

LEARNING SIMULATION GAME FOR TAKT PLANNING AND TAKT CONTROL

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1 BACKGROUND

The methods of Takt Planning and Takt Control are applied in many companies. The difficulty often lies in teaching abstract concepts to participants in a way that is clear and that reflects reality. The knowledge learned in simulation games can be used to actively test the theory in a simplified form. Some games and trainings in the field of Takt Planning and Takt Control have been developed. According to research there has been little scholarly documentation or analysis of trainings of this nature. It is not trivial to incorporate Lean Construction principles and approaches in trainings in an understanding way (Hirota and Formoso 1998). A training concept was developed and is based on a real project in the industrial sector.

2 GOAL OF THE TRAINING

The primary goals of the training are providing a foundation in the methods of Takt Planning and Takt Control and an application based on the 'Three Level Model' (Dlouhy et al. 2016). The secondary goal is to develop an understanding of Lean principles. The Lean values should be known and participants should have a basic feeling for value creation and waste. A simulation game plays an important role and can be beneficial to implementing these Lean principles (Heyl 2015, Choomlucksana 2013). Also taught are factors such as team building, commitment, value to the client, communication and collaboration. The simulation game helps to reduce scepticism regarding transferability of Lean principles to construction projects.

3 DEVELOPMENT OF THE SIMULATION GAME

The development of the simulation game was oriented toward the five levels of reality according to Kriz (2003). The basis of the real world was an industrial project executed using lean Construction principles, which is described in a paper by Dlouhy et al. (2016). To support the carrying out of the simulation game an instructional presentation, guidelines for all participants and an Excel workbook were developed.

4 CARRYING OUT OF THE SIMULATION GAME

The training concept is designed as a day seminar of a group of 12-20 participants. The training includes three game rounds (light blue boxes in the following picture), with a duration of 15 minutes. Lean principles are taught through two theoretical parts.

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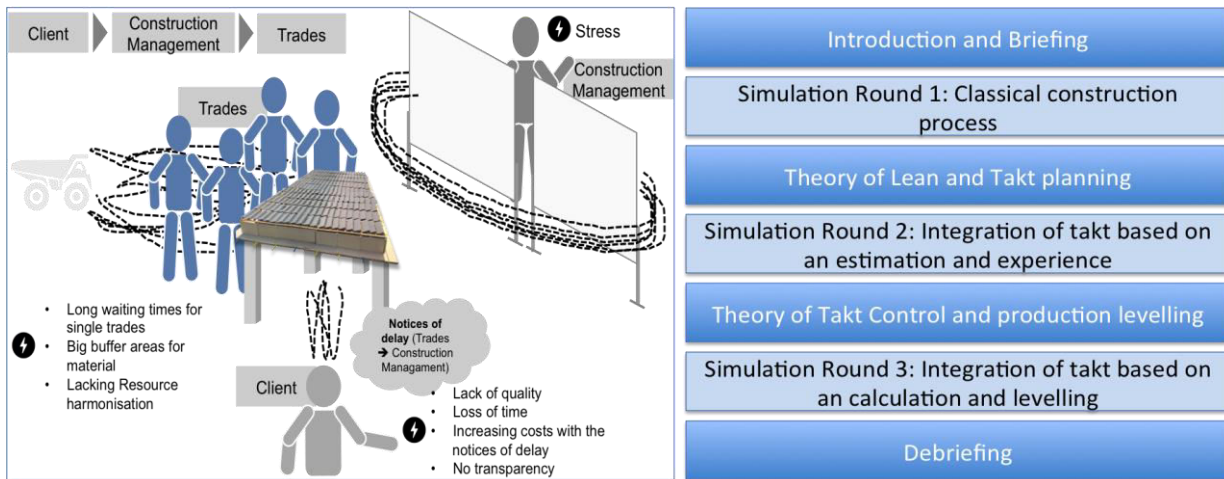


Figure 1: Roles, Structure and effects of the training

5 EMPIRICAL AND QUALITATIVE ASSESSMENT

More than 100 participants over 15 trainings were surveyed for feedback. Due to a questionnaire in which the importance of time, cost and quality was compared, the focus of the game should be on time planning. The evaluation of soft factors supports the use of Takt Planning and Takt Control. Takt Planning enables a high level of transparency. The Takt Plan allows possible alternative processes to be quickly visible, which allow the Takt Control a high degree of process flexibility. Between the three rounds, there is a clear improvement in time planning. Through an analytic and mathematical approach of the third round, the size of Takt areas and Takt time were reduced by two thirds. There was a clearly measurable trend toward a reduction in time. In the debriefings after each round, soft Lean factors such as trust, stability, transparency and collaboration were recognised.

Table 1: Average key performance indicators (KPI) during the three simulation game rounds

KPI	1 st round	2 nd round	3 rd round
Deviation notices	30	10	0
Accidents	4	1	0
Level of completion	4-20%	80-100%	100%
Completion time	>15 min.	15 min.	12:00 min
Fulfilment of the clients value	0%	50%	100%

6 CONCLUSIONS

The training and simulation game are a fixed part of a large business organisation and has been implemented as part of teaching at the Karlsruhe Institute of Technology. Preliminary enquiries have been made by further interested companies. Presently the training is focused on a small sub-process-construction of the shell for a production facility. Based on participants surveys, a continuation of the simulation game to include fit-out and installation works is being developed.