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Guideline-based video analysis of competencies for a target-oriented continuous improvement process

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Abstract

This paper presents a guideline to distinguish and analyze competencies for a target-oriented continuous improvement (CI) process. Participants from industry are filmed while solving a CI-related problem in the learning factory situated in Darmstadt. In order to analyze and translate the filmed actions into competencies a video analysis guideline is developed which consists of a generic CI-related action register and a competency indicators catalogue. The register helps to identify CI-relevant participants' actions whereas the catalogue is the basis for translating actions into competencies. The guideline itself is part of the design-based research approach taken in the project.

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Keywords: continuous improvement (CI); target-oriented improvements; design based research (DBR); video analysis; guideline; competency; learning factory

1. Introduction

Methods of lean production proved to be very successful in coping with current challenges in industrial production like short production lifecycles and increasing quality demands of customers [1]. Among other principles, especially the continuous improvement (CI) process needs the involvement of not only single experts but the whole workforce including direct and indirect leaders. That is especially true in a target-oriented CI on which the paper focuses. By definition the direct leaders and the actual process improvers have to work jointly on a daily basis to ensure that improvements meet the targets of a department, a factory or the whole company. To ensure that this collaboration takes place, most companies specify necessary qualifications on the different hierarchy levels which are tracked against the existing qualifications of their workforce [2]. However, a mere focus on employees' competencies instead of qualifications would be more aspiring. That confronts companies with the following two questions which are therefore addressed by the guideline presented in the paper:

- Which competencies are necessary for CI at different hierarchy levels?
- How can these competencies be developed by training employees?

Answers to the first question have been partly given in the form of a "lean leadership" [3] before. However, for target-oriented CI the necessary competencies to develop training in a systematic way are still unknown. Due to their convertibility and possibility to restore a defined initial state, learning factories are the ideal environment for the identification of competencies by observing participants' actions. The realistic production environment makes learning factories also suitable for action-oriented training of industrial participants for which "intended competencies" [4] are necessary [5].

Competency is in general a human disposition for autonomous acting. Chomsky [6] used that terminus following White [7] for his linguistic theory when he defined that competency is the requirement for performance. Rhein [8] observed that it is not possible to find out which dispositions cause a specific acting and vice versa which specific acting can be related to dispositions. Therefore it is

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clear that intended competencies cannot be directly and without contradiction derived from a participant's acting itself and then translated into a training module.

2. A design-based research approach for identifying competencies

To solve the dilemma described above, a design-based research (DBR) approach is used [9]. DBR is a methodology for the systematical development, testing and evaluation of learning strategies [10]. It focuses not on the application of learning theories and interventions, but is primarily orientated to the creation and optimization of new learning-frameworks. For the didactical optimization of learning factories DBR guarantees a twofold productive process of cyclic and progressive development and exploration. The DBR approach gives the opportunity to observe a participant's actions while taking part in CI training. The performances can then be translated into a new training module which will be again the basis for training and observation of participants. The process is executed in several consecutive loops which can be obtained from the following figure 1.

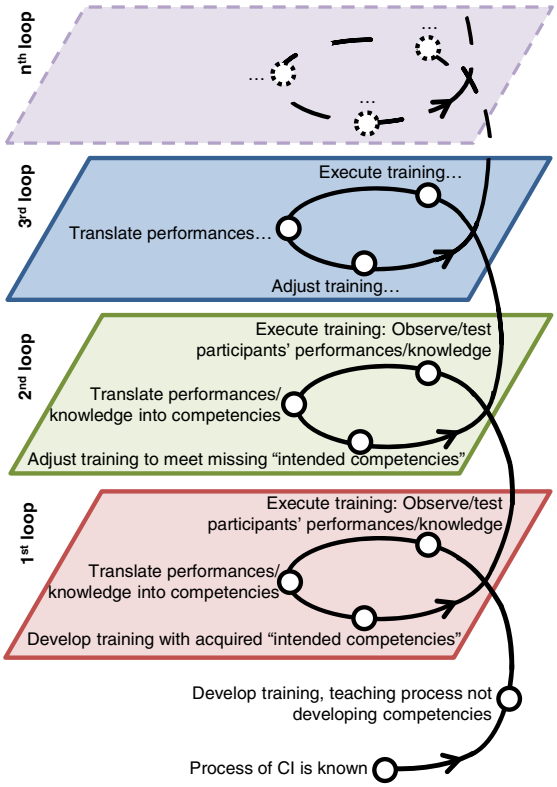

Fig. 1. DBR approach used to develop an action-oriented training for CI.

3. Theoretical principles of the target-oriented continuous improvement process

Improving and renewing existing processes are an underlying principle of every lean production system [5]. Within industrial production a number of improvement methods and underlying philosophies are possible. On the one hand there are methods like business (process) reengineering and innovation management which ensure that improvement takes place on an erratic, project basis [11,12]. Within this approach improvement workshops are used usually. The improvements, which are covered by key performance indicators (KPI) to count quantities and quality of products, are quite large. However there is a constant danger that achieved improvement is decreasing over the time.

That is why a second, additional approach of improvement is addressed: Kaizen or continuous improvement is performed continuously and takes place on an incremental basis. Target states (sometimes called future states), which consist of both measurable and qualitative aspects, provide the necessary focus for the improvement activities [11]. However, improvement does not stop after reaching a target state. A reached target state is just the new basis for another target state which again must be achieved.

CI activities can also be distinguished in reactive and proactive which take place in parallel. Reactive CI is what Liker [1] calls "Maintenance Kaizen" because it ensures stability within a production process. The target state then consists of the actual working standard like standard operating procedures that have to be restored. Still, there is no real improvement towards a company vision statement, making improvement short sighted and taking place only based on events. A proactive CI approach can circumvent that. At the beginning of such a proactive CI the target state is not clearly described but leaves some aspects open which are specified while the improvement process is executed. It is also possible and required to question existing standards in order to move them to a higher level. Therefore, improvement takes place more on a long term basis and can be started anytime if sufficient personnel and a developed target state are available [5].

In general, CI can be performed with the help of specialists who are usually obligated to execute improvements. However by that, knowledge and especially problem-solving skills are not distributed among a company and become therefore a unique characteristic of special departments. This inhibits company-wide problem-based learning.

In order to prevent that situation, the presented target-oriented improvement process addresses specific roles which are filled by managers and shop-floor operators and are explained in the following. Beyond, the approach can be transferred anytime to e.g. the service industry and indirect departments. It is also important to note that hierarchies and the number of hierarchy levels differ between companies. Employee participation is not voluntary as in suggestion programs because only mandatory employee-CI-involvement can actually cut costs and increase productivity [13].

3.1. General management

CI is started top-down by the creation of a vision statement which has to conform to the principles of lean manufacturing. This process is initiated by top-management like the general manager. Derived from that, an overall process target, which