

# New Technologies and Options of Work Organisation in the German Capital Goods Industry

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## RESUME

*Although the diffusion of new technologies in Germany is progressing more slowly than predicted, a very dynamic development can be observed.*

*There is definitely a trend toward more production-related computer applications such as production planning and control (PPC) or computer-aided design integrated with computer-aided manufacturing systems (CAD/CAM).*

*The question as to which impacts CIM-technologies actually have on industrial work can no longer be answered with the concept of "technological determinism", which was the historical starting point of this debate. The fact is that CIM-components do not necessarily determine the actual forms of work organisation and work design.*

*At present, no clearly predominant concept of restructuring industrial work has emerged. We can identify three different models of work on the shop floor : computer aided "Neo-Taylorism" , polarized production work and skilled and cooperative production work. While some companies are attempting to make traditional Tayloristic forms of work organization more efficient by utilizing more computer-based technologies, others are seeking ways and means of maintaining or revitalizing forms of skilled production work on the shop-floor. The latter concept of work design holds considerable potential for the future and has positive implications for the efficiency of CIM-structures.*

*More than ever the restructuring of industrial work seems a political question. The system of education and vocational training, the concepts of technology offered by the market as well as the management of innovation on the company level are important influences in determining the direction of further development.*

The traditional starting point for discussing work organization is well known. It has been technological determinism. This point of view takes for granted that the type of work organization actually realized can be explained by necessities of a technological nature. As a result the role of human resource management was to react within certain limits.

Today we know, that new technology (such as CAD, CAM, DNC and CNC-machinery) can be implemented in different organizational ways. This leads to new tasks of human resource management: Under increased competition in the marketplace innovative structures have to be considered, which are more efficient and more flexible than the tayloristic work organization of the past.

This presentation deals with the debate about technology and work organization. Specifically that new technology,

when coupled with national and international competition, is driving changes in factory lay out and job design. Human resource management has to be involved in this development more than ever.

Similar pressures of increasing competition, globally defined, are facing French firms. The question is, what their responses are. One can perhaps identify some similarities in both countries. In other instances there are of course vast differences.<sup>1</sup>

<sup>1</sup> Some of the theses and facts mentioned here are documented in an article: Behr, Marhild von; Brunstein, Ingrid: Technologies nouvelles et organisation du travail. Des leçons d'outre-Rhin? In: CESAG (Centre d'Etude des Sciences Appliquées à la Gestion; Centre for Applied and Theoretical Research in Business Administration), Cahier No. 1, Université Robert I

To show the main facts and preconditions for change in work organization concerning the metal working industry in Germany this contribution concentrates on the following subjects:

1. German manufacturing and its links to Taylorism
2. Three basic options of work organization
3. Crucial role of implementation process

First there is given a little information about the manufacturing system of the German non-automotive metal working industry. For the German economy as a whole this industry is very important because of the high export level of its products, the number of employees and the influence, it has on working conditions also in other industries.

### 1. German manufacturing and its link to Taylorism

The German metal working industry is noted for customized and small batch manufacturing of complex products and the complex flow of materials and information. Roughly 80% of parts are machined in lot sizes of one or in small batches, only 2% of the parts are mass produced.

Workers in Germany are highly skilled in part as the result of the strong apprenticeship system premised on both in-plant and classroom training. The workplace remains the preferred site of learning. Not all workers serve an apprenticeship however. The more customized a firm's production is the higher is the percentage of skilled workers in the sense of having served an apprenticeship.

The influence of Taylorism in the German metal working industry is not as highly developed as in the mass production industries. But nevertheless significant examples for tayloristic principles can be found. This includes a relatively high division of labour, the reduction of tasks in its most basic elements, the centralization of decision making, the systematic work measurement and the incentive system.

Up to the 80s there was much belief in the concept of the highly automated "unmanned" factory. Also the goals of human resource management were often oriented to this concept. But in the last years the point of view changed. It became more clear that this concept will find only very limited application within the near future.

In the last decade German firms have faced stagnating economic growth in the light of greater competition on the national and international market. This has brought into question the way how firms are organized. Particularly the division of labour between the shop floor

and the technical departments is one of the significant factors which influence competitiveness.

There is a need to reduce lead time and maintain quicker delivery of parts and products, to be more flexible, to deliver on schedule, to improve quality and to be cost competitive. Thus German firms have attempted to solve two contradictory goals: increasing both flexibility and productivity. New information technologies show promise in attaining a new level of optimization between these goals. In fact, there are numerous examples of the implementation of these new technologies. A consequence of the use of new technologies is the wide range of possibilities that arise for organizing the factory of the future.

### 2. Three basic options of work organization

Two remarkable facts inherent in this technical development are pointed out first. They explain among others, why the question of work organization on the shop floor and in the technical offices has been brought more strongly to the attention of management.

(1) On the one hand, the way in which human labour contributes to manufacturing is undergoing a change.

A low degree of automation integrates workers direct into the manufacturing process. Loading and unloading the machinery is the main operation, which links the workers to the machines.

A higher degree of automation decouples human labour from the production process both in terms of time and work functions. The remaining human contribution to the manufacturing process - such as setting and monitoring of machines, maintenance and repair etc. - can be planned and allocated with a high degree of variability. Some tasks, which are fulfilled in the office can be re-integrated and grouped together with operator functions to new specific jobs. Put in another way this development on the shopfloor also influences work organization in the offices.

(2) On the other hand the way in which information technology forms the accessibility to data is undergoing a change.

In the past there was a relatively rigid link between data generation and data access. Today the new computer technologies are driving a new transparency of the whole process. The accessibility of company information as a result becomes greatly enlarged, and grants a new degree of variability in the allocation of tasks.

These two developments allow a basic openness with regards to the allocation of work tasks to departments, workshops and individual jobs. Among the many patterns which can be observed today in Germany, we may differentiate between three basic options.

#### (1) Computer-based Neo-Taylorism

The only tasks left on the shop floor are those directly relating to the production process (such as workpiece

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Schuman, Strasbourg 1991, p. 44-75. This article deals more comprehensively with the question, what sort of relevance the development in Germany has to work organization in French firms. Here mainly the German aspects are presented, to show some results of research projects done by the ISF, which were conducted chiefly for the German Ministry for Research and Technology.

handling and setting up machines). These tasks are divided into hierarchically graded jobs. Tool presetting and quality assurance, as well as control functions, planning and monitoring are centralized and carried out in technical departments by specialized skilled workers and technicians.

### (2) Polarized production work

In this option planning and service functions are no longer centralized but integrated into the shop floor activities. Nevertheless the job requirements for machine operators do not increase. The highly skilled tasks are combined into top jobs, which are similar to those of engineers and technicians. For the machine operators there is nearly no possibility to get onto those top jobs.

### (3) Skilled and cooperative production work

This third option is characterized by a reduction of specialization and hierarchy. This sort of work organization is realized on the shop floor in the so called "production islands". It takes advantage of the existing skills and qualifications of the work force. In terms of work organization the essential basic characteristics of this concept are:

- The over-head is reduced as far as possible,
- workers form a group dealing with all tasks in a cooperative and collective manner,
- the group work is characterized by self-coordination in terms of work assignment, scheduling and technical considerations,
- the group cooperates with still remaining specialized departments.

And there are a number of additional characteristics, such as making decisions on the basis of centrally determined guidelines, or which is also very important, systematic training of all members of the group.

This new concept includes a combination of technological and organizational innovation. It represents the most advanced form of work organization that is being discussed in Germany. It is not yet widely diffused, but much talked about particularly in context of the debate on the Japanese "lean production".

Even though nearly all experts are sure that the skilled and cooperative production work is the most effective solution for small batch operation, it is till now, as noted before, not yet widely diffused. Our findings show that one of the main reasons is the way technical systems are implemented.

### 3. The crucial role of the implementation process

In our research we have identified, among others, two contrary types of implementation processes. These lead to different requirements for action on the part of human resource management:

The technology-centred implementation process and the labour-centred implementation process.

The procedures of implementation are in general dominated by technical considerations. This most popular way of implementing new technology is therefore called technology-centred. Under this process, planning is normally short-termed. Thus, the human resource management is reduced to limited functions. The works council is practically not involved. Activities are focused on achieving the most efficient use of technology while minimizing the role played by labour.

On the contrary to this procedure we have found as a result of our research the labour centred implementation process. This implementation policy is oriented towards the long term, it aims for skill-based work structures. It increases the chance for changing job structures.

Because of the tendency of Taylorism to carry over into the new environment there is a need to activate to support the change. The movement beyond Taylorism towards a concept of group work based on higher skills and cooperation can only succeed with far sighted preparation in both technical configuration and human resources. Top management and the works council plays an important role in this process.

The conclusion is:

In the case of the German metal working industry the labour-centred implementation process involves new responsibilities for the human resource management. It has to be active and preventive, rather than simply reactive, to organize the change necessary for the transition to a "lean" and competitive factory of the future.

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