

Analyzing Learners' Behaviors in a Business Gaming Practice

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Abstract: This paper describes the experimental analysis to evaluate business game learners' understandings. For the purpose, we have carried out intensive experiments to record and analyze what learners have understood from business gaming practice. We utilize (1) the methods of recording decisions of each round and visual screens referred during the games, (2) protocol analysis of the utterance of players, and (3) understanding degree sheet, or paper testing, to extract learners' understanding levels. The main results are that for players, player teams, and a game designer, the proposed method is applicable to business training games with computer-support.

Keywords: Business Game, Game player, Protocol analysis, Visibility, Utterance

1. Introduction

Business gaming and case studies are commonly used in training and education in both a business school and a company. In a business school, the objective is to let the students know practical knowledge. On the other hand, the purpose of corporate training is to improve the behaviors and attitudes of employees in a company [4]. Action learning, such as business gaming and case studies, is considered as an effective educational technique for the behavior improvement [10], however, it is difficult to find how to measure the educational effects. Based on our previous research [5, 6], this paper proposes a method to measure business gaming effects. For the purpose, we have observed learners' behaviors during game playing. That is, the utterance and plays of the learners' behaviors have been recorded and ethno-methodologically examined.

The organization of the paper is described as follows: Chapter 2 describes related work and the purpose of the research. Chapter 3 explains the outline of experiments. Chapter 4 describes the experimental results and discussions. Chapter 5 describes some concluding remarks and future work.

2. Related work and the purpose of the research

2.1 Evaluation studies on business gaming

Business gaming is one of the educational techniques to train skills for managerial decisions within a limited time under the virtual business environment [1]. In the research of business gaming literature, there have been a few systematic approaches: one is questionnaire analysis to the students [3], and another is integrated study of the cases and the games [7]. However these researches have not described educational effects.

2.2 Outline of protocol analysis

It is difficult to measure learners' educational effects in business gaming. It is because the learners' or players' behaviors would influence the other learners' results. In this research, the learners' behaviors during game playing are recorded, and what they have understood is examined. The records of learners' behaviors include verbal utterance expressions and game screen shots during playing a business game. We have applied the protocol analysis to investigate the learners' ideas and the validations [2].

2.3 Purpose of the research

The purpose of the research is to develop a guideline to measure learners' understanding levels for business gaming practice. Learners' levels of understanding are the approximation of game setting by both a business game designer and learners' understanding to the game [5]. So far, the evaluation of business gaming have only emphasized the gaming results. This is because the results of game playing are in accordance with learners' learning process of the game. Instead, this research investigates what level of understandings there exists by keeping and analyzing records of the process of the business gaming.

3. Outline of experiment

3.1 Experiment design

This research consists of preliminary experiments [6] and practical experiments. The preliminary experiments examine the effectiveness of the protocol analysis and the measuring method. The results are used and validated in the practical experiments. Figure1 shows Experiment design.

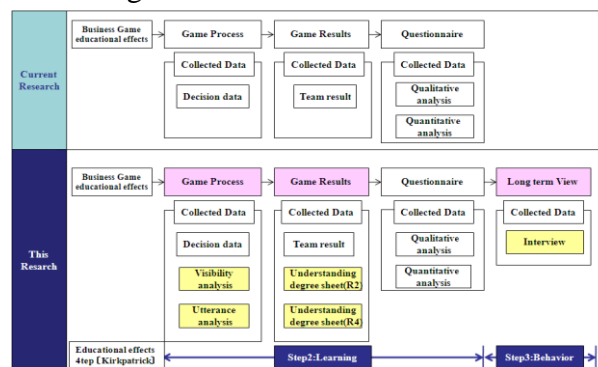


Figure 1: Experiment design

3.2 Outline of practical experiments

The purpose of practical experiments is to examine how much validity there exists during evaluating learners' levels of understanding. Seven graduate school students are subjects for the practical experiments. Two or Three students form together to create one team for a business game. Data collected contain 1) Gaming results, 2) Understanding degree sheet, 3) Protocol data of Visibility and Utterance, and 4) Questionnaire survey data. Video camera was set in each team (Figure 2). Visual screen shots and the contents of their utterance have been recorded. The business game is 3-products, and 3-markets model manufacturing industries. Players must decide 80 kinds of input items in each round. The subjects are required to process 4 rounds and to evaluate the amount of capital stocks in each round.

3.3 Understanding degree sheet

The understanding degree sheet [5] is designed to extract learners' understanding levels. This is a simple paper test carried out at the experiments

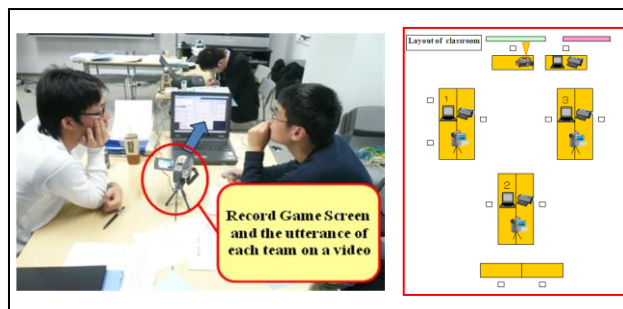


Figure 2: Experiment Snapshot

The questionnaires of the understanding degree sheet consist of the following elements: 1) Aim of the game, 2) Key elements, and 3) Optimal solutions.

It is used during the game playing and after the game. A designer of the practical experiments set ten categories: Process management, Demand forecast, Product strategy, Analysis capability, Decision-making capability, Production capability, Personnel allocation, Cash flow, Competition strategy, and Human strategy.

4. Experimental Results and Discussions

4.1 Results of practical experiments

4.1.1 Questionnaire surveys

To investigate the validity of the business game, a questionnaire survey has been conducted after the game. Surveys consist of 5 level answers: bad (1) – good (5). The number of subjects is equal to 7. The summary of the survey is as follows:

	Avg
• Could work positively with interest.	4.7
• Found lecturer's answers and explanations to the questions.	4.6
• Satisfied with the study by using business game?	4.0

From the results, we have concluded the business game used is at a appropriate level.

4.1.2 Outline of results

As the results of the game, Team 2 (resp., Team 1 and Team 3) has taken the 1st place (resp., the 2nd place, and the 3rd place). Team 1 has taken the 2nd place. Team 3 has taken the 3rd place.

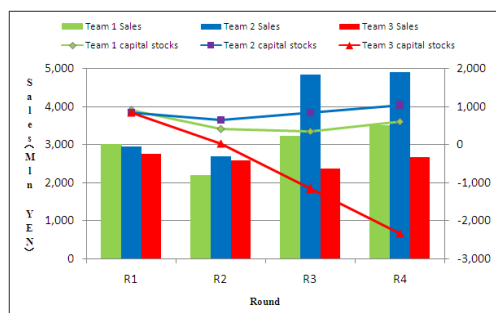


Figure 3: Result change

4.1.3 Protocol analysis

Behaviors of each team have been compared by the protocol analysis. The number of Visibility and Utterance during the game has been analyzed. Visibility consists of the six categories: Research, Results, Input (Sales), Input (Production), Input (Human Resource),

and Simulations. Utterance consists of the nine categories: Strategy, Result, Operation, Rule, Model, Input values, other companies, Revenue, and Impressions.

When counting the number of utterance during the total of Round 4, Team 1 has made the minimum utterance: 281 times, and Team 3 has made maximum utterance: 485 times. At each round, the minimum has been 50 times by Team 1 and the maximum has been 146 times by Team 3.

The analysis of each team's number of visibility and number of utterance. As Team 1 has had a fewer utterances, the degree of understanding was not deeper in spite that the so much information has been collected. Team 2 has had a lot of utterance stating "result - strategy - input" at the latter half, although at first half, they have had lesser utterance. Since Team 3 has failed to make proper decisions in the first half, in the latter half, they have shown information gathering behaviors from the other teams (Figure 4).

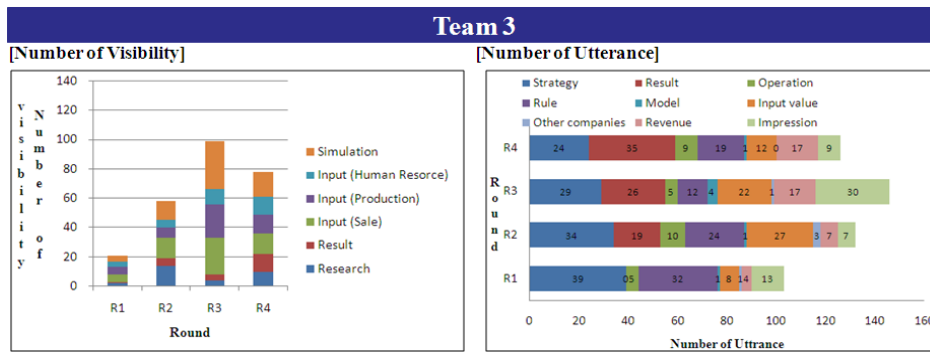


Figure 4: Number of visibility (left), Number of utterance (right)

4.1.4 Analysis of understanding degree sheet

After Round 2 and Round 4, the understanding degree sheet was deployed to the players. Team 1 shows that there is no change in understanding from the start to the end. Although Team 2 shows a lot of point of understandings, they have failed to expand the lead toward to the end. Team 3 shows lesser understandings at the beginning of the game. However there are a lot of increments in understanding to the end.

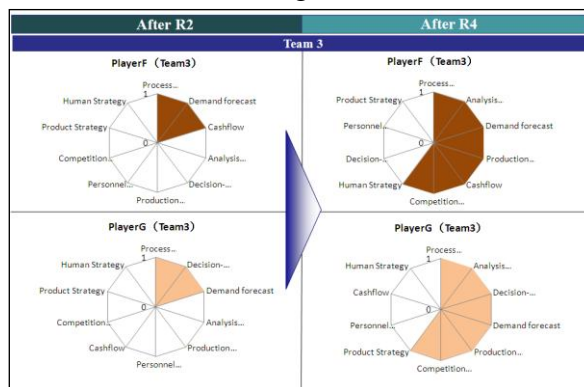


Figure 5: Understanding degree sheet

4.2 Discussions

4.2.1 Understanding of team

We have observed the understanding levels of each team:

1. Team 1 has a fewer utterance, although much information gathering has been observed;
2. Team 2 has shown a lot of understanding points observed from the start; and
3. Team 3 has shown most increasing of the understanding toward to the end, because of the decision making failures shown in the first half.

Using protocol analysis and understanding degree sheet, we are able to examine Teams' levels of understanding. They are not able to obtain through the gaming results only.

4.2.2 Understanding of players

We have observed the following players' understanding levels:

1. Among players in Team 1 and Team 2, player D has a lot of increment of the understanding Δ : (analytical capability + personnel allocation) ; and
2. Player F and player G in Team 3 have a lot of increment of understanding Δ .

Examining the level of understanding, players F and G in Team 3 have suggested:

Player F increases Δ :(analytical capability + production capability + competition strategy + human Strategy); and

Player G increases Δ : (analysis capability + production capability + competition strategy +product strategy).

This means that players F and G learn their analytical abilities of own company and other companies.

5. Conclusion and Future work

In this paper, we have presented business gaming experiments to measure game learners' understanding level. In the preliminary experiments, we have proposed the methodology to use the protocol analysis and the measuring method which utilizes the understanding degree sheet. We have confirmed that learner's understanding could be measured using the methodology. The validities of the measuring method have been reconfirmed by the practical experiments.

Our future work includes the following directions: First, we must examine the functionality of understanding degree sheets, which includes free text descriptions. Second, we must re-examine the validity of contents categories of the utterance. Third, we will explore the applicability of protocol analysis techniques to other action learning; such as case study and MANGA teaching materials [10].

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