Implementation of Business Game Activity Support System

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Abstract Business game can be used not only as an educational tool for the development of decision making ability, but can be used for supporting the knowledge creation activity in organizations. In this paper, some conceptual considerations to meanings of the business game in the knowledge creation activity by using the knowledge creation theory and other related theories are given, and business game activity concept which refers to game play and development is proposed. Then focusing on the business game activity as an instantiation of the knowledge creation activity, and a Web based gaming activity support system based on the former system called YBG that enables us to play and develop many business games through the standard web browser is proposed. This system also provides us a lot of opportunities to play and develop the business games over business game communities.

Key words business game;  e-learning;  knowledge creation

In purposeful organizations such as enterprises and local governments, the “learning” activity is quite important and one of the essence of organizational activities. In recent years, it is required to change the organization architecture dynamically in response to the enterprise strategy and the organizational goal. There are therefore many cases when a project team for a specific task is established across the organizational functions. The understanding and sharing the purpose or details of the tasks in the early stage take on an important meaning because the dynamic organization formation brings lack of the organization culture and context, and unless it realized, knowledge creation can not be done effectively by the organization. In other words, it is very important to build up a mechanism that each member or employee can easily and rapidly “learn” the knowledge and/or the know-how owned by others or accumulated in the organizations.

Adopting e-learning or business game is a recent approach to providing the leaning opportunities and the educational environment in the organizations. In e-learning, the leaning contents are presented as a set of propositions, that is, explicit knowledge, and distributed by the local area network system. This method can both eliminate the restriction of time and place for leaning, and reduce the education cost. The latter mainly aims at the development or enhancement of decision-making ability, management ability and organization ability. Most of the business games adopted in the enterprises are computer-based rather than type of “on the job training” for the purpose of cost reduction. While the e-learning system will be able to provide us the interactive educational contents or environment with which each student participates and competes each other like a business game, it is difficult to realize in the present circumstances with respect to the e-learning system concept and design. And furthermore, there does not exist a powerful method to create a lot of effective business games\[1\]. In this paper, to resolve these difficulties, we give a conceptual consideration to meanings of the utilization the business game in the organizations in order to enhance the utility value of the business game method in many organization settings. Next we point out the e-learning feature of the computer-based business game by presenting the practical use of the business game. Then we focus the business game activity as an instantiation of the knowledge creation activity, and propose Web based gaming activity support system.
based on the former system called YBG which enables us to play and develop many business games through the standard Web browser. Finally we examine the possibility of our conceptual framework by illustrating a system design and implementation.

1 Business Game as Knowledge Creation Support

While the business game method is generally considered as an educational tool for decision making ability, since education is an activity that supports people acquires new knowledge, the business game can be thought as a method which supports knowledge creation activity.

In the epistemological discussion of knowledge creation activity, the knowledge can be classified into two categories; explicit and tacit, and the knowledge creation theory is widely known as the SECI model which argues the cycle of social interaction between explicit knowledge and tacit knowledge facilitates new knowledge creation and leads to the innovation \[^{[2]}\]. In the SECI model, four knowledge transformation modes are introduced. The letter S, E, C, and I stand for socialization, externalization, combination, and internalization respectively. Shirai states that the internalization modes in which the knowledge in explicit level changes into tacit one, is the most effective domain for the simulation and gaming (S&G) methodology \[^{[3]}\]. In Ref.[2], it is stated that the internalization mode is closely related to “learning by doing”.

In contrast with the internalization mode, instantiation of the externalization mode, that is, the transformation of the tacit knowledge into the explicit knowledge is considered more difficult. Yoshida et al argue that SSM (Soft Systems Methodology) proposed by Peter Checkland is an effective way in giving shape to the externalization mode from a view point of systems methodology\[^{[4-6]}\]. On the other hand, Uchiyama introduces a new way looking at reality proposed by a psychiatrist Bin Kimura into the discussion about similarity SSM and the knowledge creation theory. Bin Kimura \[^{[7]}\] argued there are two aspects of the real world, that is, “reality” - aspect of cognition, and “actuality” - aspect of action. Uchiyama uses a reality/actuality viewpoint for the distinction of some steps of SSM, and compares four mode of the SECI model by using the analogy between actuality/reality and tacit/explicit, and states that SSM is a model that transfers tacit knowledge into explicit knowledge.

As a tacit-explicit knowledge transformation method, Shirai proposes the participant modeling method which involves people who would take in the business under modeling\[^{[8]}\]. While SSM is a methodology for problem solving in general, he regards SSM as one of the participant modeling method with respect to the business process improvement, and proposes a modeling method using business game creation and playing iteration as more clarified step of the participant modeling.

It will be clear from above discussions that the game plying activity is an instantiation of the internalization mode transferring explicit knowledge to tacit knowledge. Furthermore the game development activity can be considered as an instantiation of the externalization mode transferring tacit knowledge into explicit knowledge. In this paper, we call all activity related to game development and game playing “business game activity” or “gaming activity” in the wide sense.

2 Practical Use of Business Games

There is a business game system which has been developed by Tsukuba University (GSSM), Japan that aimed at enabling us to play games easily and development flexibly\[^{[9-10]}\]. The GSSM business game toolkit includes a business game description language and a business game execution and development system. The original version was developed in 1997. The toolkit has been improved from 1997 to 2000, and 10–20 students of each year class developed their own business games using the toolkit. Although the students of 1996’s class who could not use the toolkit failed the developing their own games, all of the students who used the toolkit had completed their models. The GSSM toolkit has achieved a part of its goal, that is, requirement that the game developers can use Japanese
language to describe game model, and do not needed computer programming skills. But the system was highly based on the UNIX system, the other goal, such as “required the standard Web browser only” has not completed.

In 2001, the system improvement project have started at Yokohama National University (YNU), Japan. Main goal is to provide the Web interface for the game development[11]. This system is called YBG1.0. At this present, YBG1.0 server is located at YNU and used by the lectures and the ordinal/extension seminar at some universities including YNU and GSSM, and also at the Chamber of Commerce and Industry.

As mentioned above, YBG1.0 allows the students not only to execute the given business game but also to build their own business game models and generate their executable system only using the standard Web browser. If the student is in an Internet-available computer environment, s/he can develop a business game at any time and place. But the playing of business games usually takes the form of same time-same place. Generally, including YBG1.0, a business game takes the form of same time-same place, and limitations of time and place are not removed. The next generation business game systems, as e-Learning systems, should allow us to play build the various types of game without these limitations. We examine the possibility of some execution forms of the business game.

The author has experiences to conduct business game at lectures or extension seminars using YBG1.0. In this paper, we show two examples of the practical use of YBG1.0. The first case is the business game playing held at the department of information systems.

The participants of the game are 25 undergraduate students and the game is played among 10 teams (each team consists of two or three students), and all teams compete each other in the virtual market. The game scenario is “The Bakery” in which each player (team) makes decision on the production and sales of the product (bread). In this game, each team should decide the value of three decision variables, the selling price level, the number of the production for next term (round) and the number of the procurement of row materials. The goal of the game is to increase surplus. And the game aims at giving to students understanding of the importance to consider the break-even point, the delivery delay. From a questioner survey after the debriefing, 24 students of 25 answered the game was interesting. The reasons for above result are moderate difficulty by the restriction of game structure, competition with others, reality of the scenario, increasing understanding by continuous thinking, accuracy of own prediction, variation of analysis, real time response of the result, long term strategy planning and so on.

Next, we show the asynchronous-distributed case. The simple experiment using the cellular phones has been already shown in Ref.[11]. In this paper, we introduce the case at the class “group decision making” organized by the author. The game used in the class is “the newspaper seller” in which each player competes with around other 10 players in selling the newspapers. Total demand of each term changes depend on a given probabilistic distribution and demand for each player is distributed in response to their selling prices. The decision variables are the selling price level and the number of the buying newspaper (stock). Since the loss occurs when the player buys more/less papers than demand in this game, each player should make decision with consideration of the break-even point and probability. The result of each term is available for all players at next term. In this case, the number participant student was 144. Students were divided 12 game groups in which each student competes with other 11 students per group. All instruction except the explanation of the game scenario was sent by e-mail, and the round progression of all game groups were done simultaneously.

3 Business Game Activity Support System

Not only in e-learning, but also in the IT-based human activities systems, in general, the more complex the information systems, the more important the communication among IS developers, and the more necessary the management of the community. We can consider e-learning as one of the e-collaboration[11], in
which each persons work together collaboratively for a certain purpose in an IT-based (virtual) place. In the e-Learning type business game, to support the activities of the game developer is more rather important than the teaching materials themselves, the creation of materials, and the management of learning. Therefore, we need the creation of the business game community which facilitates the communication between teachers and students, among game developers, and among students, and the information system that supports the activities of the community, namely the business game community ware. This information system facilitates sharing of the knowledge among the game developers, management of the models and the execution of these games.

The present YBG1.0 was designed to provide an environment, in which each game developer can build game models, and change them into the execution systems instantly. Then the developers can open their models to the other non-developer game players and developers to hold a game with them. Through these activities, the accuracy and validity of the game models are examined so that the final models can simulate the essential structure of the reality. Based on the aim of the system, it has four user categorizations, YBG administrator, Game developers, Game players and Game controllers.

During the actual use of YBG1.0, some problems have been realized. As a preparation of business game play, we should make a participant list and assign all participant names to game player user accounts beforehand. This assignment work is always needed and burden to game facilitators or teachers. Furthermore, if the game will be played for trial and for the object, we will be required leave the trial results remain because of the needs of the analysis for the object game.

The author developed YBG2.0 which resolves these problems. YBG2.0 has a significant feature that we can change the role of the user flexibly; developer, controller and player, and we can play same business games at same time in different classes. The latter function was realized by the “game session” concept. The game session stands for whole business game activities of a certain organization or community. For instance, a business game play at a class in a seminar is a session. By using session concept, we can use “trial session” and “object session”, and also provide the students comprehensive data for analysis. The game session does not mean a certain game models or execution systems, but the all values of decision variables and other internal variables, namely a set of all values of state variables at a certain period. YBG2.0 has been developed based on the user model shown in Tab.1.

<table>
<thead>
<tr>
<th>User Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Player</td>
<td>Play games. Participate in game sessions assigned by controllers</td>
</tr>
<tr>
<td>Controller</td>
<td>Control game progression. Create game session and assign player to the session and team.</td>
</tr>
<tr>
<td>Developer</td>
<td>Develop game. Games developed by developers are used by players and controllers</td>
</tr>
<tr>
<td>Administrator</td>
<td>All account management, YBG system maintenance, registration of game templates</td>
</tr>
</tbody>
</table>

A site administrator should register the player, controller and game developer to the YBG2.0 system. To play a game developed by a game developer user, the developer should create a game session and assign game controllers to the session, and the game controller should assign game player to the session.

In YBG2.0, different login interfaces are provided based on each user categorization. Fig.1 shows the login interface for the game developer user. YBG2.0 adopts a password reminder sub module because many game players may not keep their password in mind.

Fig.2 illustrates the session management interface for the game developer user. Only game developer can manage or control his/her sessions. This figure shows that more than one game session is created from one business game (Alex).

The YBG1.0 supposes that players can be divided into general players and developer players. However from the result of actual use, we found that there are many ways of user commitment to the YBG; one might be a general player who has a game idea that s/he wants someone to realize it, and another could be a teacher who doesn’t develop the models but wants students to use them in his/her university.
To resolve above problems, the author has been developing new community ware-oriented business game platform called YBG2.1 based on YBG2.0. As mentioned above, YBG2.0 supports business game activity such as game play and control, and game development. But the user categorization model and a user assignment mechanism bring us complicated operations. Furthermore, we can not manage a new business game activity which would be needed in the future in YBG2.0. The author developed YBG2.1 to eliminate these limitations and make it more community ware oriented. In YBG2.1, all users have the attributes on the authority, and user interface is to be dynamically created by the values of attributes. A significant feature of this authority model is introduction of the authority which user with this authority can set or change other some authorities including this authority itself. This authority model is quite different from the top down user management architecture adopted by YBG2.0, but well suitable for various business game activities. The authority model of YBG2.1 is shown in Tab.2.

<table>
<thead>
<tr>
<th>Authority</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Group</td>
<td>Create group information</td>
</tr>
<tr>
<td></td>
<td>Access to edit interface</td>
</tr>
<tr>
<td>Control Members</td>
<td>Control authorities for group members</td>
</tr>
<tr>
<td>Develop Game</td>
<td>Develop games</td>
</tr>
<tr>
<td>Control Game</td>
<td>Control game sessions</td>
</tr>
<tr>
<td>Play Game</td>
<td>Participate business game</td>
</tr>
<tr>
<td>Delete a Message</td>
<td>Delete message from BBS</td>
</tr>
<tr>
<td>Post a Message</td>
<td>Post message to BBS</td>
</tr>
</tbody>
</table>

In YBG2.1, unit of game development and game play is managed by a “group”. Once a user has a user ID (e-mail address), the user can own many groups, and participate in other groups. Group can be considered as a set of business game activities whose objectives are shared among members.

Fig.1  Login I/F for game developer (YBG2.0)

Fig.2  Game session management (YBG2.0)

Fig.3  Group home (YBG2.1)

Fig.4  Use case of group owner in UML
4 Conclusion

We gave some conceptual considerations to meanings of the business game in the knowledge creation activity by using the knowledge creation theory and other related theories, and proposed business game activity concept. The business game method can be used not only as an educational tool for the development of decision-making ability, but also can be used for supporting the knowledge creation activity in organizations. Two cases of the practical use of business games are shown and these cases indicated the abilities of computer based business game method such as YBG1.0. Then we focused on the business game activity as an instantiation of the knowledge creation activity, and proposed a Web based gaming activity support system YBG2.0 and YBG2.1 based on the result of actual use of YBG1.0.

References


Brief Introduction to Author

TANABU Motonari is an associate professor of information systems at Yokohama National University, Japan. His teaching experience includes a range of courses in computer programming, MIS, systems analysis and design, systems evaluation and mathematical systems theory. His current research interests are in the areas of systems theory, decision support systems, and qualitative research in information systems. He received MS and Dr. Eng degrees from Dept of Systems Science, Tokyo Institute of Technology in 1995 and 1998 respectively.