

Utilization of free lean games in education and comparison of results in business and academic field

MARTIN JANUSKA

Department of Business Administration and Management
University of West Bohemia
Univerzitni 8, 30614, Pilsen
CZECH REPUBLIC
mjanuska@kpm.zcu.cz

JIRI KUDRNA

Department of Industrial Engineering and Management
University of West Bohemia
Univerzitni 8, 30614, Pilsen
CZECH REPUBLIC
kudrnaj@kpv.zcu.cz

Abstract: - This paper presents a comparison of achievements and benefits of the usage of management games in teaching university students and employees. The paper describes the benefits of playing managerial games and the result is demonstrated on the Frog Factory game which serves as a simulation of the production line. Frog Factory game should simulate lean strategies and principles, optimizing of the layout and benefits of staff training.

Key-Words: - Lean games, managerial games, Frog Factory, lean principles training, training games.

1 Introduction

Management simulation games are a means by which is possible to simulate any business environment. Games includes the interaction of multiple people. This makes playing management games very close to reality. Players can test their decisions in "dry runs". This practice helps to develop all types of managerial skills both soft skills and learning itself. Management games supports faster learning because players can compare their own theory and experience gained during the game [1].

As an example of the current practical usage of games can serve the usage of managerial games in the staff coaching. Also there is a big influence of teambuilding activities (games) at the formation of high-quality team or workgroup. Management games are an important active method for teaching management skills. Their main task is to develop the capacity for strategic thinking and decision making in tense situations, encourage teamwork and communication between individuals.

Management games can be referred to as business simulators, business games, interactive learning environment, management flight simulators, micro-world or serious games [1].

2 Evolution of managerial games

Most authors think that modern management games evolved from war games. Their ancient predecessors were for example chess. The basis of the war games were originally viewing of maneuvering exercises with progressive decision making of participants playing according to predetermined rules. At the beginning of the 20th century extended knowledge of war games was around the world. Over time the measures simulated by game were formulated still more in detail and in addition to military factors economic, financial and psychological factors were included. The major development of advanced simulation games began after the Second World War. Simultaneously with the development of mathematical methods in economics, development of operational research, game theory, systems theory and other new disciplines emphasizing analytical, quantitative and experimental site of simulation games.

Under these conditions managerial games were developed from the war games. Top Management Decision Simulation developed in the USA in 1957 is considered as a first managerial game.

Development of the management games starts based on the success of this game by number of institutions in USA and later in world especially universities and companies manufacturing desktop computers. Number of other management simulation games was developed. Some games with use of a computer model and some without it. Games have been applied in different fields of economy. For probably the most famous game which relates to simulation modeling is considered a Beer Game - "Production and distribution of beer." The game originated in the early sixties years at MIT. Game is designed for teams of at least four players and the theme of the game is the production and distribution of a single brand of beer. Goal of the game is to get highest profit. Popularity of this game is currently very big and it is offered by many companies and it is also part of the teaching program in many business schools.

2.1 Goals of the games

The usual goal of every game is to be the winner but even that would not be satisfying if we did not have good time during the game. The aim of management games is rather test the behavior of the players during the game. Individual players can verify the consequences of their decisions on the outcome of the game. By playing they gaining experience that otherwise would be difficult to acquire in the real conditions or their decision could have fatal consequences for running real businesses. In some cases of management games players learn to look at problems differently thanks to the understanding of the processes within the system. Players can try the systems thinking rather than reactive behavior.

Rules are the basis of management games same as in other games. More complex they are the harder playing is. The game even with complex rules can often provide lots of space to search for new novel results which enhances the attractiveness of a game experience and develops creative approach of players [1].

2.2 Advantages of utilization of managerial games

There are many advantages of management games described in literature.

- **learning by doing**

This is the method in which students are educated by their own experience. Students in regular classes receive only 10% of their capabilities at the school. The remaining 90% is by the natural ability of the

student's their socioeconomic status and other factors.

- **teamwork**

There are teammates and opponents in the managerial games as indeed in every other game. When we collaborate with teammates to win and beat the opponent we share a common goal. At this time a group of players become a team.

- **managerial decision making**

By playing management games is possible to examine the consequences of our decisions. In the event that we do not know which solution is correct is possible to seek a solution by trial and error. By playing the management games is possible to get plenty of experience by working with modeling tools. Thanks to them is possible to model the specific situation and modeling tools are an ideal decision support tools.

3 Division of games

Considering the complexity of the concept of "management game" is also possible to divide these games by many criteria.

According to Biggs [2] is possible to classify managerial games by following criteria:

- **according the subject of game focus**

One group is relatively narrowly focused on only one aspect of decision-making within the company and on the other side games dealing with the whole company including the possible interactions between different functional areas within the company.

- **according the nature of competition - competitive and noncompetitive.**

Competitive games allows interaction model to affect the results of one company by decisions of other companies. In other words firms compete with each other. In games that can be described as non-competitive, firms play "against the computer" and decisions do not affect each other.

- **according to the level of interactivity**

That means how participants communicate with the management game respectively with the model or how the data about participants decisions are transferred to the game model and vice versa. Also depends is what form is the output of management game for participants.

- **according to the generality of game focus**

This relates to the intention of the drafters either model the game as a simulation of a particular industry (eg production and development of computer processors) and therefore their efforts to

capture the specifics of the industry in the model in the game or to completely avoid this dilemma and does not specify the type of products produced by the company.

- **according to the nature of participants involvement**

Games can be divided into individual and those in which participants create teams. Each team then represents one company.

- **according to the level randomness of events in the game**

The level of randomness means the way the game goes from one state to another. If there is only result of participants decisions and the clear rules or if there is also an element of luck in the scenarios.

- **according the way of technical implementation**
- **according to the overall complexity**
- **according the way of dealing with game time**

Another division is from economic point of view [3].

- **Business games** simulates decision making on the top management level
- **Functional games** simulate functions and decision making on operational management level. For example: traffic management, material and finished goods handling, supplies, sales, human resources management,...
- **Economic games** difficult, complex and related to the economic situation, individually and collectively assessed, developing stages in dynamic contexts, often based on model procedures.
 - **the functional business game** - consider the various views on the economic situation, expressing complex character of the situation
 - **the general economic game** - similar to the functional economic game but is focused on causal relationships and simulating economic practice
 - **isolated economic games** - are the opposite of the previous modifications, the decision of one group is focused only on a particular area of the economy that are not related to other areas
 - **integration economic games** – mutual interaction of economic subjects decisions with the external environment
 - **manual economic games** - solution does not require technical resources, data and

information is processed manually using a variety of forms, reports, papers

- **computer economic games**
- **economic games based on solid mathematical methods and rules** - economic situations that are more quantitative
- **Economics games based on free models** – decision is based on actual situation which is developing during the game

4 Lean games

Following part of the paper shows the practical application of managerial games. Specifically games that deal with practicing lean approaches (Kanban, 5S, Kaizen, etc.).

Here are the reasons why games are better than the traditional way of teaching, such as using Power Point presentation. Following chapter (4.1) is taken from portal www.leansimulations.org [4]:

4.1 Seven Benefits of Teaching Lean with Simulations

Why should to use games and simulations to teach Lean material? What's wrong with Power Point? Why waste time with a simulation, when you can take your team right out to the shop floor? Learning through games has many benefits.

Seven Benefits of Teaching Lean with Simulations:

1. Simulations demonstrate Lean principles in action.

Demonstrating Lean concepts is one of the main reasons to use a simulation as a teaching tool. During a Lean workshop, the key material can be taught, and then illustrated with a simulation or game.

2. Games involve your audience!

Maintaining your audience's interest is one of the hardest things to do during training sessions. Especially when they don't want to be there!

3. Games are perfect team building activities.

Training sessions done at your workplace will typically involve people of different departments and management levels.

4. Simulations are small and flexible.

Manufacturing and business processes are large and complex. Providing real-world improvement solutions within the current business is difficult

within a two-day training session. If it was that easy, you would have done it!

Simulations are small and compact. They fit into a room. They can be performed in a quiet training room environment, rather than a noisy shop floor. They don't interrupt normal business. They are short. They are expandable.

5. Games are confidence builders.

Your audience consists of many types of people. Shy, introverted thinkers mix it up with overbearing loudmouths.

By placing people in roles they are not familiar with, you can empower them. A shop floor employee can shine while directing the divisional manager, who's struggling with the bottleneck process. When roles are switched in such a way, managers can see what it's like to be in the trenches, while others can become confident with their new responsibilities, even if their factory is just making paper airplanes.

6. Test real processes with simulations first.

Sometimes simulations are used exactly to simulate actual processes in your business.

Kanban sizing is a good example. Kanban card calculations can become pretty confusing once all the factors such as lead times and signal stagnation are considered. Simulating this with pieces of paper or on a spread sheet will make things a lot clearer and highlight potential issues before implementing into the real world.

Another example of this would be designing new work cell layouts with papers representing work equipment.

7. Give yourself a break!

A simulation allows you to break away from teacher-mode and interact with individuals one on one. You can relax, joke around, answer questions and have a breather while the teams are interacting with each other.

4.2 Frog Factory game

In order to revitalize and improve the attractiveness of teaching subject Operational Management the authors decided to use game called Frog Factory taken from portal www.leansimulations.org [5].

This game is intended to simulate the production line. A group of students is divided into several teams. Each team simulates a factory production line. Individual teams compete against each other and the goal is to achieve maximum profits. The

game forces the students to effectively divide the different manufacturing processes and make the appropriate layout. The simulation of manufacturing processes is done here by folding paper frog model. Students must divide among themselves the various tasks.

At the beginning of the game participants are divided to professional workers and inexperienced workers. Inexperienced workers can send their product to next working site every 90s. Professionals can send over the product every 30 seconds.

The **first** round of games is just about building an effective layout and production testing.

The **second** round simulates the benefits of staff training.

In the second round of game teams can use profit from the first round for training of inexperienced employees and thus shorten the time. Training can be ordered between all rounds of the game.

In the **third** round the variability of demand is simulated.

Teams have 5 colors of paper for folding frogs. Organizer of the game randomly draw one color every 2 minutes that is now preferred on the market. Delivering the preferred color earns double points. However the actual production cycle of one frog is longer than 2 minutes. So before the next round teams will have to adopt a strategy. Team can produce to stock and sell only preferred color goods or not and sell all colors for normal price.

In the **fourth** round all of the previous rules apply and there will be a random event for each team. Random events include:

- **failure of a key supplier**
- **loss of trained personnel**
- **theft of finished goods from the previous round**
- **fire in stock and loss of unfinished products from the previous round**
- **inability training in this round**
- **nothing happened**

There is no new rule in **fifth** round. This round is for the final competition and the points are doubled in this round to prove which strategy was most effective.

After each round there should be at least 5 minutes free time for discussion and optimization in team.

4.3 Benefits of the Frog Factory game

Based on the evaluation of results and feedback from trainees is possible to draw the following conclusions and recommendations:

The game certainly enriched the theoretical teaching of lean principles and was positively received by all participants.

The authors have good results with letting participants to create their own teams and then to reorganize them to force participants to work with strangers. If it is not a course where the participants are from one group (classmates, co-workers) is not essential. This was evaluated positively by participants at the end of the course because they were forced to work in the new organizational structure that enabled excel other personalities than usual.

After each round is necessary to leave time for discussion and subsequent optimization.

The tutor should not advice the participants during the course and they should work completely independently even when they chose wrong solution.

After end of the game is necessary to analyze the mistakes and successes of all teams in discussion.

The game simulates very nicely creation of inventories of unfinished products. Although theories such as JIT says that inventories are wrong and waste. This is a frequent topic of discussion and is necessary for tutor to be prepared for this discussion.

Another topic for discussion is forecast of customer requirements (in-game simulated color paper) and therefore the importance of marketing research for manufacturing enterprises.

Participants manage quite well the organization of production but many of them will not be willing to invest in training in the early rounds even though it is an effective solution. After they realize they should invest in training in first round they will still refuse to invest to training because it's late and payback period will decrease. It is appropriate to debate the decision-making traps.

5 Conclusion

Authors use Frog Factory game for teaching at University of West Bohemia but also at lean management courses for private companies. It turned out that company employees do not have the theoretical knowledge of lean principles but are willing and able to respond flexibly to the situation and try new solutions. Students on the other hand

have theoretical knowledge but often lack the more complex interconnection of such knowledge to real situations. The authors therefore recommend an emphasis on enriching the theoretical knowledge of company employees at the general superficial level. Trainees from companies are most interested in general courses which demonstrate all available lean methods. They are interested to be inspired what is used in other companies and which method can bring benefit and be implemented in their own. Than they are willing to study selected methods deeper.

Students on the other hand miss the link between theory and practice. This is not a surprising conclusion. The authors recommend greater involvement of students in teaching and recommend an emphasis on teaching the application of the theoretical knowledge. Management games are an ideal tool for students to test the application of rich theoretical knowledge obtained while studying at the University.

The use of management games as a teaching tool was positively assessed by both groups (staff training and students)

For inspiration, the authors recommend portal www.leansimulations.org where a number of games for training lean principles is available.

References:

- [1] Vožická, M., Využití systémových simulátorů. Jindřichův Hradec : Vysoká škola ekonomická v Praze, 2011. Diplomová práce.
- [2] W., Biggs., *Introduction to Computerized Business Management Simulations. Guide to Business Gaming and Experiential Learning.* 1990. ISBN: 0-89397-369-6.X1.
- [3] LOKŠOVÁ, I., LOKŠA, J., Tvořivé vyučování. Praha: 2003.
- [4] Seven benefits of teaching lean. Portal [leansimulations.org](http://www.leansimulations.org) (cited 1.2.2013) <http://www.leansimulations.org/2011/01/seven-benefits-of-teaching-lean-with.html>
- [5] List of free lean games. Portal [leansimulations.org](http://www.leansimulations.org) (cited 1.1.2012) <http://www.leansimulations.org/p/huge-list-of-free-lean-games.html>