

GAME: Lean tools implementation in knowledge work on the example of analysis of a planning processes

Daniel Safin

Restol Sp. z o.o.

**Katarzyna Antosz, Dorota Stadnicka, Ryszard Perłowski, Paweł Litwin,
Arkadiusz Rzucidło, Jarosław Sęp**

Rzeszow University of Technology

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This presentation describes a game concerning an implementation of lean tools in an analysis of a manufacturing processes planning.

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The game is developed in the frame of the international project titled : „Innovative Learning Approaches for Implementation of Lean Thinking to Enhance Office and Knowledge Work Productivity”, which is co-funded with support from the European Commission.

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Why should you play this game?

- When there is a delay in a product delivery to a client everybody usually blame production department
- People don't realize how much waste a planning process can cause
- People don't realize how much one employee's work can influence on a work of an another employee
- People are mostly thinking about own benefits without taking into consideration goals of the whole company

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The game consists of the following steps.

STEP 1 – Production planning according to the established rules.

STEP 2 – problems analysis with the use of A3 report, implementation of Hoshin Kanri to obtain improvements.

STEP 3 – playing the game according to the new rules.

STEP 4 – results assessment.

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The problems presented in the game concern a planning process and are presented on the base of a case study. The case study company manufactures kitchen fronts. They offer fronts having different profiles and different colors. The real conditions were simplified to present the problem in the enough short time. Therefore only 3 profiles and 3 colors were taken into consideration.

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The main goals are:

- Learning how to apply lean tools in knowledge work
- Identification of dependency between different work stands and steps of a process

Additional goals for a team are:

- Identification of the wastes in the planning process
- Identification of possibilities of time waste minimization
- Identification of possibilities of cost minimization
- Identification of possibilities of profit maximization

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In the game 4 people are working on four work stands. Each of person plays own role.

The information flow concerning the planning process is presented on the slide. Each process takes one day therefore it is possible to realize a client's order in three days. However the planning process has a great influence on the clients' orders realization on time, what will be noticeable in the game.

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The clients' orders come to the 1st work stand. The order contains such information as a day of the order receiving, the client, size of the format, profile of the format, color of the front, number of pieces and deadline.

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An employee working on the 1st work stand transfers formats representing the products which are ordered by clients to the 2nd work stand. The formats present information concerning the products which have to be realized, in particular: Day of order receiving, Client, Profile of the format, color of the front, size of the format and number of days in which the front has to be manufactured.

In the case presented on the slide the order have to be completed in 4 days. One day is dedicated for cutting process. One day is dedicated for milling process. One day is dedicated for laminating process. This order came the first day from a client C-1, who ordered profile „A” in color „P”.

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On the base of the received information (formats) an employee working on the 2nd work stand optimizes the cutting process.

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The capacity of the cutting machine is 600 cm² (A4 piece of paper). The employee has to plan what and how will be cut. The fronts will be cut from one wooden board. The employee has to take into consideration the capacity of the cutting machine as well as the priorities of orders realization.

The bonus of the employee depends on how much material waste will be produced in the cutting process.

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In case if a product can't be realized in a certain day because of lack of the capacity the format has to wait for the next day. This information has to be registered on the format by putting blue „C” for each day of delay in this process. The rest of formats the employee transfers to the 3rd work stand.

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Additionally, material used for products realization as well as material waste are registered of the form presented on the slide. Then the cost of material waste is calculated.

How to do it? Look at the picture on the right side of the slide. 7 formats have been placed on a sheet of paper representing a wooden board. Summarize areas of all formats, that is $70+70+70+70+90+90+50$, what gives 510 cm². Because one piece of a wooden board has 600 cm² the waste will be 90 cm². Then fulfill the form like it is presented on the left.

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On the 3rd work stand an employee optimizes the milling process.

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In the process two milling machines are used. A capacity of each machine is 300 cm². Total capacity of the milling process is 600 cm².

On each of the machine different kinds of profiles can be realized. The employee has to plan what will be processed on which milling machine.

The bonus of the employee depends on whether all products will be completed.

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In case if an format can't be realized in a certain day because of lack of capacity it has to wait for the next day. This information has to be registered on the format by putting red „M” for each day of delay in this process. The rest of formats the employee transfers to the 4th work stand.

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The employee can also decide to work in overtime if it is necessary. The work in overtime (the additional shift) is connected with additional costs. In normal shift 1 cm² costs 2 Euro. In overtime 1 cm² costs 4 Euro.

The employee has to assess the real load of machines and registered this information on the form presented on the slide for each day. On the presented example you can see that the first machine is loaded with 290 cm² what means that it will work on one shift only. Therefore the cost will be 580 Euro. On the second machine we have 430 cm², what means that the machine will have to work in the second shift. Therefore the costs will be 600 Euro per the first shift, that is 300 cm² multiply by 2 Euro. And 520 Euro per the second shift, that is 130 cm² multiply by 4 Euro. This information should be written on the form.

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On the 4th work stand an employee optimizes the laminating process.

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The capacity of the laminating process is 2 laminate sheets per a day. One sheet equals 300 cm² (1/2 A4). Total capacity of the laminating process is 600 cm².

The employee has to plan what will be laminated taking into consideration the color of the laminate.

3 colors of laminates are used: green (G), pink (P) and yellow (Y). The employee has to decide which colors will be realized in a day. Additionally the employee has to take into consideration deadline of the orders realization.

The bonus of the employee depends on how much materials waste will be produced in the laminating process.

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In case if an format can't be realized in a certain day because of lack of capacity it has to wait for the next day. This information has to be registered on the format by putting green „L”, which means delay in this process. In the presented example we can see one blue „C”, one red „M” and one green „L”, what means that this format had to wait in each process for one day. Totally it was three days. This caused two days of delay in a client's order realization.

The information about realized formats has to be transferred to the 1st work stand.

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Additionally each day the material waste is registered on the form. In the case presented on the slide we used 380 cm². Because we used two sheets per 300 cm², the waste equals 220 cm², what costs 660 Euro.

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On the work stand 1 an employee is responsible for sending realized products to clients. On the example presented on the slide a Client C-2 ordered four products. The products should be delivered within 5 days. However as we can see it was impossible because one product (90) stayed in process one day longer.

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Therefore we fulfill the form concerning orders completions and shipment as you can see on the slide. We put 1 day of delay for Client 2, that is, C-2, what will cost 500 Euro.

Additionally three products for this client stayed in cutting process one day longer (C), so we put 3 in the form. One product stayed one day longer in milling process (M), so we put 1, and two products stayed two days longer in laminating process (L) so we put 4 in the form. Because cost of work in process is 50 Euro per a piece per a day we can calculate cost of work in process for all parts stayed in process longer and then we calculate total cost connected with cost of delay and cost of work in process. That is 1000 Euro.

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Let's play.

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After 5 days of work each work stand assess the costs.

The game participants have to make an adequate analysis to answer the questions:

- Why the costs of the processes were so high?
- Why the clients didn't received the products on time?
- What can be done to improve the planning process?

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The game participants chose adequate lean tools to make a necessary analysis an implement chosen lean tools to improve the process.

It is recommended to implement **A3 report** for making the analysis and **Hoshin Kanri** for improvement.

The winner is this team which will be able to achieve the best improvement. The improvement are assessed on the base of costs.

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To analyze the problems the team will use A3 report.

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The teams will have delivered an empty form printed of A3 sheet of paper.

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The improvements proposed by a team should be implemented and the game should be played again with the new rules.

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The improvements should be assessed and write down on the results table. The winner is a team which achieved the lowest costs.

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The game participant after the game should realize that:

- Individual interest of an employee should be related to the business interest of the company (Hoshin Kanri)
- Individual costs calculation for a single point in the system without taking into account next steps in the process can increase total costs (Lean Accounting)
- Lack of the communication and feedback between people who realize the planning process can increase costs of the manufacturing process (Communication problems)
- Wrong planning rules can increase manufacturing costs (Planning rules)

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Thank you for your attention.