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Approach for personnel development planning based on the technology calendar concept

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Abstract

In the majority of manufacturing systems, human resources are the most expensive but also the most flexible factor. Therefore, the optimal utilization of human resources is an important success factor contributing to long-term competitiveness. In order to meet future requirements, which arise from continuous changes to products and technologies, production enterprises are forced to constantly adapt their human resources with respect to the number and abilities of employed persons. In order to accomplish this, it is necessary to define time frames, which allow for at least a rough planning of the needed number and abilities of a workforce. These time frames are determined by the dates when product or technology changes are expected.

This already known technology calendar concept has now been enhanced by time frames for personnel development measures. Which worker is suitable for further education and how the respective abilities should be achieved is a subject matter related to the determination of qualitative personnel requirements, whereas the number of needed persons is a quantitative issue. If the required qualifications are to be available at the right point in time, it is indispensable that the necessary qualification measures are defined and scheduled appropriately. The concept, which has been developed here, describes the qualification measures, sorted into target groups, content, qualification costs and time. As a means to meet the personnel requirements arising from continuous changes to products and technologies, the enhanced technology calendar concept will be illustrated by using an application example.

Keywords: Personnel development planning; Personnel-oriented simulation; Technology calendar

1. Introduction

1.1. Problem description

In manufacturing systems, various aspects must be taken into account in order to adapt the number and abilities of a workforce to a continuous process of change. The main influencing factors for personnel development are a changed manufacturing programme, the implementation of new products as well as new manufacturing technologies.

However, in the industrial practice, personnel development very often occurs in a reactive way. This means that already existing qualification deficiencies are the trigger for development measures. Consequently, the elimination of personnel

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bottlenecks occurs reactively, after the adoption of product and technology changes, usually with single, improvized measures. The insufficient integration of personnel in the change process can be regarded as the chief cause for failures during the implementation of product developments and new manufacturing technologies.

The approach presented in this paper provides support for the personnel development planning in order to eliminate the mentioned deficiencies of a reactive personnel development. The aim is to avoid the delayed allocation of required abilities and to initiate a personnel development planning which is coordinated with the product and technology changes. In contrast to the usual single stage reorganization of the workforce, the presented approach creates a basis which supports personnel development planning for several development stages of a manufacturing system.

For this purpose, it is necessary to define points in time at which certain personnel development measures must be completed in order for the required workforce number and abilities to be available in sufficient time. Considering several points in time for development, it becomes necessary to analyse the development potential of the number and abilities of a workforce for the entire planning horizon.

1.2. Systematic approaches for personnel development planning

Systematic approaches for personnel development planning are scarcely found in the literature. Usually, only short-term staffing problems are regarded and solved by using spreadsheet approaches (cf. e.g. Krajewski and Ritzman, 1999, p. 609). Furthermore, qualification requirements are usually not focused in detail.

Accordingly in practice, mostly static methods are used to identify the demand for personnel development. However, these methods cannot consider all aspects which are necessary for a realistic prediction of the forthcoming requirements. In particular, the dynamics of work processes within a manufacturing system and the resultant possible personnel bottlenecks are not considered with static methods. Because of these deficits, approaches which reproduce the complex dynamic co-action of the technological requirements of a manufacturing system and the number and abilities of a workforce are more suitable to solve the planning problems.

1.3. Personnel-oriented simulation of manufacturing systems

In a static approach, the question which worker is able to fulfil which requirement is in the foreground. In addition to this, the dynamic approach addresses the more critical question as to which worker is available at the right time for a specific requirement appearing in the manufacturing system.

In any planning stage, the personnel requirements are defined by the number of the needed workers and their individual qualifications. The qualification of a worker is hereby defined by the functions the worker is able to fulfil and the machines and workplaces he is assigned to (see, for this concept, e.g. Zülch and Vollstedt, 2000, p. 188). A function is hereafter defined as a set of similar activities (e.g. machine setting-up, workpiece clamping, material checking). In the following, only operative functions on the shop floor level are regarded. For defining the number of persons, the time-related capacity requirements and therefore also the time per work operation of every manufacturing order is needed.

In order to exploit the flexibility of human resources and to consider the plurality of possibilities for personnel development, effective planning tools are needed to solve such planning problems in a quick and flexible manner (cf. e.g. Zülch et al., 2004). With the goal of solving these problems adequately, the ifab-Institute of Human and Industrial Engineering at the University of Karlsruhe has developed the personnel-oriented simulation tool ESPE (Heitz, 1994). ESPE stands for ''Bottleneck-oriented Simulation of Personnel Structures''. In the following, an enhanced version of this tool will be used for personnel development planning over several stages of manufacturing changes.

2. Modelling of change processes in a manufacturing system

For the personnel development planning, the envisaged changes to the number and kinds of products as well as the introduction of new manufacturing technologies are externally influencing factors. The existing number and abilities of a workforce has to be adapted to these factors. The modelling of these change processes in the personnel-oriented simulation tool ESPE will be demonstrated in the following chapters.