

Occupational competence in modern production structures

Development of competences for the production of tomorrow

► **Modern production concepts and holistic production systems form the basis for current and future production. The main focus is on consistent process orientation and the streamlining of these processes. The effects of these developments extend to exerting a direct impact on operative employees rather than merely affecting executive management and require new and changed competences. The present paper concentrates on presenting these new competences and other competences gaining in significance. It also highlights further competences of relevance due to teamwork, the characteristic feature of modern production concepts alongside process orientation. This "broad-based" development necessitates a widening of and a change in our understanding of occupational competence in overall terms. The paper concludes by outlining a profile for employability skills for skilled work within modern production concepts.**

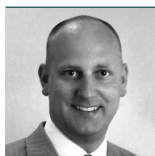
Process specific competences

The initial implication of *process orientation* is that the full execution of and responsibility for a work process is transferred to employees (cf. OESS 1991, p. 105). The abilities to obtain the required information in an autonomous manner and to plan, execute, monitor and evaluate the process constitute the basis for this. At this micro level, there is an initial correlation between process competence and the theoretical interpretative approach applied to occupational competence although this does not yet provide a vehicle for the definition of contents. The following will supply a content related description of process specific competences categorised according to knowledge, skills and competences.

(WORK) PROCESS KNOWLEDGE

Process oriented restructuring does not enable a work process to be observed in isolation from upstream and downstream processes or from the operational process as a whole. Process knowledge therefore encompasses knowledge of the interrelations and reciprocal effects of a person's own work process as well as incorporating the way in which this is embedded into the operational business process. Knowledge of the process structure also embraces structural and organisational knowledge of the function and tasks of others involved within the process. As far as process organisation is concerned, this further includes knowledge of specific phases of the operational process. The objective is to understand the influence a person's own work process exerts on the next stage of the process, which parameters of a person's own work process influence the subsequent process in terms of performance and how these can be affected and optimised (cf. KLING 2000, p. 84).

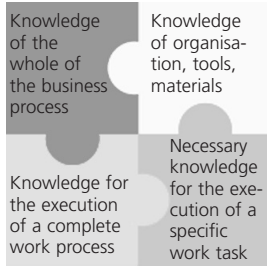
To this structural knowledge must be added knowledge of process performance. This includes the quality, customer satisfaction, time and cost dimensions of current performance. Although this does not represent knowledge in the strictest sense of the term, it is essential for the ability to address weaknesses within the process in a targeted way or to bring about improvement (cf. KLING 2000, p. 150).



THOMAS SCHEIB

Dr.-Ing. Institute for Technology and Education (ITB) at the University of Bremen

Figure
Dimensions of work process knowledge
 (Source: SCHEIB 2004, p. 221)



virtually no significance within the “regular” process, although it takes on particular importance if the work process is disturbed.

In contrast to purely specialist knowledge, work process knowledge in overall terms constitutes knowledge of the whole of the work process rather than merely knowledge for the execution of individual activities (cf. Figure). One particularly new aspect is knowledge of the interlinking of work processes, although work process knowledge is specific to the operational and work process and is generated via the linking of declaratively associated specialist knowledge and experience of work. Process orientation does not bring about any initial change in terms of content to the actual technical specialist knowledge required for the execution of the work process. Notwithstanding this, this knowledge is also undergoing expansion.

PROCESS SPECIFIC SKILLS AND COMPETENCES

Process orientation represents the alignment of work processes along the operational business process and also requires the ability to move beyond “specialist limits” in cooperating and communicating with those involved. The customer orientation exhibited by TQM in its capacity as a comprehensive quality management system encompassing all areas of an organisation sheds a particular light on this competence, requiring customer desires and expectations to be taken on board and customers to be dealt with in an appropriate manner. Although this ability has always been of significance within service sector occupations, the importance accorded to it in respect of commercial and technical skilled work within companies has until now been subordinate. This view of communication skills needs to be accorded a new place in the canon of employability skills for commercial and technical occupations within the scope of process orientation.

Process specific skills and competences continue to arise as holistic tasks are structured at the operative level. The

Knowledge of tools and materials deployed, which constitutes a partial area of work process knowledge, is also of significance for this purpose (cf. FISCHER 2000, p. 150). Increasing distance and abstraction from the production process render the acquisition of this knowledge more difficult, however. This area of work process knowledge, which includes knowledge on how to prevent, recognise and remedy malfunctions, is of

self-monitoring concept included within TQM expands the spectrum of competences required for mere execution of tasks by providing staff with monitoring competences. Extension is also taking place in the direction of strategic and materials planning competences. Workers require the ability to align orders and plan the sequences and deadlines for orders and materials requirements.

The horizontal extension of tasks occasioned by work in areas such as the procuring of equipment, maintenance and transport is leading to greater complexity of task planning and an attendant increase in planning skills required rather than merely calling for competences related to the execution of such tasks.

The objective is to achieve mastery of the complexity and reciprocal interdependence of tasks when planning work. This increase in tasks requires workers who are capable of dealing fully with the constant changes in task. Swapping tasks requires a form of functional flexibility (cf. CURTAIN 2000, p. 37). Customer orientation and the continuous improvement process mean that flexibility in the wider sense is becoming a core ability within the competence profile of staff operating in modern process oriented production structures. Flexible reactions to the changes to the product and within the working environment are required.

Process and product changes are constantly generating new demands and an attendant competence requirement. A person’s ability to resolve this for him or herself is a competence which is becoming more and more important for staff in modern process oriented production structures. The process optimisation within the scope of CIP in particular is an area where (self-directed) training and the self-learning competence this exhibits are indispensable for employees operating in task fields subject to change.

Autonomy and the ability to self-direct on the part of staff are competences on which modern production concepts depend and also constitute the foundations on which such concepts are based. There is also a close association with the competence of staff assuming responsibility for their own activities. This responsibility is extended and linked to the principle of customer orientation and does not merely relate to the work process itself. This is an area where knowledge and the willingness to undertake relevant action are especially required to go alongside occupational ability.

The attitude and willingness to use existing competences and establish new competences is a prerequisite for all process specific competences presented here and not only a precondition for the ability to assume responsibility. The CIP approach and the change this brings in its wake accord a particular increase in significance to the willingness and motivation of staff to embrace such change and to their fle-

xibility in reacting to change. Management concepts for continuous improvement are based on empowerment of employees. The competences required for this, which were of little significance in Tayloristic production processes, are an essential factor in the success of modern production concepts. Due to the importance attached to such competences, they will be presented separately under the concepts of “empowerment”.

EMPOWERMENT

Empowerment has its origins in the fact that continuous improvement processes require involvement at the operative level and that the objective of modern production concepts is to make full use of all human resources. Empowerment is the competence and willingness of staff to co-determine their own work process in a constructive manner, to contribute towards the solution of both problems associated with the work process and problems which extend beyond it and to become involved in decision-making processes (BINNER 2003, p. 22). Since constructive involvement cannot be imposed, empowerment fundamentally requires readiness to participate. This means that there is a change in the self-perception of staff. They become the producers of solutions to problems rather than any longer merely being the recipients of such solutions (cf. ARNOLD 2001, p. 2). Active involvement and the willingness to embrace change need to be viewed as the new guiding principle of occupational activity. Notwithstanding this, this change in values requires the ability for employees to monitor their own values and attitudes and make corrections (capacity for self-reflection).

Empowerment encompasses both a technical and a work organisation dimension. The aim is empowerment for structuring processes and work organisation as well as involvement in the structuring of technology. This requires imagination, creativity and methods for identifying ideas, appropriate methods and social competences in particular being in demand for the purposes of carrying out evaluations and decision making within the team. One objective is for staff to use participative and communication competences as a vehicle for involving themselves in the decision making process, a further aim being to demonstrate the ability to exercise criticism and engage in dialogue in the course of the joint decision making process. In order to implement the solution to a problem, staff require knowledge and competences to enable them to plan and organise work processes (planning competences). The evaluation of improvements which have been instigated represents a further starting point for further improvement processes and requires self-assessment competences.

Team competences

The initial understanding of *team competences* is competences which enable the communicative and cooperative working together with other people. The joint nature of the work order, the absence of any time limit and the reciprocal dependency of cooperation represent a particular form of cooperation involving (partially) autonomous working groups operating within fractal structures. Within this process, the staff constituting these groups require competences which extend beyond purely social competences. The specialist dimension of (partially) autonomous working groups is determined by the transfer of the work task. This task needs to be divided into manifest partial tasks by the working group itself, and the assignment of the task requires organisation. The autonomy of the working groups gives rise to a work organisation dimension of competences which needs to be revaluated for the operative level. In conjunction with this, identification can take place of further planning competences such as the coordination of work processes and tasks within the group, human resources deployment planning, holiday planning and the organisation of learning processes (cf. CURTAIN 2000, p. 37). The partial tasks are executed by the members of the working group in accordance with the principle of job rotation. In order to do this, they require both the ability and the readiness to adapt to the changing nature of the partial tasks on an ongoing basis and deliver a high level of performance throughout the course of the partial tasks in order to be able to ensure the quality of the overall process of the group. This requires (specialist) knowledge and (specialist) skills from every member of staff at every workplace within the group. Self-directed learning competences and the ability and willingness to pass on “knowledge” are also being accorded a higher level of significance (cf. SPÖTTL 2002, p. 36). The fact is that employees need to organise and execute necessary learning actions independently and autonomously.

As far as communication in teams is concerned, mention should also be made of the ability to exchange work related information and the ability to engage in relevant discussion, this being further underlined by the cross-functional nature of the cooperation or by the integration of cross-functional tasks (cf. HEUSER 2002, p. 330). The ability to work together in a cooperative manner firstly involves being able to coordinate work tasks and work processes in respect of one another. In the case of (partially) autonomous working groups, this also involves assuming joint responsibility for the work result. Staff ability to take responsibility for their own work result whilst focussing on the joint whole picture is a prerequisite. This means it is also necessary to assume co-responsibility for the other members of the group (cf. SPÖTTL 2002, p. 32). Group oriented types of behaviour, often summarised as “team spirit”, constitute the foundations for this.



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Social interaction and/or specialist problems in conjunction with joint responsibility are the starting point for conflicts. Mutual dependency renders it particularly important to solve these problems. For this reason, the ability to function as a team player includes the ability to engage successfully in social situations (cf. ZIEHM 2002, p. 16). The competence to address and resolve conflicts forms the basis of any form of cooperative work. Conflict management skills mean the ability to express criticism in an adequate, constructive and problem related manner, the ability to accept relevant criticism and the ability to reflect on one's own actions and make any changes to these if necessary. Values and forms of behaviour such as fairness and integrity are a prerequisite for both.

Profile of employability skills

In overall terms, the activity of employees at the shop floor level in modern production concepts encompasses the autonomous setting of goals, preparation for action (planning) and the monitoring and evaluation of the work

process rather than any longer being restricted to production elements. A shift is taking place towards the up-front phases of action (planning and materials planning). The delineations between production and planning work, and therefore the boundaries between engineers and skilled workers, are shifting or becoming blurred (cf. ZIEHM 2002, pp. 16). Accordingly, an employee within modern production systems can be described as “anyone who is able to solve work tasks in an independent and flexible way and is able and willing to become involved in planning within his or her occupational environment and within the work organisation” (BUNK 1994, p. 10). BUNK (1994 p. 10) has already designated this as “occupational competence” some time ago, thus providing a more apposite description of the ability to cooperate in modern production structures than is rendered via “employability skills” due to the fact that explicit consideration is accorded to work organisation and because planning and participative competence are emphasised. ■

Literature

- ARNOLD, R.: *Veränderungskompetenz – Wandel gestalten und Krisen überwinden*. In: *Berufsbildung*, Volume 55 (2001) Issue 72, p. 2
- Binner, H. F.: *Prozessorientierte Personalentwicklung*. In: *REFANachrichten*, Volume 2003, Issue 56, pp. 18–23
- BUNK, G.: *Kompetenzvermittlung in der beruflichen Aus- und Weiterbildung in Deutschland*. In: *Berufsbildung. Europäische Zeitschrift 1 (1994) Issue 1*, pp. 9–15
- CURTAIN, R.: *Der Betrieb der Zukunft: Auswirkungen auf die Berufsbildung*. In: *Berufsbildung. Europäische Zeitschrift 7 (2000) Issue 19*, pp. 33–43
- EIDENMÜLLER, B.: *Die Produktion als Wettbewerbsfaktor*. Cologne (TÜV Rheinland) 1995
- FISCHER, M.: *Von der Arbeitserfahrung zum Arbeitsprozesswissen. Rechnergestützte Facharbeit im Kontext beruflichen Lernens*. Opladen 2000
- HEUSER, M.: *Prozessorientierung im Supply Chain Management*. In: *Controlling 14 (2002) Issue 6*, pp. 327–335
- KLING, J.: *Geschäftsprozessorientierte Personalentwicklung*. Wiesbaden 2000
- KRUSE, W.: *Von der Notwendigkeit des Arbeitsprozess-Wissens*. In: SCHWEITZER, J. (Ed.): *Bildung für eine menschliche Zukunft*. Weinheim 1986, pp. 188–193
- OESS, A.: *Total-Quality-Management. Die ganzheitliche Qualitätsstrategie*. Wiesbaden 1993
- SCHIEB, TH.: *Indikatoren für die ganzheitliche Leistungsmessung beruflicher Handlungskompetenz in Produktionsprozessen*. Bielefeld 2005
- SCHIEB, TH.: *Work Process Knowledge*. From: ZÜLCH, G.; JAGDEV, H. S.; STOCK, P. (Eds.): *Integrating Human Aspects in Production Management*. Dordrecht 2004, pp. 217–228
- SCHWERES, M.: *Das Konzept der vollständigen Tätigkeit*. In: *FB/IE – Zeitschrift für Unternehmensentwicklung und Industrial Engineering*, Volume 46 (1997) Issue 4, pp. 166–171
- SPÖTTL, G.: *Der neue Facharbeiter – ein dienstleistungsorientierter „K-Worker“*. In: BECKER, M.; SCHWENGER, U.; SPÖTTL, G.; VOLLMER, TH. (Eds.): *Metallberufe auf dem Weg zur Neuordnung*. Bielefeld 2002, pp. 22–42
- WÜRZ, T.: *Produktionstechnik – aktueller Stand und Perspektiven*. In: BECKER, M.; SCHWENGER, U.; SPÖTTL, G.; VOLLMER, TH. (Eds.): *Metallberufe auf dem Weg zur Neuordnung*. Bielefeld 2002, pp. 75–89
- ZIEHM, S.: *Berufseignung aus betrieblicher Sicht*. In: *Berufsbildung*, Volume 56 (2002) Issue 73, pp. 16–18