Initial training for the digitalised work

Example: skilled workers supporting production in the automobile industry

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The digitalisation of work in the high-tech areas of the automobile industry and of the automobile supplier sector is a good example of the change in task and requirements profiles for skilled workers in engineering and plant construction. Within the scope of a pilot project, BIBB joined forces with the Volkswagen Academy to undertake a sample investigation of work tasks and activity profiles in the areas of operation, maintenance and repair of production systems. These were compared with existing training occupations and current training practice. After a brief description of the approach adopted, the article states the results which emerged and draws conclusions for possible changes in the structuring of training within the framework of existing occupations. It concludes by illustrating how these changes are presently being implemented on a step-by-step basis.

The VW-BIBB pilot project

The aim of the cooperation between VW and BIBB was to investigate existing training and matchability of the corresponding training occupations and regulatory instruments in order to derive recommendations for regulatory work and the structuring of training.

Participatory observations of training and attendant work processes were carried out at five automobile locations, and interviews were conducted with training managers, production and maintenance managers and skilled workers. Group discussions and workshops were also used to generate results and for the purpose of validation. Finally, the results were summarised and documented (cf. ZINKE et al. 2017).

An activity profile for an operational maintainer was described before the first interview began, and this was used as a reference framework and defined in more precise terms during the course of the investigation (cf. Information Box, p. 16). This enabled the following to be defined.

- Which changes are required in typical access occupations
- Which shifts arise for the necessary competences
- Which conclusions can be drawn with regard to the structuring of training.

Information technology determines the tasks of the skilled workers

Work processes for maintenance are determined by information technology applications. In the maintenance of automated systems, IT applications play a major role via sensor technology, networking, data capture and evaluation IT-aided documentation, process monitoring and process control. The rules of maintenance are shifting from a cyclical to a continuous procedure. This can increase the useful life of plants, plant parts and components, and reduce the frequency of malfunctions. Skilled workers responsible for maintenance also take on tasks to secure ongoing plant operation at the same time. In order to ensure the maximum possible running time of plants per shift, day and week, the preference is to exchange plant parts, components and elements for the purpose of repair or the remedying of malfunctions and to replace these with structurally identical units. Repair and maintenance then take place outside the plant and do not necessarily need to be performed by the skilled workers on site.

The employability skills of the operational maintainer have their foundation in competences such as comprehensive IT-based system understanding, the handling of systematic error diagnoses, problem solving strategies and anticipatory action.

IT-assisted trouble shooting and error diagnosis are central stages of action within the setting of the work tasks of

Task profile for skilled workers in operational maintenance and process support

- Analyse, diagnose, monitor, extend, amend and parameterise production networks.
- Carry out IT-assisted error diagnoses on systems and sub-systems within complex automation plants, identify, allocate and check functions and components.
- Maintain, repair, extend, test and commission production plants (and control systems).
- Check interfaces and components.
- Model and sketch out network structures.
- Capture and administer operational data.
- Develop visualisation systems and guides.
- Exchange, wire up and integrate electronic components (sensors/actuators/drive systems).
- Exchange and expand IT hardware and integrate into systems.
- Apply digital control technologies.
- Use technical information systems.
- Use (amend/administer), structure and manage IT-assisted documentation systems, archive data.
- Install and dismantle mechanical sub-assemblies.
- Coordinate with third parties, induct and instruct auxiliary workers.

operational maintainers. Social and personal competences are a necessary prerequisite for professional action and are continuing to gain in significance in terms of performing these tasks. Self-direction, autonomy, the ability to work as part of a team, and communication skills are all in demand.

The need for change to regulatory instruments

In terms of individual contents, a comparison of these requirements with the existing regulatory instruments for the training occupations of mechatronics fitter and electronics technician for automation technology showed only partial matchability in each case. Although their accentuations differ, neither occupation is as yet sufficiently suitable to correspond to the task profile. The comparison also reveals that scope of content and necessary competences for information and communication technologies are not adequately reflected in the regulatory instruments. For mechatronics fitters, for example, network and bus system technology do not form an object of training within the general training plan (company) until the third year and are not even included in the skeleton curricula used by the vocational school. In terms of implementation at the learning venues, this topic is only accorded subsidiary significance in many places. Additional compaction of the structuring of training is discernible as a result of the shortening of the training period in company contexts.

In the interviews, the representatives of the specialist departments perceive matching problems in two directions in respect of the questions of suitability of the training occupations and whether those completing such training were properly equipped for work in operational maintenance:

1. Matching problems in respect of individual professional competences within the occupational profile, which have thus far not formed a sufficient object of the general training plan (e.g. network technology, robot handling, bus systems).
2. Matching problems relating to competences which represent fundamental changes in the approach to troubleshooting and system understanding (different error diagnosis and problem solving competence, the way in which IT systems and data are handled and basing thought processes on the software).

The project team also thought that the scheduling and didactic structure of the training neglected the development of system understanding and of problem solving skills, and thus constituted a further deficit. Training commences by imparting the "basic principles" of metalworking technology and electrical engineering by means of a course of instruction, and system understanding does not form an objective until the end of the process. The general training plans thus set out an inductive teaching/learning concept that begins with the relaying of solitary areas of knowledge and skills, such as the basics of metal and electrical technology.

If we assume that certain action patterns and modi operandi are marked out as soon as training begins and that the foundations of future occupational identity are laid during the first year of training in particular, then a change to the approach adopted may achieve an optimisation of training.
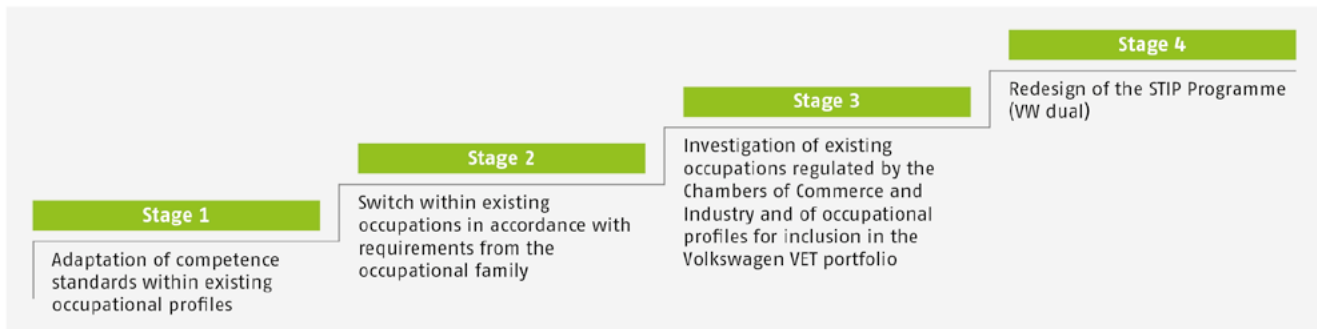
Conceptual shift in training

A crucial prerequisite for understanding systems is a holistic approach which encompasses the interplay between mechanical, electrical and information components and sub-systems. To this extent, it is necessary to adopt a different didactic procedure which takes the system as a whole as its starting point and places this at the commencement of the training. This means we require a conceptual shift from an inductive to a deductive approach.

If, for example, a mechatronic system is included as a model at the start of training and this is initially used to explore, analyse and amend functionalities and sub-assemblies, the systematic thinking that is a prerequisite for problem solving skills, trouble shooting and ultimately for overall professional action will be able to emerge. Such an approach also enables the curiosity and motivation of trainees to be fostered and strengthened in a significantly better manner than via a basic course in metalworking technology. The possibility of using IT technologies, tablets or hand-held

Figure

Control process for the updating of company training at Volkswagen

Stage 4

Redesign of the STIP Programme (VW dual)

Stage 3

Investigation of existing occupations regulated by the Chambers of Commerce and Industry and of occupational profiles for inclusion in the Volkswagen VET portfolio

Stage 2

Switch within existing occupations in accordance with requirements from the occupational family

Stage 1

Adaptation of competence standards within existing occupational profiles

Source: Volkswagen AG

devices in this process ties in with the media habits of the trainees in their own life world. The interaction of virtual and real processes and sequences is a problem which is addressed and brought alive at the very outset of training, and this creates the foundations that are actually needed for mastery of future occupational work tasks.

The relevant training regulations for the occupation of mechatronics fitter and for the group of the industrial electrical occupations entered into force in 1998 and 2003 respectively.* Updates to these are currently not anticipated. This makes it even more important for companies providing training and for vocational schools to scrutinise at the implementation level whether the way in which they are structuring training meets future operational requirements and to upgrade this structure.

Implementation activities and experiences from the point of view of the stakeholders

The joint pilot project undertaken by BIBB and the Volkswagen Academy provided additional support to change processes which were already ongoing in Volkswagen training. The project management group, which included the heads of training for the group's brands in Germany, and two cross-brand groups comprising expert trainers served as vehicles for regular networking on approaches and outcomes during the term of the project.

Measures for ongoing adaptation

Vocational education and training at Volkswagen is governed by competence standards that are stipulated by company training management on the basis of national regulatory instruments. These competence standards link the requirements contained within the general training plans

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* Training regulations for the occupation of mechatronics fitter underwent a partial updating in 2011 in respect of the examination model. In 2007, the regulatory instruments governing the industrial electrical occupations were converted from a pilot ordinance to a full ordinance.

of the respective occupations with Volkswagen-specific requirements defined by the relevant specialist departments. A control process also takes place, via which steps to refresh and update are implemented across locations (cf. Figure). This procedure initially involves identifying new technologies and resulting work tasks, which are mapped against the occupational profiles and competence standards (Stage 1). If necessary, occupational profiles are adapted and new learning contents are integrated into the relevant competence standards. The prerequisite for this is extremely good cooperation with the various specialist departments. This process has gained even greater significance within the scope of the digitalisation of the world of work. During the most recent updating procedure in the training occupation of electronics technician for automation technology for example, which took place in 2016, 34 competence standards were revised or added. This represents a change to almost 25 per cent of training contents.

Increasing networking between industrial plants means that further changes are in the pipeline in this occupation in particular. This is also associated with the objective of the specialist departments to increase the IT competences of electronics technicians for automation technology and mechatronics fitters. New concepts and technologies, such as maintenance by condition monitoring, virtual commissioning of industrial plants for the avoidance of production downtimes, camera technology for the identification and positioning of components, databases and networking technology are therefore all being introduced into VET in order to take account of the future requirements of the specialist departments.

A further measure is regular adaptation of the quantities of trainees in the respective occupations (Stage 2). One discernible trend is a significant proportional shift away from metal technology occupations (e.g. tools mechanic) towards occupations with a greater focus on IT competences, such as mechatronics fitter.

The results which have emerged from the BIBB-VW pilot project have made it clear that the integration of new con-

tents into VET in individual occupations and quantitative changes to training figures per occupation are not fully sufficient in terms of continuing to meet the challenges of digitalisation and that further steps appear to be necessary. One particular area of focus is the expansion of software competences. From the point of view of the training managers, this may lead to further changes in the portfolio of training occupations (Stage 3). The occupation of IT and telecommunications system electronics technician may, for example, represent a useful future addition to the training occupation portfolio at Volkswagen.

Within this context, the programme for dual students also needs to be investigated alongside VET (Stage 4). The so-called "VW dual Programme" is currently in the design concept phase. Its aims are to prepare dual students for future requirements in a better way and to integrate them into internal company human resources development.

Didactic reforms within the scope of the "DigitalXperience" initiative

Changes to the pedagogical and didactic approach adopted within training are also required. Training is currently undergoing extensive restructuring via the use of tablets, videos, training apps, e-books and web-based trainings (WBT).

The initiative "DigitalXperience – digitalisation of VET" has been instigated for this purpose. DigitalXperience acts as a holistic process to link the changes in VET within the group with the change process and with training for the trainers themselves. The launch of the campaign initially facilitated and fostered networking between stakeholders via the vehicle of digital media. Special user groups have set up a type of VW Facebook for VET on Volkswagen's internal "Group Connect" system. This was followed by a series of awareness and training formats aimed both at training staff and trainees.

Existing standardised teaching documentation has been digitalised and made available as WBT, video material or apps. This was backed up by the launch of a pilot project on the use of tablets in order to encourage mobile learning in VET. The resultant positive experiences show that the present generation of trainees are very accepting of these new forms of imparting training and indeed expect such an approach from a modern company training provider.

One works model, which up until now has been deployed at a single location, is currently being integrated into training at other locations. This involves using relevant learning and work remits in projects and small cross-occupational and cross-cohort groups as a basis for developing and enhancing models for process automation. Measured against the course of training, this will enable trainees' problem solving skills and system understanding to be developed earlier, in a more concentrated form and in a different methodological manner.

A competition calling upon trainees from all production locations to create either a teaching video or a video about the structuring of VET in the year 2025 from the point of view of the trainees will be hosted in the spring of 2017 in order to promote their media competence and encourage them to address a specialist topic. Involvement with the contents to be imparted enables strong consolidation of this knowledge by trainees.

The role of training staff will alter in the wake of these changes. They will open up learning pathways and assist trainees with learning processes by acting as coaches and support agents who also make learning packages available. In order to be able to drive forward the digitalisation of VET in a holistic manner, investments in VET facilities will, of course, also be required.

Using areas of company structural potential in training

Digitalisation will bring about wholesale change in VET. Within this context, the BIBB-VW project was an important building block in terms of advancing, improving and upgrading VET in the VW Group. At the same time, the project provides insights into training practice and shows how further development of VET can be achieved in the short term within the scope of the existing regulatory instruments and that initial changes can represent a response to digitalisation.

In the view of the authors, the approaches and initiatives presented are capable of being transferred to other companies providing training, including to smaller firms. Company and training managers will act as process drivers in this regard.

Trainers also need to remain on board. Continuing training for training staff is essential to the success of these initiatives. They also need to be given the opportunity and motivation to help actively in shaping the change process in VET. Greater consideration also needs to be accorded to the different learning behaviour of a "new" generation that has grown up with digital media. The trend is clearly moving away from "omniscient training staff" to "learning support". ◀

Literature

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