USE OF SIMPLE LEAN GAMES IN EDUCATION

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ABSTRACT
This article describes the use of simple lean games to practice and understanding principles of industrial engineering methods. All games are based on principle of using simple tools - paper, pencil, scissors, etc. It means there is no need for complex or special equipment. Practical examples of gaming within education at the Department of Industrial Engineering And Management at University of West Bohemia in Pilsen are shown.

KEYWORDS
Games, lean, simulation

INTRODUCTION
Games are tools that can create "real environment". The use of games is very good in coaching staff. Their main task is to develop the capacity for strategic thinking and decision making in tense situations, promote teamwork and communication between individuals. Management games can be marked with different terms. For example business simulators, business games, interactive learning environmental, management flight simulators, microworld or serious games.

The aim is to test manager games behavior of players during the game. When playing, you can try system thinking instead of reactive behavior. The basis of management games are like in other games rules, the more complex they are, the harder playing is. The even with complex rules can be free space to search for new results in the game, which enhances the attractiveness and gaming experience and creative approach develops players.

DEVELOPMENT OF GAMES
Business games were born from war games. First management simulation game is considered Top Management Decision Simulation. It was developed in the U.S. in 1957, most famous game which relates to simulation modeling is considered "The production and distribution of beer", on development of simulation games and had influence on dynamic evolution of computer technology (the use of computers is not a necessary condition for a well-coordinated simulation games). [1]

LEAN GAMES
Although one cannot learn about Lean exclusively from playing games, games do allow quick experiential learning more that reading about Lean, or listening to a lecture. Games (Picture 1) allow players not only to learn about the interaction of particular Lean tools, but also develop the richness of discussion, participation, and decisions making that are essential requirements for successful Lean implementation.

Figure 1: The Kanban Pizza Game [2]
SIMPLE LEAN GAMES
Simple lean game is very good tool for interactive teaching and training. We do not need a lot of special tools and aids. We played simple lean games in our department. This game is described in Huge List of Free Lean Games. A lot of information about games are there too. Specifically, we played games Frog Factory and Kanban Pizza. You can see how we played it in pictures (Figure 2, Figure 3).

Figure 2: Playing free lean game – Frog factory

Figure 3: Playing free lean game – Frog factory II.

KANBAN BAR
Within lessons at the University of West Bohemia in Pilsen students of Faculty of Mechanical Engineering created new manager game to explain Kanban principle. Impulse for creation of a completely new game was a need for comprehensive visual teaching method usable at Faculty of Economics. The goal of game is to simulate production line
and methods used to optimize production on example even students without technical background can fully understand and imagine.

The game was tested during lessons at the Faculty of Economics. There were three two-hour games with total of 100 students involved. Based on experience gained during these pilot games basis for teaching in next term were created. The game is especially suitable for educational purposes within the University, but can be modified for use on training in enterprises. [3]

The game was developed primarily from initiative of students (master's and Ph.D. studies) on basis of previous experience with Simple Lean Games. There was a call on whether it will succeed to develop and implement own Lean Game. Of course, inspiration is taken from existing games.

Training Kanban method was chosen because of simple practice of this method. This means using the fact that it is easy to create an environment in which use Kanban cards and principles of method itself, using simple tools.

ABOUT THE GAME

The game has been named Kanban Bar Game and is intended for any number of teams with seven players. The game is controlled by the moderator, who is cooperating with needed count of supporters. Same as in number other management games players are not informed about principles of particular method – here Kanban. Purpose of the game is gradual uncovering of the method and explanation in the course of the game rounds.

Name of the game gives the hint that it simulates team workers in bar. Every Bar has assigned one player as customer. The game moderators with his assistants are investors who decided to open a bar. Investors give support to the bar workers such as material needed, supplies and know-how. Investors expect that bar workers will attract and maintain customers provide high-quality services and earn as much money as they can.

Game should be played in four rounds where each round is evaluated and teams receive points. After every round results are being evaluated and discussed. Therefore more than one team is needed to create competitive environment. Same time between rounds discussion will be set up to demonstrate principles of production. Teams are discussing impact of theirs decisions with moderator. Players and moderator are finding the best path how to eliminate wasting which happened in round (game). It is expected that moderator will explain the method to players (students) in this phase.

HOW PLAY THE GAME

First round - First round is about bar products introduction (Figure 4). Products, which are presented in the bar are being introduced to players (bar workers). The goal of first round is to divide tasks between players and master production processes. Players are tasked to make five selected drinks and deliver them to the customer.

- Pick up tools
- Goal = Learn recipes
- 5-manufactured drinks in the shortest possible time
- follow the order of ingredients

![Figure 4: Drinks](image)

Second round - Story that is being told by moderator in second round is following: investors are satisfied how teams created 5 testing drinks. All workers know the operation process which they are supposed to do and line is well
assembled. It is possible to open bar to the public. Opening party starts and investors expects the great deal of customers to come. The bar’s goal is to finish as much orders as possible in one shift. Players are not familiar with length of the shift. Moderator tracks time and make approximately 8 minutes long round.

Third round - In the third round the Kanban principle is implemented in all bars. Kanban cards, boards and trays become novelty in the bar (Figure 5). Moderator explains all the new rules and tools using illustrations.

<table>
<thead>
<tr>
<th>Table number:</th>
<th>Card number:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Card 1</td>
</tr>
<tr>
<td>3x Cuba Libre, 1x Screwdriver, 3x Paperboard</td>
<td>Time for the task: 4 min</td>
</tr>
<tr>
<td>Tray (box) 210x297</td>
<td>Customer: Quality control</td>
</tr>
</tbody>
</table>


Fourth round - The last round is just an extension of previous rounds. Teams make a brief meeting at round beginning. Every team assesses where their bottleneck in chain is and how it can be eliminated. Teams will try to figure out what could be improved while maintaining all the rules that were set out in the previous round. Each bar is trying to get the best result of all rounds and gain advantage over other teams.

After the last round the points are counted and the winning team is announced. At this moment it is up to moderator to summarize all demonstrated principles and theories demonstrated by the game and compare all phenomena with reality which occurs in actual production. Than is time for questions and for final discussion. There is also possible to include whole theoretical seminar with pictures and case studies of good practice. Summarize the types of waste which are in production and explain what methods can be used to remove wasting. To create a competitive atmosphere is good to announce some kind of reward for the most successful bar. According our experience at the university simple pack of candies will do the trick.

Figure 5: Kanban card and Kanban board

Figure 5: Examples of „Drinks“
CONCLUSION AND RECOMMENDATIONS
Simple lean games are very good tools for simple and fast teaching industrial engineering methods etc. It is good way for interactive teaching too (not only presentation but practical testing).
We use them in our department (and in other departments too) for training industrial engineering methods. Lean games we are used for practical training in real companies. Employees learn to understand the principles of production and their individual procedures in an entertaining way.

Custom game Kanban Bar was being successfully introduced at Faculty of Economics during one-day workshops. After discussion with students about how they play and how worked through understanding principle of Kanban. Another deployment will take place at Faculty of Mechanical Engineering. Within implementation of this action a survey will be also carried out.

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REFERENCES