Swedish Production Symposium

2007, Göteborg
2008, Stockholm
2009, Göteborg
2011, Lund
2012, Linköping
2014, Göteborg
2016, Lund

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1. Introduction

Simulation for training lean manufacturing ranges from simple paper-based or LEGO®-based games to larger scale simulation environments, for instance push car assembly. This may be suitable for educating students, but often less so for training industry workers. The latter group is more diverse and is more used to intuitive learning than to formal instruction. Thus, it is important that a training environment for this group more realistically represents the work environment; otherwise training transfer will be limited. For this reason, a lean training environment that includes materials processing stations as well as assembly areas was created. The stations exhibit some realistic behaviour such as stochastic breakdowns.

2. The Karlstad Lean Factory

The single unit and batch processing stations are all equipped with stack lights. Processing times, breakdown intervals, and repair times can be set by the instructor. In this way, not only can a variety of production environments be emulated, it also allows for adjusting the level of difficulty to the participants’ proficiency. Figure 1 shows some workstations during a simulation session.

3. Future Research

An initial comparison between relatively homogeneous groups such as university students or military personnel and often more heterogeneous groups such as industrial employees has resulted in five hypotheses to be studied in future research. These are:

1. For heterogeneous groups (which factory workers often are), training transfer may vary significantly, even within one group of participants.
2. In the low- to medium simulator fidelity range, factory workers need more similarity between the work environment and the training environment to get the same amount of training transfer.
3. Factory workers require a higher degree of similarity (fidelity) for training transfer to take place at all.
4. For simulation environments with a high degree of similarity to the work environment, factory workers have concrete work experience that they can relate to, and training transfer surpasses that for university students.
5. For novices in manufacturing, high fidelity simulators are not very suitable. Participants need to handle/understand the various parts of the functionality before they can understand a complex system as a whole.

Fig. 1: Workstations during a simulation.