece described in their paper (Karacapilidis and Papadias, 2001), "Collaborative decision making problems can be addressed through argumentative discourse and collaboration among the users involved. Consensus is achieved through the process of collaboratively considering alternative understandings of the problem, competing interests, priorities and constraints. The application of formal modeling and analysis tools to solve the related processes is impossible before the problem can be articulated in a concise and agreed upon manner. This paper describes Hermes, a system that augments classical decision making approaches by supporting argumentative discourse among decision makers. It is fully implemented in Java and runs on the Web, thus providing relatively inexpensive access to a broad public. Using an illustrative example, we present the argumentation elements, discourse acts and reasoning mechanisms involved in Hermes. We also describe the integration of advanced features to the system; these enable users to retrieve data stored in remote databases in order to further warrant their arguments, and stimulate them to perform acts that best reflect their interests and intentions."

Tanja Urbancic and her co-researchers presented in their paper (Urbancic, Bohanec, and Kontic, 2003), "a method for supporting collaborative decision making with groups of people having different backgrounds and varying levels of expertise. " And they explained, "A method of multi-attribute decision modeling is proposed for such situations. An experiment was carried out in which the participants were involved in collaborative decision modeling to choose a location for low and intermediate level radioactive waste disposal. The results show that due to the well-defined procedures the participants were able to produce complex decision models that were evaluated by the experts as reasonable and relevant. This opens new perspectives in the practice of environmental decision making and confirms the applicability of collaborative multi-attribute decision modeling to a wide range of demanding real-world domains. "

SYSTEM CONFIGURATION AND ITS FUNCTIONS FOR COLLABORATIVE DESIGN

Background of Design Concept for System

As results of reviewing the above preceding works and researches, we have decided to design and implement a campus-based information sharing and communicating system by reference to SNS services and its facilities. With our foregoing experiences (Imai and Imai, 2011a) (Imai and Imai, 2011b), we used to be definitely ready to utilize major commercial SNS just like Facebook, Twitter and so on as a part of our information sharing and communicating system. It is seemed that such approach would be one of the easiest, most effective and efficient approaches to build up and establish the relevant system for collaborative design.

In this case, we have some restrict conditions to build and/or use our information sharing and decision making system for collaborative design as follows;

- (1) In order to build the poster of promotion must be performed with college committee members who are usually not good at utilizing even major commercial SNS.
 - (2) The process of the above collaborative design must be sometimes closed to restrict members including committee so that it can be suitably hidden and inhibit to be accessed for other persons outside to view and/or read the inner communication and decision making.
 - (3) Organizer, namely manager of the whole system, can control and enclose the inner behavior of information
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sharing and communication system for this time collaborative design.

Because of the above discussion, we have decide to build up our system for collaborative design of college promotion poster not with major SNS but by ourselves without usage of Open famous SNS just like Facebook. That is our necessary condition to build up our information sharing and communication system.

Overview of System

System must be equipped to provide information sharing services whose objects are not only text but also binary files such as images, documents/spreadsheets, and other application working files. In such a case, a Web-based system, for example, pukiWiki and related system, will be suitable for our necessary condition. Simultaneously, The system must be equipped to perform some kind of communicating environment just like SNS for casting their votes for or against the target proposed draft. In such a case, another Web-based system, for example, small-scaled groupware and related application, will be suitable for another kind of necessary condition.

Figure 1 show an overview of our campus-based information sharing and communicating system. It is designed and implemented as an application of Web-based information server and its clients are able to access to their server by means of campus-based local area network.



Figure 1. Overview of our campus-based Information sharing and communication system for collaborative Design

System employs a very simple style of Web-based Information server and its some kinds of clients are from potable note PCs to tablet PCs and smart phones. That is a result requested from a lot of members of committee who want to use their personal communicative devices in side of college or away from college.

Functions Proposed by System

Our system can provide users with some special functions for collaborative design. These functions are categorized as following;

- (1) File viewing and exchanging: Users of the system can view the registered types of files by means of suitable application such as Text editor, PDF viewer and so on. Of course, some users want to modify a relevant file in order to show their opinion to others. In such a case, they view the relevant file and request to "exchange the file".
- (2) Casting vote for or against the proposed object: Users of the system want to assert their opinions for the proposed objects and/or targets. Vote casting is one of the most popular procedures which can determine whether they turn thumb up or down on the relevant proposal. System can provide a result of vote casting with showing "vote X% in favor and Y% opposed very clearly.
- (3) Report generation based on evaluation by Kansei Engineering: System asks some categories of questionnaire to obtain summary count. After that, it can analyze the answers from users at the proposed questionnaire, evaluate such a result by means of Kansei Engineering approach, and finally generate some kinds of reports for users to understand trends of answers for the proposed questionnaire.
- (4) Question asking for system manager: Unfortunately, our experience has shown that system sometimes does not treat with its some special user kindly or disappointedly. In such case, the relevant user wants the system manager to look a notice of that situation. So system must have a special communication channel with high priority between manager and the registered users independently.

This procedure of the above function (3) proposed by the system has been based on our other research results, which are ones of valuable applications of Kansei Engineering methodology (Imai, Imai and Hattori, 2013b).

COLLABORATIVE DESIGN PROCESS BASED ON SYSTEM FACILITY

Initiation of the System

With the information sharing and communicating system, belonging users, who have been previously registered, can post their comments and view the target objects (= files) by means of personal devices with the registered IP-address. The system manager can initiate the system and put an original idea and/or objects on the suitable portion and set the relevant attribute for the original one. The other users of the system can view the original one and sometimes put their comments and criticism for the target on the column of the system, which is prepared by the manager for the sake of communicating. Such comments and criticisms can be evaluated among all the users. In other words, viewing results have been classified and enumerated into voting calculation and then these are added into the newly feedback evaluation for the current target. And then all the users including the current manager can decide whether the target should be fixed or modified according the results from the previous evaluation by the users.

This time, our target is some kinds of suitable photos of the college building and the relevant aim is to choose the most suitable one of the building for the promotion of the college, especially for entrance examination promoting poster. The period of time to choose it and design the poster based on the choice is very much tight so that those processes for design and decision making must be complicated and tough to accomplish the final consensual understanding in a short period. We have decided to apply our information sharing and communicating system into the above tough mission.

The author, namely Masatoshi, plays a role to take several photos for candidates of poster foundation. And all the authors set up the system for committee members to receive the services to check the design process and vote each

evaluation for the candidates of the poster. The committee members are including the president of the college, executive officer, and so on. As well known, they are always very busy and have probably no or very little time to attend such a special meeting to perform poster design and obtain consensual decision. So authors must play a role to do the initiation of system, namely preparing some photos for candidates and proposal of not final version of poster foundation. Figure 2 shows the original poster foundation with simple footer and sign of campaign message on the right hand of the photo. But those are not decorated, because of receiving comments and criticism from the committee members.



Figure 2. The original poster foundation for the sake of initiation of the system

Rapid Design based on System Facility

With system facility, the registered members of the Committee can view the original figure of poster foundation at first, write many comments, questions and criticisms, and finally cast their vote for or against the target proposed draft. In this case, target draft is the original figure, which is given on the system as a candidate of poster foundation material. Committee members request the draft of poster to include more detailed information about the college because it is used for entrance promotion in the outside of college, for example, at the station. So in the next stage of the poster design, the new draft patterns are requested to provide more detailed information in the footer description. Figure 3 shows two alternative of newly modified patterns of draft poster including detailed information.



Figure 3. Footer description is requested to provide more detailed information about our college: (a) and (b)

Figure 3(a) shows a modified version of the draft poster foundation of Figure 2 with footer description. And Figure 3(b) shows an alternative pattern of poster foundation with different photo of the college building. Against Figure 3, some members of committee request to change color of right-hand message of the draft poster from Red to White, while others request to change photo image of the draft poster from Zoom-in to Zoom-out, because they point out that people who look at both of Figure 2 and Figure 3(a) cannot find the entrance gate and hole of the college so that both draft poster Figure 2 and 3(a) are not suitable for the entrance promotion of our college. Collaborative Design process should propose two types of alternatives for Figure 3(a) with the different photo of the college building shown in Figure 4.



Figure 4. Two types of alternatives for Figure 3(a) with the different photo of the college building: (a) and (b)

In order to discuss the contents of poster, one of the author, Prof. Moritoh proposes that footer of the poster had better include URL of the college so that the more newly draft of poster is modified as shown in Figure 5(a). Another opinion from one member of committee is a little unique. Its proposal is that the photo of college inside is better than one of college outside, because students who look at the relevant poster shown in Figure 5(b) can easily imagine they would be “in our college” (= be a student of our college!). Such discussions are sometimes very interesting but at the same time they are going around and around for a long time. So it is necessary to decide by vote casting among the members of committee with relevant function of our system



Figure 5(a) Footer description includes URL of college. Figure 5(b) Poster draft employs the photo of college inside.

Decision Making on the System

It is very much important for collaborative design process to perform decision making by such a reasonable way that all the constituent members can fully understand and accept the relevant situation. Functions of our information sharing and communicating system provide reasonable decision making service with weighted vote casting by means of adding suitable weight as priority order of each constituent member. Therefore, a rule that the president of the college has the first = heaviest priority of vote casting gain approval from all the constituent members. That is a very realistic approach to perform the final decision making for collaborative design of practical objects.

This time, the final poster of entrance promotion of the college is now set at the nearest station of our college. Figure 6 is a memorial photo that shows major members of committee stand by the poster at the station. It is one of the evidence that our information sharing and communicating system can play a role to support collaborative design of practical problem. And it is confirmed that the system is useful for the relevant members to view the proposed draft, exchange their comments, opinions and criticism, and finally cast their votes for the sake of decision making in a way the member can accept the situation.



Figure 6. Photo of the final poster at the station where some members of committee are standing around

CONCLUSIONS

This paper describes our Campus-based Information sharing and communicating system for collaborative design. The system provides some functions for viewing proposal, exchanging comments and criticism, and finally performing vote casting. We have applied our system into design and building of the practical problem to create the poster of entrance promotion of the college. With our system, such a time-consuming task can be accomplished in a relatively short period. It is confirmed that our system can support all the members of committee perform their decision making reasonably and acceptably.

Additionally, the paper illustrates the real collaborative design process in detail. Without our system, such collaborative design would be handled on the according environment just like SNS. But such an SNS cannot provide reasonable methodology to accomplish decision making by vote casting with weight added priority. As our future plan, we will apply our Information sharing and communicating system into several domain in practical problems on collaborative design.

From this work, we have obtained the following experience, which is very important to develop and application of some kind of Information System to provide an environment of effective information sharing and strategic decision making;

- (1) Some kind of real-time feedback mechanism is necessary to share valuable information among the closed members.
- (2) It is good enough to provide mechanical evaluation by Kansei Engineering in order to perform strategic decision making.
- (3) It is very important to equip priority-based vote casting mechanism to accomplish collaborative design in a relatively short period.

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