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**The Changing Contours of
Work in the Car Industry**

Ulrich Jürgens

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PREFACE

The contours of work in the car industry are changing, there is no doubt about it. The direction of these changes are unclear though. In the following the change process will be described and some tentative answers as to its direction will be given.

Chapter 1 summarizes findings from a research project done by the author together with K. Dohse and T. Malsch in the context of MIT's first program on "The Future of the Automobile". This was an internationally comparative research on the changes in major world auto companies and their assembly plants in the United States, U.K. and West Germany.

The second chapter deals with the influence of national specific industrial relations systems on the formation and implementation of new production concepts. The third chapter deals with group work or team work as a central "new forms of work"-concept and the different paths taken by German companies in this respect.

The three chapters are based on articles which were or will be published elsewhere and which are, partially, not easily available.¹

¹ Chapter 1 is taken from a paper presented on a workshop on "Organization of Work and Technology: Implications for Country Competitiveness" in Brussels from May 31 - June 1 1990, organized by EIASM and will be published by Bruce Kogut, Wharton School of the University of Pennsylvania; Chapter 2 is drawn from a paper for the Seoul International Symposium sponsored by the Korean Automobile Manufacturers Association (1989), published by Sung-jo Park (Ed.), Technology and Labor in the Automotive Industry, Frankfurt/ N.Y. 1991. The third chapter is taken from: Wissenschaftszentrum Berlin für Sozialforschung und National Institute for Employment and Vocational Research (Eds.), Technological Innovations and Work Today - Options of the Japanese and the German Models, Tokyo 1988 (in Japanese language).

Content

Chapter 1 National and Company Specific Differences in Organizing Production Work in the Car Industry

1. Directions of change
2. The influence of company strategies
3. The influence of the factories' national affiliation
4. Models for future development
5. Perspectives

Chapter 2 New Technology, Work Organization and Industrial Relations in the Federal Republic of Germany

1. Milestones in the development of the industrial relations setting
2. Driving forces for new concepts of work organization
3. Introducing new technology and reorganizing work und the codetermination system

Chapter 3 Team-based Work Organization in German Car Plants: an Account of two Cases

1. Introduction
 2. Two approaches to team-based new work structures
 3. Comparing case A and case B
 4. Production groups and production teams - two ideal types
 5. Summary and conclusion
- Literature

Ulrich Jürgens:

National and Company Specific Differences in Organizing Production Work in the Car Industry

We are experiencing a far-reaching change in the automobile industry which is comparable in its historical consequences to the diffusion of the Taylorist-Fordist regulation model decades ago. The criticism of Taylorism-Fordism has grown since the beginning of the 80's, especially, and the demand for greater emphasis on human resources and the self-regulation of work by the workers themselves has been experiencing an enormous upswing in the public discussion in Western countries. One hears of the "new plant revolution".¹ A mixture of ideas on questions of work motivation, the design of work (in both social and technical terms), and industrial democracy which had been developed over decades has now come to fruition and been translated into textbooks for personnel policy² as well as for industrial engineering and production engineering.³ Titles like "Improving Productivity and the Quality of Worklife",⁴ "Productivity Gains through Worklife Improvements",⁵ and "High Involvement Management"⁶ signal a new way of thinking among managers.

The signs of dissolution of the Taylorist-Fordist model for labor regulation are obvious. But what will come after it? A clear answer to this question is not possible at present. In view of the many facets of the current radical changes in the automobile industry, we are faced with considerable difficulties in interpreting the direction and pace of the change and getting to its essence. It is difficult to track down the actual changes, despite, or perhaps because of, the loudly proclaimed objectives of the companies. One of the problems in this is to properly assess the inertia of the established structures, institutions, and attitudes.

In the following I would like to address three questions:

1. What are the directions of change which can be established in the most important dimensions of how labor is deployed in the factory?

1 Lawler 1978

2 representative for many: Milkovich/Glueck 1985

3 for many: Barnes 1980

4 Cummings/Molloy 1977

5 Glaser 1976

6 Lawler III 1986

2. What influence do company affiliation and national affiliation have in regard to the differences observed? Are there converging or diverging developments in the company- and nation-specific forms of regulation?
3. Are there models for future forms of labor regulation and what are the prospects for their stabilizing and spreading?

My observations are based on research carried out 1983-1986 in assembly plants of three automobile companies (Company A, B and C), two of them with their headquarters in the USA, and one headquartered in Germany.⁷ In order not to succumb to the danger of investigating the rare orchids of development, i.e. model projects for publicity and company image which, most probably, will remain exceptions, we have selected our sample of plants on the basis of their comparability in terms of the product (front wheel drive subcompact cars) and the production volume (mass production). In this manner we attempted to control for the influences of the product type and production technology as much as possible in order to isolate the differences which arose from work organization and labor relations. This corresponds to the principles of "most similar design"⁸ and of the comparison of "matched" pairs.

With this, we were able to detect differences in the directions of change

- among companies,
- among countries,
- between factories of one company in the same country.

In the following, I want to deal with the first two dimensions of variation. Let us first look at the general pattern of changes in the regulation of work in the industry.

⁷ This project on "Challenges and Opportunities of the Current Restructuring in the World Automobile Industry for its Employees" was carried out in the context of MIT's research program on "The Future of the Automobile" by K. Dohse, T. Malsch and the author. The paper draws on the final report: U. Jürgens, T. Malsch, K. Dohse, "Moderne Zeiten in der Automobilindustrie. Strategien der Produktionsautomatisierung im Länder- und Konzernvergleich", Berlin et al. (Springer Verlag) 1989. The English version is forthcoming from Cambridge University Press.

⁸ cf. Przeworski/Teune 1970

1 Directions of Change

I would like to summarize our findings about the main direction of changes in six points.

(1) Strategies for job integration

"Integration" is a key concept used to describe the restructuring of car production in the 1980s. Common to all intervention measures is the understanding that the forms of specialization enforced by Taylorism-Fordism have turned out to be dysfunctional, obsolete or exaggerated. The costs of coordination required by separating functions and competences have become too high. Flexible production and high technology require a more integrative approach.

Integration refers both to the horizontal and vertical separation of tasks and functions. And it refers both to management and supervisory jobs as well as to rank and file production or administrative jobs. In fact, many of the new concepts for management organization, technical systems and work organization (like project teams, computer-integrated manufacturing, group work) aim at a higher function integration, too. But at this point I am only referring to the job design aspect, i.e. the task structure of the individual employee.

According to our findings, the main focus of the measures undertaken by the companies at the time of our study was on the horizontal aspect of work structuring, and in particular the integration of direct and indirect production tasks. This classical differentiation has increasingly become a hindrance to a more effective and efficient work organization. Tasks which had become the basis for separate departments and lines of hierarchy, such as quality control, equipment maintenance, and material handling, are being partially merged again with direct production tasks. Shopfloor politics of "job control" which were based on the formalized structures of the division of labor are increasingly losing ground against such measures toward "job enrichment".

The aspect of vertical integration was often touched upon when it came to measures of dismantling hierarchies and decentralizing competences. But, in practice, we observed only timid and mostly symbolic steps toward "enriching" the jobs of line managers or operators with planning, budgeting, and control functions.

(2) Employee participation

Measures to increase employee participation were widely discussed in all of our research sites. The existence of all kinds of small group activities such as quality circles, problem-solving groups, voluntary study circles, was regarded by most of the people we talked to in the companies as an essential difference between the Japanese and the western companies and as a major factor explaining the success of the Japanese.

The actual activities in the factories exhibit considerable differences in this field, however. In this, one can see two directions of thrust in the management strategy:

- (a) The first aims at individual work behavior and motivation and at the quality of labor relations. In the process, management strives to reduce individual and collective resistance (absenteeism, strikes), and to create or improve the identification of the workforce with the company's goals.
- (b) The second direction of thrust aims at exploiting more fully the capabilities and experience of individual workers and the informal personal networks among them. This potential is to be mobilized for work-related solutions to problems and for improvements in the operative work process.

We found the first direction of thrust to be prevalent in those cases where the problem scenario was seen very much in an industrial relations context; the second direction of thrust was found to be prevalent in those cases where the problem scenario was defined in terms of new tasks and new qualification requirements due to the introduction of new technology and higher automation levels.

(3) Shopfloor self-regulation through group work

Group work principles also played an important role in the strategies of all companies. Theoretically, group work could be a means to achieve many objectives at the same time: a greater job flexibility among individuals (by practicing job rotation), enhanced responsibility of shopfloor workers for cost and quality (by delegating quality control, machine maintenance, and process control responsibilities to the group), and improved

social relations in production (by less direct control and more mutual help and support between workers and supervisors).

Group work meant task integration in the horizontal and vertical dimensions and it meant a certain degree of self-regulation by shopfloor workers regarding their work. The range of tasks to be delegated to the group and the extent of self-regulation varied widely in the discussions about group work in the different companies but at the time of our research only a few cases could be observed where group work had actually been introduced.

(4) Substituting human labor with automation

In the beginning of the 1980s the development of technologies seemed to many company strategists to offer the possibility of dramatically increasing automation levels. This was true especially in the area of assembly work where labour relations were worst and where the process layout had remained virtually unchanged since the introduction of the assembly line. Robots, sensors, and computers seemed to offer the potential to strive for the "unmanned" factory. Obviously, no company could afford to remain outside of this technological trend by failing to acquire know-how for high tech production.

According to our findings not all of the companies regarded high technology as the key to future competitiveness. Some of our companies invested heavily in advanced high tech process technology, but not all of them.

(5) Reducing of line-paced jobs

Tying work rhythm and performance to the pace of the assembly line has been a central characteristic of Taylorist-Fordist production organization. In the 1980s some companies began to abolish the assembly line as the backbone of its work organization even in mass production assembly plants. Whole modules of assembly operations were taken off the main line in order to be done on stationary work places. Such organization can deal more efficiently with the increased variety of car models and options produced in the same plant.

Thus, the number of workplaces which are uncoupled from the flow of the assembly line is increasing in many plants.

The gradual abolition of the assembly line in favor of stationary workplaces and the establishment of work areas outside the main line flow allows job design to be more oriented to meaningful division of tasks, and less dominated by the priorities of the moving conveyor belt. This is reducing the share of extremely short-cycle, repetitive operations. Nevertheless, the classic assembly line still governs the majority of jobs in assembly operations; the new modules (pre-assembly areas) only comprise one-third of the jobs, even in these factories.

But not all companies share the view that the reign of the assembly line is coming to an end. This is definitely not the message that could be taken from the Japanese car plants and, since production organization there increasingly was becoming a model for "best practice" in the 1980s, advocates of the assembly line still had a strong position. There were cases where the assembly line was even brought back into areas where process planners had originally set up stationary workplaces.

(6) Skilled workers for direct work

It has often been stated that work in the modernized factories of the car industry will increasingly become the domain of skilled labor. With increasing levels of automation, direct work is being done by machines anyway and the tasks of controlling and maintaining these machines and preventing break downs would become dominant, requiring technically skilled workers. In these statements, skilled workers would normally be synonymous with journeyman, workers who had gone through apprenticeships as mechanics, electricians etc.

According to our findings it is too early to speak of auto production as the domain of skilled labor. One reason for this is that we found a polarization of qualification requirements in the areas of high tech production.

On the one hand, new jobs of system-monitoring and systems-management with more demanding qualification requirements are emerging here; on the other hand there is the emergence of less qualified jobs, like feeding parts ("residual work"). But this "left-over work" is losing its importance as the mechanization gaps will probably shrink in the future. From the point of view of management, wage costs would speak for a segmentation of the few highly qualified jobs from the many lower qualified jobs. But the increased importance of avoiding machine down times would demand, on

the other hand, that all of the workers assigned to installation could detect process irregularities as early as possible, intervene preventively, and support the experts in the event of a disruption. That is why plant management indeed has an interest in deploying skilled workers at the "residual work places" even if they would be overpaid for what they would be doing most of the time.

This would require a new type of skilled worker who runs the equipment which performs "residual jobs" as well as performs maintenance and system control tasks. The question is whether enough skilled workers are available and whether they or the union accept these conditions. In this respect we found a special situation in the German plants. Only here, availability and acceptance could be expected and only here we found examples of autowork becoming skilled trades work. Due to the oversupply of skilled workers many low tech assembly jobs were given to skilled tradesman who were thus being deployed "below status" on unskilled jobs. The fact that most skilled tradesman accepted this measure (although grudgingly at times) can be explained by the labor market situation also.

In summarizing these changes we see a general trend of breaking away from the traditional forms of control over production work.

In the traditional automobile factory organized along Taylorist-Fordist lines, everything was geared to prescribing the course of work to the last detail from above - beyond the "shop floor" level. Machine-pacing of work through the assembly line, standardization of work performance by the industrial engineering experts, and direct monitoring by the line supervisors - this control structure of Taylorism-Fordism did not tolerate self-regulation by the workers themselves. This constellation, which stifles initiative and a sense of responsibility among the workers, is now beginning to loosen up in the course of developments which soften the deterministic character of the traditional control structure:

- An increasing number of workplaces is being freed from the strict machine-pacing through alternative work design and mechanization.
- The task of setting production standards is being increasingly shifted into the production planning phase, thus avoiding the direct con-

frontation of the experts with the "shop floor", as was the case in the traditional work study.

- Increased demands of technical expertise require a different type of supervisor, who has to be able to deal with problems of process control, material flow, and the technical equipment of his area, rather than simply being the commander of his "subordinates";
- routine matters of labor allocation, work organization and personnel mobility are, in part, given back to the shop floor for self-regulation.

With this, room is opened up for a self-regulation of the operative tasks in the production process. The question of how much autonomy will be given in which functional areas was being debated in all the companies of our sample.

It should be emphasized that more self-regulation on the shopfloor does not mean less control by management. The control possibilities from the side of the company headquarters have been increasing: through computer-assisted information and control systems and through comparison and competition among factories, which are increasingly being used as instruments for performance regulation. These elements make it possible for the corporate headquarters to observe the performance profile of their individual organizational units and to measure them against the most efficient and successful examples in their own global company ("best practice"). The competition between factories contributes to externalizing the pressure to adapt, and to strengthening the consciousness of common (survival) interests in the factory. Parallel production of the same product at different sites, growing overcapacities in the industry, modularization of production, and increased pressure to decide on the question of "make or buy" intensify this external pressure on the factories and workforces to adjust. An increase in the self-regulation of tasks to be carried out thus does not necessarily mean the reduction of control, but rather a change in the form of control.

These general findings convey a clear message. The work reforms of the 80s can neither be interpreted as a purely symbolic policy or even cheap propaganda of management in order to ensure the "acceptance" of the workers and the general public for personnel reduction, the introduction

of new technologies, and the restructuring of the industry. Nor can a sweeping renunciation of the traditional Taylorist-Fordist production model be observed. Rather we can observe an unfinished process of development in which differing configurations of the Taylorist-Fordist regulation mode and its negation are visible. Challenges and opportunities for the employees are concentrated in a specific manner at each of these points. At no point is there an established model. The picture of a linear improvement of work in the automobile industry through the displacement of Taylorist-Fordist forms of regulation would, in any case, be too simple. Our empirical results also make clearly visible the limitations of the negation forms of the Taylorist-Fordist work organization: Separate workplaces do not necessarily mean increased time sovereignty; internal self-regulation of partially autonomous groups is not to be equated with the weakening of external controls; job integration does not mean the abolition of the division of labor, status differentiation, and the segmentation of labor markets within the factory.

Nevertheless, a growing decoupling of the systemic elements of the Taylorist-Fordist model for labor regulation can be observed. In contrast, a close connection of these elements existed well into the 70s. Standard product, mass production and economies of scale, rigid single-purpose mechanization, strict hierarchical control over labor deployment, fragmented and low-qualified work contents, stressful working conditions, and conflicting labor relations formed a seemingly indissoluble package. According to our observations, this structural connection began to break up in the 80s. Against the background of the diversification of demand and the development of flexible technologies, combinations are developing which are increasingly becoming more complex: product standardization and diversification go hand in hand; flexible and inflexible technology is combined on a microelectronic basis; jobs which require more demanding qualifications and which have been decoupled from the assembly line are nevertheless being carried out according to strictly prescribed times and methods.

2 The influence of company strategies

We found huge differences among the 17 plants we investigated with respect to work rules, labor deployment patterns, and direction of change. However, two of our three multinational companies had branch plants in all three research countries, so most of our plants had "sister plants" in the other countries, often producing the same or a similar product. What in-

fluence did the company affiliation then have in explaining the differences in reorganizing production and work organization, the extent to which new forms of work were introduced and which factors were stressed most in this respect?

Clearly, the companies cannot be seen as just adapting and reacting to the trends described above. In strategically choosing a specific direction of work reform and giving priority to certain measures they actively influenced the trend itself. But none of the companies opted to stay outside the trend and preserve the well-established Taylorist-Fordist ways of work.

The clearest and most important difference between the companies could be found in the question of whether they oriented their strategy toward human or technical factors as the supposedly "decisive" productivity resource. This was indeed a strategic decision, although it is true that the companies were in very different positions with regard to their financial strength and thus their ability to purchase new technology at the beginning of the 80s. But it would be overly simplified to explain the companies' decision of whether they would give priority to "technology" or to "people" as merely a matter of the power of the purse. More important was the different degree to which the companies were rudely awakened at the beginning of the 80s. The companies which perceived their very survival to be at stake were presented with the option of making a more fundamental break with past practises or perishing.

Company A clearly emphasized the "people potential" in its reorganization measures. The focus of the measures in its factories was on decentralizing management responsibility and on integrating direct and indirect production tasks. Along with this went the institutionalization of a program for employee participation and of involving employees in problem-solving activities on the shop floor. The concepts were based on a human relations approach, group work principles did not play a central role in this. A further characteristic of this strategy is the remarkable emphasis that Company A placed on increasing efficiency and rationalizing labor deployment. The use of new technologies was secondary in this strategic concept. Finally, Company A did not venture into new production concepts which do away with the assembly line.

Figure 1: Emphasis of Change Measures by Companies

<u>Directions of change</u>	<u>Company</u>		
	A	B	C
(1) Task integration	+		
(2) Employee Participation	+	+	
(3) Shopfloor self-regulation via group work		+	
(4) Automation as much as possible		+	+
(5) Reduction of line-paced jobs			+
(6) Skilled workers for direct work			+

Figure 1 shows the differences in the directions of change taken by our three companies. Of course there are differences in the emphasis put on each of these measures by the companies and in the extent to which all of the company-specific measures could be found in all of its plants even in the same country. Figure 1 shows the company profile which was characteristic in the country where the companies had their headquarters because it seems plausible that here company strategies would find their most authentic expression.

In contrast to Company A, Company C clearly emphasized automation in its measures. As a complementary measure, C expanded its programs for initial and further vocational training considerably and adapted them to the new technological requirements. Less importance was attached to questions of the task integration, employee involvement, and group work principles at the time of our investigation. It was a clear policy to reduce the number of directly line-paced jobs by various measures. The most important of these was, however, assembly automation. Finally, there was a clear strategy to let skilled workers run production in their highly automated areas.

Company B's strategy could be characterized as maximizing its options. Different paths were being tested in pilot plants in the company. The long-run goal was to achieve a synthesis of the technology and the human factor strategies. To this end, the company introduced programs of employee participation, but also programs of high-tech automation aiming at the "unmanned" factory, as well as socio-technical programs to restructure work on the basis of group work principles. But this multi-faceted strategy was only valid at the company level. On the level of individual

plants, we found insecurity as to which direction the development should go.

Just as important as the differences in the main emphasis of the strategies were differences in the way they were being implemented. Profiles typical for the different companies as a whole could also be observed here. As far as Company A is concerned, the human factor-oriented strategy was pursued on in the factories - company-wide - with remarkable consistency and speed. This was true for the goal of job integration as well as for employee participation. A campaign, also carried out publicly in the company, attempted to secure the acceptance or toleration of the workforces and the local managements for the program. The speed and the breadth of this process of reorganization can be summed up in a paradoxical formula: the strengthening of management and employee participation on the shopfloor was pushed through by means of a tightly centralized company organization. This paradox of a new combination of highly centralized company management and the strengthening of decentralized self-regulation at the lower levels is the key to understanding the organizational change in Company A. The highly centralized form of control was faced, admittedly, with the limits of the national industrial relations. The measures could be rapidly introduced and enjoyed initial success in the company's American and German factories, whereas they were defeated for the time being by union objections in the British factories. National specific factors come into play here.

Company B, with its strategy of maximizing its options, i.e., simultaneously testing several alternatives, increased the variety in forms of factory labor regulation within its global organization. In contrast to the far-reaching innovations in production technology or work and social organization in some pilot plants, the bulk of the assembly plants remained limited to an onlooker role at the time of our empirical investigations. At the level of local management, a greater insecurity over the goals of future development existed than that which we had observed in the case of Company A's local management. The diffusion process of new organizational concepts into Company B's factories proceeded in a less centralized fashion and was more strongly oriented toward individual local initiatives. In view of this pattern of diffusion it is no wonder that the influence of the national affiliation of the factories showed through to a greater extent than at Company A.

At Company C there seemed to be no ambiguity and hesitation about how the factory of the future was to be envisioned. The future was automation and the personnel considerations concentrated on the necessary training requirements. At the time of our final investigations, however, the shortcomings of this strategy were already recognized.

Differences in emphasis and priorities as to the directions of change described above - whether companies focus on human factors or technology factors - does not say anything about the quality of these measures in terms of work goals. Company A's strategy was designed to take advantage of a potential for rationalization which could obviously be attained in the shorter run. Holding back with automation meant at the same time that the lay-out of production technology remained largely unchanged, so that possibilities for improving in working conditions through technology and process design could not be realized. Company A thus still retained the traditional forms of assembly line organization in the factories we studied. On the other hand, Company B and C's factories had already transferred a considerable share of their assembly tasks to production areas without an assembly line. These new work structures, generally introduced in connection with new production technologies, provided significantly improved working conditions, at least from an ergonomic point of view.

3 The influence of the factories' national affiliation

The national affiliation of the factory site turned out to be a strong intervening factor which often comes through more strongly than the influence of company affiliation. Figure 2 shows considerable differences in the directions of change found in the various plants of the same company located in different countries. (There were also differences between plants of the same company of the same country but the influence of location was clearly weaker than the influence of company or country affiliation.

As can be seen of Figure 2, Company A's American plants emphasized task integration and employee participation; its British plants task integration was the only major direction of change; at the German plants we found task integration, employee participation, and the deployment of skilled workers on direct production jobs as characteristic directions of change.

Figure 2: Emphasis of Change Measures by Companies and Countries

country company	USA	UK	FRG
A	(1)(2)	(1)	(1)(2)(6)
B	(2)(3)	(5)	(5)
C	-	-	(4)(5)(6)

In the American Plants of Company B which we investigated, employee participation and the introduction of group work were dominant features. The Company's other plants ventured into "automation as much as possible" and partially abolished the assembly line. Thus, the intracountry differences between Company A and B were in fact bigger than expressed here. In any case, Company B's British plants were characterized new assembly concepts as their characteristic feature as were the German plants. The direction of people-oriented measures, i.e. task integration or group work or deployment of skilled workers in direct production jobs was quite unclear in these European plants at the time of our study.

Company C focussed clearly on automation and the work organization concepts it devised for these automation areas centered around skilled workers deployed in production. A third range of measures aimed at diminishing the role of the assembly line for determining speed and rhythm of the individual workers: firstly the introduction of automated transfer-lines in assembly areas had the effect of decoupling human labor from the direct production process; secondly, areas with stationary workplaces linked by automated guided vehicles were created, though to a smaller extent than at Company B in the European plants; thirdly due to union demands line work was organized in such a way that individual work cycles became three to four times lower than at the assembly plants in most other companies we investigated.

Among the national factors which most conspicuously influenced the direction of change in the various countries were the politics and institutions of industrial relations and of vocational training.

In the USA, the companies have made the transformation of industrial relations a central element in their strategy for work reform. Since the beginning of the 80s, the purposeful change of industrial relations has been formulated and supported jointly by the top representatives of the

companies and the unions. At the local level this policy was also jointly supported in the majority of cases because it was made perfectly clear by the company headquarters that the decisions over future investments and thus over the survival of the production sites were strongly influenced by the demonstration of their willingness and ability to change. Under these conditions the change strategy focussed mainly on human factors. The Employee participation programs played a central role in securing the compliance with job integration or the introduction of group work.

The strategy of transformation from above had already taken root at the factory level in the American automobile industry at the time of our investigation. The traditional structure for regulating labor deployment (seniority and demarcation rules) were still partially in force. They had already lost their unconditional validity, however.

Where advanced automation projects were implemented in the US the importance of vocational training politics and institutions became clear though in a negative sense: not only were there too few tradesman with adequate (especially electronic-related) skills, production workers were also incapable of coping with the new technologies. Due to the status consciousness of skilled workers and union policy, the deployment of skilled workers as direct production workers, (as in the German plants) was out of the question in the American plants at the time of our study.

The decisive importance of union cooperation for such a strategy of institutional change can be seen in the case of the British companies. Here it was not possible to obtain a consensus between the companies and unions at the top level and to jointly support programs for change as in the USA. Because of the differences in the union structures, a strategy "from the top down" would hardly have had a chance of success anyway. The influence of the unions on the process of change in work has always been strong in the UK. But it was limited to establishing and consolidating veto power. This led to a special selectivity which furthered traditional strategies for rationalization through industrial engineering and mechanization which, because of shifts in power relations, could be pushed through almost unimpeded by management. Programs to develop employee participation or group work, on the other hand, were blocked by the unions since they required a formal agreement in the arena of industrial relations. In its inability to develop its own concepts, British management apparently perceived its scope of action to be especially limited by the de-

pendency relations in the European networks of their companies. We observed a growing consciousness of heteronomy at the British sites. Production organization and technological equipment were seen as "German concepts" imposed upon the British factories by the European company headquarters.

But the prerequisites for greater autonomy in developing their own solutions would have been better performance and a process of institutional change that was jointly supported by unions and management. These prerequisites did not yet exist at the time of our study, despite remarkable examples of change in behavior within individual plants. Independent innovations in work and social organization for regulating labor could not emerge under these conditions. Concepts like employee participation, group work, or production concepts without the assembly line were regarded as foreign imports from either the USA or the continent. The British constellation was apparently not particularly fertile soil for developing independent non-Taylorist forms for regulating labor in the 1980's.

Characteristic for developments in the German context is that the change in labor was being carried out in and through existing institutions. The companies' restructuring process in the German automobile industry did not include a specific strategy for transforming the institutions. The system of industrial relations remained, so to speak, outside the brackets of the restructuring. The dual system of interest representation by the union and co-determination by works councils elected by all workers as the central institution of industrial relations showed a relatively high affinity to recent trends toward de-Taylorization. Along with this came a specific promotion of mechanization and forms of labor deployment centering on skilled workers.

The statutory rights of the works council to information and participation had entrenched a pattern of cooperative problem-solving at the factory level. At the same time the works council members and union representatives have been able to develop their own concepts and alternatives for organizing work, not least because of the institutions of co-determination. We did not find a comparable pattern of union involvement in job design in either of the other countries studied. It was possible on this basis to negotiate future oriented arrangements between the two sides. With this, the institutions for labor policy and vocational training have had the function of a societal productivity resource for the restructuring process of the 80s.

The institutional peculiarities in the German context seemed to foster specific solutions in regard to work organization and patterns of labor deployment. Three indicators supporting the thesis of a special German development could be observed:

1. The exceptional vocational training and labor market situation provides the factories with a skilled worker potential which is also deployable for direct production tasks, and can thus also be used for new forms of work organization and new job descriptions in direct production. The growing use of skilled workers in direct production increases the necessity and the possibility of creating "intelligent" work structures. Corresponding to this, a close connection has emerged between the surplus of skilled workers and the degree of innovation in the work organization in the German assembly plants.
2. Because of legal and contractual regulations, absentee rates due to illness and the percentage of disabled workers in German plants are much higher than in the British and American plants (about three times higher). In order to overcome the restrictions for labor deployment this situation created, management is more dependent on job design and the use of technology. Management has to improve working conditions and job design in order to make work more attractive. In the American and British plants, restrictions lie more in the area of informal work practices and are tackled by management in the arena of industrial relations.
3. The particular profile of demands by the unions and works councils in the Federal Republic of Germany is clearly aimed at reducing line-paced work or at least loosening the link between the individual's work rhythm and machine or assembly line cycle times. This has led to alternative solutions in process design and work organization being considered. In contrast, a one minute cycle time was still considered by the production planners in the USA to be the ultimate in work layout for the 80s. The average work cycles in West German plants, which are much longer than in American plants, are in line with qualification requirements, even for simple line work, which are considerably higher than those in the American plants. With this, the gap between assembly line work and the work requirements at stationary workplaces with more comprehensive tasks is clearly smaller, and that is why a change-over to forms of labor without an assembly line with

a given workforce faces fewer difficulties there than in the American context.

Let us summarize: the national systems of industrial relations and labor policy institutions in each of the three countries were related to systematic cross-national differences in the objectives and priorities of restructuring. Our study reveals three different nationally specific types of rationalization. In the USA the dominant pattern was participation-oriented rationalization (QWL-rationalization); in Great Britain, Taylorist rationalization was still dominant; and in the Federal Republic of Germany, a type of rationalization oriented toward skilled workers could be observed. These broad national patterns of selection overlapped with the company-specific patterns.

4 Models for future development

With the dissolution of the Taylorist-Fordist control system there are above all two lines of development which could fulfill the function of a model for future developments: the "German model" of labor regulation revolving around the use of skilled workers and the "Japanese model" of group-oriented labor regulation. (The "Swedish model" is not discussed here. It is in many ways similar to the German model but they differ considerably in terms of training systems and measures to upgrade skills on the shop floor; see Berggren forthcoming). Both developmental models are characterized by a degree of self-regulation of shop floor work. And both employ a type of worker who, through his/her competence and willingness to accept responsibility, is clearly different from the unskilled mass laborer. Despite these common features, there are important differences between the two models.

Figure 3:Paradigms for the Production Organization of the Future

<u>Germany</u>	<u>Japanese</u>
Infiltration of skilled workers into direct production	OJT trained workers with high general base qualification
Decoupled from the production cycle	Determined by the production cycle
large/wholistic job content	short, takt determined job cycle
mixed teams (skilled/unskilled)	homogenous teams (OJT trained workers)
high degree of team autonomy by process-design	low degree of team autonomy by process-design

Figure 3 shows some of the basic differences between the models.

At the center of the "German model" is the skilled worker and a specific understanding of skilled work as a "profession". This understanding includes several features: interest in the work, a willingness to accept comprehensive responsibility (also crossing over the borders of one's own task area), and a large degree of self-regulation in carrying out the work. This model presupposes a "qualification offensive", above and beyond the direct company needs for skilled workers, which in turn is dependent on institutions and politics of vocational training. With this we are referring to the societal prerequisites for a specific form of labor regulation as they exist in the educational system in the Federal Republic of Germany. It is clear that the model of skilled worker centered work regulation is especially important for modern technology management. The ideal-typical goal of the German way is qualified labor, uncoupled from the production cycle and the rhythm of the machines. Uncoupling work from the flow of production is the prerequisite for a type of labor with increased possibilities for self-regulation and with increased responsibility.

The Japanese way also gives a central role to skilled labor, though not in the sense of uncoupled skilled labor. Rather, ideal-typical for the Japanese model is self-regulation under the pressure of the assembly line and the production pace. Characteristic is a the allocation of personnel which aims at the best possible performance and its permanent improvement, i.e. the continual intensification of labor. This stands in contrast to the industrial engineering practices in Western companies which aim for "normal" performance ("fair day's work principle") and are restricted in their possibilities for a continuous review of the established time standards. In the Japanese automobile industry, the work group is the starting point for an integrated job understanding, for the flexibilization and expansion of labor deployment, and for the qualification of the workers. Self-regulation is thus not based on skilled worker competence and a professional ethic.

The question of the transferability of group- or skilled worker oriented organizational alternatives is also posed for the British and American companies in view of increasing technological requirements of the future . The considerable increase in vocational training in British factories hints at the German way. Although such a development is not yet achievable in British labor policy, there could be an expansion of the skilled worker potential beyond the needs of the skilled labor departments in British factories, with similar consequences as can be seen in the German automobile industry. Such a development is being furthered by the centralization and creation of European company branches and the corresponding standardization of production and rationalization concepts.

In contrast to this, the considerations of the American companies are obviously more influenced by Japanese concepts. The formation of production groups in the unskilled area and a flexibilization and expansion of the workers' areas of deployment is being sought. Training measures with the goal of forming groups and the teaching of group problem-solving techniques also play a much more important role in policies for worker qualification than does the training of skilled workers. In the German context, on the other hand, a potential for dealing with technology by using skilled workers, can be observed which arose through a "softening up" of the skilled worker status from above. In the long run, on the other hand, the strategy of group related retraining for unskilled workers could allow the necessary qualification potential to emerge in the American plants too.

Transferring either the German or the Japanese management concepts poses problems. Social and cultural prerequisites play an important role in explaining the Japanese concepts. In fact it is quite disputed among "Japanologists" whether these concepts can be transferred to the West at all and whether it makes sense to isolate certain elements and use them like "recipes". Nevertheless, most Western companies are more inclined toward transferring Japanese concepts than German concepts. The strong anchoring of the German way in the structures of co-determination and the corporatist system of vocational education would set greater institutional and legal limits of the company headquarters' scope for action and decision making. Such infringements on management's prerogatives seem to be more threatening to most Western companies than the risks associated with borrowing from Japan.

In the question of the use of skilled workers and skilled worker supported solutions, one cannot only consider the circumstances that promote them in the German automobile industry, but also the circumstances hampering them in the USA and Great Britain. The distinct skilled worker status in the Federal Republic has significantly changed in the 80s. While the march of the skilled worker into production is already quite far advanced in the German factories, the classical separation between production tasks as un-skilled labor on the one hand, and technical support functions as skilled labor on the other still dominated in the British and American assembly plants. This "German path" of labor regulation centered on skilled workers has shown itself to be advantageous for coping with the requirements of new technologies. The German factories have, in fact, been able to meet the new technological requirements resulting from the wave of modernization at the beginning of the 80s with less friction thanks to their skilled worker potential.

5. Perspectives

What are the prospects for the different paths and models? What do national specific peculiarities mean for the future chances of the national production sites? According to our findings, there were enormous cross-national differences in manning levels between factories, even when these were largely similar as regards product, production technology, and degree of vertical integration (see Jürgens et al. 1989, p. 311 ff; Krafcik, 1988 p. 46ff). There are apparently considerable differences in or hindrances to increasing the work efficiency and correspondingly reorganizing the

work organization. In view of the high cost efficiency of Japanese production, the cost question was of paramount importance, especially for the American companies, in their adaptation strategies at the North American sites. In Europe, on the other hand, the competitive pressure of the Japanese had not been as intense up to the time of our investigation. Because of this, management could consider the costs with greater composure. This was all the more possible considering that their increasingly expensive car variants were selling well, also in the middle and lower size categories, and that the increased production costs of these vehicles could be passed on to the customers, in light of their reduced price sensitivity. This trend toward higher valued model and equipment variants was especially useful for Volkswagen. In the strategy of increasing the product value, an ideal line of compromise with the worker representations was found as lay-off effects due to automization and mechanization could be largely offset for through the tendency toward higher-valued model and equipment variants. During the 80s, the strategy of a higher valued product was the key to the success of the German automobile industry when compared to the other traditional Western manufacturing countries. This strategy also has its risks, though. The Japanese competitors have increasingly turned to higher valued cars and equipment. But because they still have serious cost advantages over the German manufacturers, growing pressure on price and cost structures can be expected in the future. With a relatively uniform state of development of product technology, the traditional quality and image advantages of the German automobile industry will lose their importance as a parameter of competition.

Fundamental for the question of the future chances for the "German way" is thus the appraisal of the potential savings of future technological development. If one assumes that the competition on the world market will be decisively fought out in the arena of technology, then the goal of short-range cost savings through traditional measures for increasing efficiency would only have secondary importance. According to our findings, this assumption has more supporters in German companies than in American companies. In this we are not speaking of reducing wage costs in direct production through the use of technology. Rather, we are referring to computer integrated manufacturing (CIM), as a means of achieving integration and flexibilization of the production processes, of cutting costs through new logistics systems, and of speeding up of product and process innovation. At the present, none of the automobile companies has achieved a de-

cisive breakthrough in the field of computer integration. The strategy of a determined leap into the age of high technology, as it was attempted at General Motors, thus remains risky. A concentration on the technological solutions to future problems could lead to similar experiences as we have already seen in the 80s. The possibilities of the new technologies were overestimated and the chances of innovations in work and social organization were underestimated.

In the near future, with intensified competition on the world market, those companies and production sites that will be able to assert themselves are those which are able to effectively combine computer integration and the development of human capital, new forms of group work and Taylorist work efficiency. It is possible that we will even see a synthesis of the Japanese and the German models: group formation, job integration and extreme work efficiency in manual mass production according to the Japanese example; skilled worker oriented team formation and professionalization in the high technology areas and in the service functions according to the German example. At the present state of the industry, such a scenario is not without chances for the 90s. Whether it will be realized in some form or another, or whether another type of model will determine the future of labor in the automobile industry, can hardly be predicted in view of the continued high dynamics of development in the world automobile industry. Today, at the end of the 80s only one thing is certain: The old days of the automobile industry are over, the modern times have just begun.

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Chapter 2:

NEW TECHNOLOGY, WORK ORGANIZATION AND INDUSTRIAL RELATIONS IN THE WEST-GERMAN CAR INDUSTRY

The nationally specific industrial relations (IR) setting has a great impact on the development and introduction of new technology and on the organization of work. This is the main hypothesis of the following essay. In developing the argument, I draw on findings from a research project carried out at the Science Center Berlin (WZB) as a part of the research program "The Future of the Automobile" coordinated by MIT. The focus of this project was on the "challenges and opportunities for the employees in the present restructuring of the world automobile industry", and the empirical research covered three multinational automobile corporations (made anonymous as Companies A, B, and C) and a selection of their car assembly plants in the United States, Great Britain and the Federal Republic of Germany. The plant names have also been made anonymous. Thus, as an example ADI refers to one of the several assembly plants of Company A in the Federal Republic of Germany. The empirical research was carried out from 1983-1986.

In the following account I will not undertake a comprehensive description of the institutions and regulations of the system of industrial relations in the West German car industry. I will start, rather, by trying to capture the dynamic element, the process of change, and by looking more closely at some topics and lines of development from the 1970s onward. The focus is put on questions of new technology and new forms of work organization. I will illustrate the influence of the plant level IR-system on these two questions.

My account will concentrate on the West German situation, although I will occasionally draw contrasts with the situation in the British and American plants.

MILESTONES IN THE DEVELOPMENT OF THE INDUSTRIAL RELATIONS SETTING

The developments which have especially characterized the situation we found in the German companies are (1) the difficult situation after the first oil crisis, including the problem of personnel reduction; (2) the movement to protect workers against the effects of rationalization and to deal with technological and organizational restructuring at the beginning of the 1980s, accompanied by (3) the demand for the humanization of work.

(1) The collapse in production and employment in 1974/75 formed a deep break for the three "mass producers" among the German automobile companies. Employment as a whole at Volkswagen was reduced by a total of 26% in the period between 1974 and 1975, the number of production workers by 29%; the majority of the almost 33,000 workers were released within a period of several months¹.

Foreign employees functioned to a certain extent as a crisis buffer as these measures were carried out. In the case of Volkswagen, foreign workers were released in much higher proportions than were German workers (the percentage of foreign workers was reduced by 66% or 13,000 employees). Since then, the percentage of foreign workers employed has not been significantly restored². Although the percentage was still high in certain production areas, it was clear that from now on measures of personnel reduction would increasingly affect the German core workforce. In regard to the design of work and new technology, another type of worker was required instead of the unskilled "Gastarbeiter" (foreign worker).

¹ See also Streeck, 1984, p.56ff.; Dombois 1976.

² Brumlop and Jürgens, 1986.

In spite of the enormous pressure to release personnel at Volkswagen and other companies, it was possible to achieve the reduction of personnel by means of so-called "bloodless" measures: voluntary pay-offs, early retirements, not replacing "natural fluctuations", and a hiring freeze³. Thus, the reduction of personnel at VW could be carried out without actual dismissals.

It was a part of the crisis experience of 1974/75 that the rapid upswing which immediately followed in 1975 brought about renewed hirings while, at the same time severance pay programs were still being carried out. Workers who had left their plants with large pay-offs were already being hired again a few months later - to the great displeasure of their fellow workers who had remained in their jobs. For a while, work alternated between short time on the one hand and overtime accompanied by extra shifts on the other. This experience led to a demand for a longer term orientation of personnel policy and for a stabilization of personnel development⁴. The works council has great influence in the case of overtime and extra shifts due to the right to co-determination in this matter. Works councils and unions now began to check more thoroughly the medium-range effects on employment and capacity before allowing overtime.

In regard to the goal of employment stabilization, VW proclaimed the "personnel policy of the middle line" (1975). In order to isolate personnel developments from short range variations in demand, the production volume should no longer directly follow all peaks in demand by hiring employees who would become redundant as soon as the demand goes down again. Instead, the production volume should be aligned to the demand development in a medium-range perspective thus consciously skipping the high pick market opportunities and thereby stabilizing the personnel development. In the years that followed this personnel policy principle was, to the chagrin of many managers, often violated; experience has shown time and again that

3 Cf. Schultz-Wild, 1978; Dombois, 1982a; Streeck, 1984; Brumlop and Jürgens 1985.

4 See also Streeck, 1984, p.66ff.

important resources are often tied up with breaking in and training at the workplace. The principle is practically meaningless today⁵.

The policy of employment security and of stabilizing the personnel situation in the plants has, nevertheless, strengthened expectations in a way similar to leading Japanese automobile companies with life-long employment security for their core work force.

(2) This guarantee of employment security had to face a serious test at the beginning of the 1980s in view of the German automobile manufacturers' big projects for technological and organizational restructuring. The most important experience resulting from these project was that the dismissals and downgrading measures which had been feared did not take place. The restructurings became, rather, an occasion for quite far-reaching agreements for securing the jobs of those threatened by rationalization. The following case gives an example:

In March of 1984 an agreement dealing with personnel measures in connection with the investment program for the years 1984-1988 was reached for the entire Company BD and thus also covered the changeover at BD1. This agreement contained the following points:

- Company necessitated dismissals were formally waived for the first time..
- Wage and salary safeguards were agreed to for older workers (50 years of age with 15 yrs. service, or 55 yrs. of age with 10 yrs. service) without a time limitation. (The average age of the workforce of BD1 was 41 years.)
- The wage safeguards for all others were extended and limited to four years.
- Downgraded employees received preference rights for taking over appropriate positions in the plant that became vacant.

5 See also Dombois, 1982b.

- It was guaranteed that workers transferred into new departments would not be downgraded.

- Finally firm management promised that

the appropriate committees of the works council would continually be informed regarding the current stage of planning and would be instructed about effects on production technology, organization and personnel in a timely manner - that is, when one can still influence the planning and when the decisions have not been made (Works Constitution Act § 86 Sect.2).

Wage safeguards of this kind are practically nonexistent in the USA. In Great Britain, they were realized in the same company only after the German affiliate made the first steps⁶.

(3) The third characteristic topic and sequence of events in the German context is tied to the headings "humanization of work life" and "qualitative contract policy". The discussion in the Federal Republic followed the trend of countless international programs and projects as well as the establishment of corresponding organizations in other countries (such as the Work in America Institute, etc.)⁷.

Yet West Germany developed differently from countries like the USA, where such projects were initiated chiefly at the corporate level, or Sweden where the employers' associations played a central role. Here the development was primarily characterized by the governmental program for "the humanization of work life" and the fact that the unions, especially the IG Metall, along with the works councils in the factories, became active advocates of objectives of a more humane reorganization of work. A further characteristic is that in West Germany, of the two basic theoretical positions forming the basis for

6 In addition there is a tacit understanding by both sides in West Germany that the wage safeguards are indefinitely valid, regardless of how the agreement reads: "This arrangement foresees wage security for a certain time. Up till now we have arranged things so that no loss of wages takes place... We also have no plans to discontinue this policy. The guarantees will be extended. ...there is a time limitation for younger workers, in principle, which has however not been held to and will not be held to. We will take care of that in another way." (personnel manager BD1)

7 Auer et al., 1983.

the international discussion of "new forms of work" - the socio-technological and the human relations⁸ approach - only the socio-technological approach became established. The consequence was that in contrast to the USA the discussion was oriented more toward job design than organizational design and as a result, more oriented toward technological solutions⁹. The strong link to technology exhibited by many approaches also mirrors the more pronounced engineering science character of the West German approaches and the greater involvement of engineers in corresponding considerations and projects.

The two central topics of the different "humanization of work life" programs and initiatives can be summed up under the headings of "stress and strain" and participation. Each of them has important implications for the introduction of new technology and new forms of work organization and shall be discussed in more detail.

DRIVING FORCES FOR NEW CONCEPTS OF WORK ORGANIZATION

The topic "stress and strain", and the corresponding measures for structuring technology and work according to ergonomic principles found the most rapid and comprehensive entry into the workplace. In fact, the reduction of strains and stress became a terrain of common interests between management and the works councils regarding the introduction of new technology. Measures for ergonomic improvement interfaced with demands for prevention of work related illnesses and the planning of new technology. A finding of our comparative study was that ergonomic considerations received by far the most attention in German companies, from management as well as the works council. Many members of works councils have taken courses in the meantime and have acquired the corresponding training in ergonomics. Ergonomic factors also play a very important role in the review of projects for technological change. According to co-determination legislation works councils have the right to intervene in management measures of

8 See also Strauss-Fehlberg, 1978; Schäuble, 1979.

9 The question of the degree of freedom for structuring work or, conversely, the extent to which work organization is determined by technology, was thus central for the theoretical discussion in the Federal Republic but hardly appeared in the US discussion.

technological and organizational change especially when the works council can refer to "proved findings of ergonomic science" as is stated in the law¹⁰.

The emphasis on ergonomics and on technical measures to reduce work-related strains and stress correlates with a greater problem of illness-related absences and disability. The number of illness-related absences and the percentage of disabled workers is considerably higher in the factories of all three West German companies compared to the British and American plants (see Table 1).

Table 1: Illness and disability (1985)

	illness- necessitated absences*	disabled workers**
A US 2	4.8 %	5.9%
B US 2	3.5 %	1.6 %
A GB 1***	4.6 %	3.0 %
A D 1***	8.9 %	11.6 %
B D 1***	9.2 %	14.9 %
C D 1	8.3 %	14.9 %

* in percentage of the workforce as a whole

** in percentage of the workers

*** 1984

10 § 90/91 Works Constitution Act.

Demands for compensating occupational stress and strain and preventing work-related illnesses through reducing the intensity of work provided the justification for introducing personal relief time allowances and lengthening breaks in the 1970s¹¹. This issue also provided an important argument for the expansion of individual vacation rights in the 1970s and for the reduction of weekly working time in the 1980s. The objective of humanizing work thus contributed significantly to great variation between the countries studied in the temporal availability of the individual worker to be actually deployed in the production process.

One can see from the comparison in table 2 that the average "utilization time" per worker in the blue collar area in factory CD1 is 16% less than in the US factory compared. In this comparison, the time off granted for education or training was not included. The difference becomes more drastic if the availability for overtime is considered. In plant A US1, the factory does pay a small "penalty" per hour of overtime worked into a training fund, as provided for in the general contract, but is not limited in setting overtime hours. In plant DC1 overtime is essentially made up for by additional free time on the basis of corresponding contractual agreements. When this is taken into account differences between the two factories in the temporal availability of the workers add up to between one fourth and one third of the yearly working time.

Of course, this situation caused problems for the efficient deployment of labor in West German plants. The temporal availability of the individual worker will be further reduced in the course of the shortening of the working week. The standard working week in the West German auto industry is 37 hours now and it seems certain that the IG Metall will achieve its goal of a 35 hours week in the early 1990s.

11 Sperling, 1983.



Table 2: Differences in the temporal availability of the workers in a comparison between a German and an American assembly plant (1985)

	A US 1	C D 1
paid breaks per shift	48 min.	64 min.
regular weekly working time	40 h.	38.5 h.
holidays which do not fall on Saturday or Sunday*	13 days	10 days
contractual vacation days	20 days**	30 days
illness-necessitated absences	6 days	18 days***
available working hours per year****	1,590 h.	1,340 h.

* number for 1984

** with an average seniority of 15 years; the vacation entitlements vary between 2 weeks for 1 to 3 years of seniority and 5 weeks for 20 years seniority and more.

*** average for the entire factory including salaried employees

**** calculations proceed from a theoretical maximum number of 260 weekdays per year

Source: Own surveys and estimates; VDA-Pressedienst Nr.20a from December 20, 1984.

To cope with this situation new technological and organizational concepts are being discussed. They focus

a) on further automation in order to ultimately achieve "manless" production and

- b) to increase the utilization time of the plant facilities at the same time as the standard working time of the employees decreases. New shift patterns like 4 times 8 hours per employee (36 hours per week) including the Saturday as regular working day thus increases plant utilization to 96 hours in two shifts (80 hours had become the norm in most western companies in the 1970s).

The argument for reducing work stress and strain also played an important role in regard to the topic "worker participation", which had been discussed in West Germany under the heading co-determination at the workplace since the 1960s¹². For the trade-unions, however, the question of expanded "participation" in the past was primarily a program for extending co-determination rights to other issues and areas of company affairs¹³. In the framework of the humanization projects since the middle of the 1980s, the interest on "participation" has expanded above all to include questions of training and skill.

Forms of group work were tried out in company projects in which employees could plan their work tasks independently and take part in organizing the work process and the working conditions in the factory¹⁴. In the 1970s there were projects with semi-autonomous groups in all of the automobile companies. In general, they had already been discontinued by the beginning of the 1980s and chalked up as failures - admittedly with differing reasons from the management and worker points of view¹⁵. The project at the VW engine plant in Salzgitter, in particular, received a great deal of attention. A concept of semi-autonomous groups was developed jointly by the participants and external social scientists, a concept aimed at creating improved workplaces and supporting the workers' development by widening their field of competence and increasing their skills. It

12 Fricke et al., 1982.

13 Hoffmann, 1968.

14 Friedrich-Ebert-Stiftung, 1981; Fricke, Notz and Schuchardt, 1982.

15 Altmann et al., 1981.

was above all on the basis of this experience that the union argued that group work undermines existing forms of interest representation in the plant (works council and union stewards) at the same time as management came to view groups as uneconomical for the conditions of mass production.

But the attitudes have been changing on both sides since the mid-1980s. "Learning from Japan", increased pressure from world market competition and the development in process technology have contributed to this change in attitudes. But these are not the only explanatory factors. "Group work" has become a terrain of common interest for the design of work organization as ergonomics had been for work place design.

Team-based work structures are still in a very early phase of development in German auto firms. So far (1989), there is only one company which has firmly committed itself to the team concept and by now has one third of its hourly work force organized in production teams or production groups. But other companies are catching up. All companies now seem to give production teams a central role in their plans for the future.

Of course, there are differences in the assessment of advantages and disadvantages and of the functional necessities concerning group work from the perspectives of management and the union.

For a more systematic approach to the various group- or team-based forms of work organization which can be found in practice it is necessary to deal more specifically with the various "points of reference". Each point of reference is related to specific interests or motives to reorganize the division of labor from the point of view of management and of the trade union.

In the following I want to discuss each of these "points of reference" briefly:

(a) Assurance of machine uptime:

As a consequence of the enormous investments of the car companies in process technology, questions of manning, labor productivity and wage costs have become secondary considerations in the areas that are highly mechanized. For example, due to mechanization and automation in the body shop of one German assembly plant which was restructured recently, the hourly personnel working here was reduced from 200 to 25 per shift. They are working side by side with about 150 industrial robots, grouped together in a number of highly complex automated assembly cells. By far the main point of concern of management is to keep these complexes running and avoid machine downtime. The size of the facility makes it necessary that everyone working in the surrounding area be responsible for monitoring the machines in order to prevent downtime or, if a breakdown happens, to fix the problem quickly. In such areas, the differentiation between the direct productive personnel and indirect productive personnel such as quality assurance, maintenance and logistics has become obsolete. Removed from the direct production flow, everyone in this area is serving the machine functions. Attention and preparedness to act quickly if necessary are by far more important than making sure that everybody has a full work load at any time.

(b) Direct labor efficiency is still a point of reference for the reorganization of work. However, this holds true only for the still manually dominated areas of production. Here, problems of manning, of assuring a full work load for each worker at all times, i.e. to assure efficient line balancing is a growing concern. The main cause lies in the present market strategy followed by most of the auto companies. The attempt to cover the broadest possible range of customer preferences by offering a broad range of products, has led to an explosion of the variations of models and options offered by companies in recent years. According to the statements of management representatives, this model and option complexity is even greater in Western companies than in Japanese auto companies.

The problems of model and option mix are especially exacerbated in the areas of trim and final assembly. The variation of work content from work unit to work unit may be 30% and more. The manning level required to cope with high option models will thus be "underutilized" whenever low option models come along. So far, even the most advanced computerized systems cannot make sure that the pre-planned sequence of work units in the actual production flow can be maintained. Thus, pre-planned line balancing to assure a stable work load and labor allocation remains futile.

The higher manning level required to cope with model mix problems in the area of trim and final assemblies is still an important cost factor. Around 40% of the hourly wage cost to produce a car stem from the assembly areas. Thus, there is a lot of pressure to cope with these costs and reorganizing work to assure more flexibility of labor is a contribution to this end.

(c) Improving product quality is a third point of reference for reorganizing work. One of the most important consequences of the "learning from Japan"-movement within Western management at the beginning of the 1980s has been the fundamental change in the approach to quality problems resulting from production. It has been understood that there is a relationship between the degradation of direct labor and the amount of quality inspection and repair work necessary in production. The reduction of quality inspection as a separate indirect job category and its transfer back into direct production has been the starting point in many cases for the introduction of production groups or -teams which selfregulate quality assurance in their area (Qualitätsregelkreise etc.).

(d) With unemployment rates in some segments of the labor market as high as 20%, there is a surplus of highly qualified tradesmen and companies have recruited them for unskilled or semi-skilled jobs. In addition, the company-internal apprenticeship programs have been expanded to allow a greater intake of new apprentices for labor market policy reasons resulting especially from union demands. The graduates of these apprenticeship programs (a three to three and a half year

state-controlled qualification program which is the prerequisite for the formal status of a "skilled worker" in the German system of vocational qualification) can no longer be absorbed by company skilled trades departments (maintenance etc.). Therefore, they, too, are now often first assigned to production jobs in German auto plants. The resulting redundancy of skilled labor is an incentive for management to reorganize work. It makes possible the recruitment of skilled workers for jobs in direct production and - as the German system of wage differentiation is based on the actual job demands and not on the qualification of the worker - to pay these workers accordingly. The surplus of skilled workers on the labor market has thus effected a devaluation of the costs of skilled labor and the German companies have been profiting from this effect. The rates of skilled workers with certified mechanical or electrical/electronic occupations employed "under value" in direct production ranges between 30 to 50% in auto plants situated in economically depressed regions. There are other plants though, situated in urban regions which have rates of skilled workers employed in direct production of around 10% only.

The assignment of skilled workers to semi-skilled jobs in German production plants is an important prerequisite to allow for new forms of work organization transferring skilled workers' functions to direct production workers. At the same time the lower status employment of skilled workers creates pressure to structure work in a way that suits skilled workers' aspirations and demands for satisfying and qualifying work. Management must foresee that as soon as the labor market pressure is reduced many of those well-qualified or skilled workers in production might quit to look for other jobs outside the company. Generally, there is no discrimination against mid-entries in German firms.

Regarding the regional distribution of plants with more or less commitment to the concept of production teams the surplus of skilled trades on the regional labor market seems to be one of the main explanations.

There are two "points of reference" supporting work reorganization which can be discerned from trade union policy and the institutionalized employees' interest representation (Betriebsrat) in German plants: the demand for qualification and further-qualification and the demand for income and employment protection in case of technical and organizational restructuring. As mentioned before wages are determined according to the actual tasks or jobs performed. A broader range of tasks performed within a team or a group protects the employment of an individual worker in case "his job" is eliminated due to technical or organizational changes. Thus labor union representatives regard group or team work with job rotation and correspondingly higher qualifications for each group member as protection against job downgrading and job loss. Thus, team or group work has become an arena of work organization measures in which management, trade union and works councils find common terrain. Of course, the trade union and the works council would prefer the introduction of work groups which would upgrade the lower-ranking workers to the level of the highest qualification and wage level in the team. Management would prefer production teams with shared responsibilities but specialized work tasks and differentiated wages.

A particular concern for the union in this respect is the question of "residual work". This term relates to the new unqualified work functions like parts-loading, simple machine tending and pick-and-place work which constitutes a large share of the jobs remaining after automation. These work functions are often regarded as evidence of a polarization of qualifications resulting from "technical progress". The occupational structure before restructuring of the plants was dominated by semi-skilled production jobs, such as in the body shops of auto plants, welding, soldering etc. After the restructuring the amount of control tasks, such as machine monitoring etc. increased (from below 5% to more than 30% in the case of two German assembly plants which were restructured recently), and at the same time, the amount of residual work functions increased from nearly 0 to 40% and more of the new jobs. These new unqualified work functions should be seen as temporary, as mechanization gaps which will be filled probably by future mechanization measures.

Now, an important issue for job design from the perspective of the union is whether the "residual functions" of the new work set-up are integrated with the more qualified tasks or whether they should be left bundled together and done by "residual workers" with low income and low job security. Job rotation that incorporates residual jobs thus constitutes a means of protecting employment.

INTRODUCING NEW TECHNOLOGY AND REORGANIZING WORK UNDER THE SYSTEM OF LEGALLY STIPULATED WORKS COUNCIL INVOLVEMENT

We found strong, functioning unions representing worker interests in all of the factories studied. With all of the differences in structures of union organization in the USA, Great Britain and West Germany, there are nonetheless great similarities in the factory institutions for representation of worker interests. In all factories there is a central body for worker interest representation (shop committee/joint committee/works council) whose members are elected by the work force and in which the factory unions are represented; and this body makes collective bargaining with the factory management possible.

In West German factories, the Works Constitution Act forms a basis which gives the works council - depending on its jurisdiction - legal rights to information, cooperation, and co-determination. Measures in the factory generally go through an ordered process of negotiation with the institutions for representing workers' interest in the factory which - in view of the legal co-determination rights and the ban of strikes as a means of carrying out factory conflicts - are under significant pressure to reach an agreement. This system of interest regulation in the factory has contributed to the fact that forms of informal self-regulation on the shop floor, such as we found them in American and British factories, have achieved no great importance in West Germany. The basis of this system is thus also a specific conception of law and the role of the law in disputes within the company. Simple customary rights or the making of precedents are not enough in the German context. The basis upon which a procedure is considered "normal" has to be a formal and written one, which allows

orderly processes in the case of a strike. Cases of arbitration, with procedures regulated by the law, are frequently stipulated for, or the case is heard by industrial tribunals¹⁶. It would, however, be incorrect to assume from this that disputes in the factory are generally settled by external authorities because of such legal regulation. An internal factory agreement in the course of negotiations between the two sides is much more common. The inclusion of external authorities for regulating cases of disputes within the company has never occurred in some factories. In only one factory have several such procedures been handled "outside" in the past.

As in the factories studied in other countries, negotiation agreements and minor agreements between lower level managers and union representatives also take place on the "shop floor" in the German companies. Characteristic differences exist, however, in the orientation of their actions: In the USA, traditionally, it is the central position of the seniority principle which cannot be violated by such agreements; in Great Britain it is the principle of customary rights and precedents; and in West Germany it is the reference to legally-binding factory agreements. The negotiation of factory agreements is thus at the center of interest representation in the factory. Particular interest positions must therefore seek formulations capable of being generalized, and must accept a process in which interests are balanced by central negotiations in the factory. "Restrictive practices", for example, which are not covered by such specifically negotiated arrangements are thus not protected by the works council.

A tradition of demarcation lines other than those set by management does not exist in West German factories¹⁷. The rules and demands oriented toward "protection" are, in the German context, not so much aimed at selection effects of personnel measures as in the case of the USA. In the case of dismissing personnel, the works council is required by law to ensure that the selection is made according to

16 See also Dombois, 1982a.

17 See also Bosch and Lichte, 1982.

socially oriented considerations (such as age, number of children, family and financial situation), but the criteria are not weighted. Above and beyond this, works council policy is aimed at avoiding the necessity of such a selection through measures for securing income levels as well as the overall employment level¹⁸. Added to this in the German context are wage systems which, in comparison to other countries also allow more flexibility for differentiating wages according to the work requirements. They also offer the works council opportunities to change the classification of individual jobs, thereby increasing workforce acceptance of reorganization through a more favorable classification of new job descriptions.

The wage contract negotiations in the American and British companies aim at defining wage rates for job categories which were previously established or contractually agreed to. For the individual employee, his or her wage is determined by the job classification into which he or she is hired or transferred. A wage increase can only be achieved through mobility between the job classifications. In contrast to this, the German contract negotiations determine a structure of wage levels which are agreed to in the regional master agreements. These contract agreements establish the number of and intervals between the wage levels. The wage contracts are traditionally limited to agreements on the rate of increase for "the skilled worker basic wage", i.e. the entry level wage for skilled workers. The assignment of individual jobs to wage levels is not predetermined, but is decided in bargaining at the factory level. On the basis of the master agreements and because of the legal rights of the works council to co-determination, there is considerable leeway for the negotiations at the factory level. The negotiations between the works council and management are carried out in the factory wage commission. Reference to the assigned wage level of similar jobs as well as reference to assigned wage levels of jobs at other plants of the same company do play an important role. But they only form the starting point for plant-level negotiations.

18 See also Dombois, 1976; Schulz-Wild, 1978.

In the West German wage system there are in principle no insurmountable status thresholds. Semi-skilled workers may be assigned to the entry wage level for skilled workers or higher. The works council seeks to bring as many workers as possible into the higher wage levels. Thus the works council of plant BDI attempted in 1979 to change the assignment of all spot-welders from wage level 6.2 to wage level 7.2 (the basic wage for skilled workers). This attempt ended in a compromise with the result that 20% of the spot-welders were assigned to the higher level - with the prerequisite that they master at least seven different spot-welding operations.

This example is also characteristic of practices in the other German companies. It shows that there are actually no job classifications in the American sense, but rather pragmatic clusterings of jobs derived through decentralized negotiation between management and the works council based partially on analytic wage criteria and determined according to considerations of uniformity of wages between the plants. But there is still considerable leeway for bringing in other aspects into the bargaining process.

Finally, because the assignment of jobs to wage levels is specific to each workplace and not to the job category, the possibility arises for wage increases by means of "job design" in each case of production reorganization. This takes place through the reallocation of work tasks according to demands and degree of difficulty. Conversely, there are no wage incentives in the US or British context for the consideration of job design by the unions or those affected. The motivation of the works councils in Germany to raise the pay level of a job is tied to changes in the demands and difficulty of the job; changing allocation of work tasks in the sense of new concepts of labor deployment are thus in line with the traditional wage-related interests as long as they lead to higher paid wage level assignments.

Through the concentration on job design, membership in job classifications within the realm of direct production jobs such as spot-welders, assemblers, and material transporters is secondary and from the point of view of workers, unimportant. We found only few cases where there

was conflict due to the redesign of jobs and where on the basis of occupational interests workers protested against the loss of certain work tasks. Because the employees in semi-skilled jobs hardly identify themselves with their job classification their interest but also their fears in view of technological and organizational changes are directed above all at protecting their level of income.

Trespassing the border lines between jobs which are governed by different wage principles, i.e. direct production jobs and indirect production jobs like quality inspection and maintenance would not be so easy. According to the works constitution act and the various regional wage master agreements the works council has full co-determination rights in all matters concerning the principles of incentive wage determination. It has almost no codetermination right regarding wage determination in the indirect job areas which are paid by straight hourly wages. Thus, the works council keeps a close eye on this border line. But it is more inclined to approve the transfer of job elements from indirect to direct production, i.e. from the straight hourly wage area to the incentive wage area because here it has greater influence. In contrast, the works council would in general resist the transfer of job elements from the incentive wage area into the straight hourly wage area because in this case it would lose its influence on the methods of regulating performance regarding this specific job element. But this interest meets with the new concepts of work management has been developing which state the need to bring back competence and responsibilities into the production organization which had been separately organized as staff functions so far. Thus, management too prefers the transfer direction from indirect to direct work and thereby "enriching" the job content here. Of course, the works council has to take into account reservation and resistance against such organizational reallocation of jobs on the side of the skilled workers and integrating skilled workers into production teams is an controversial issue. Management pushes into that direction because then skilled workers could during waiting time performe some "pick and place" work too. But as experience shows the works council would not be against an integration of skilled workers into unskilled production teams if the wage question could be settled satisfactorily.

As more and more of the specialized tayloristic job classifications became obsolete due to the introduction of new technology the concern of workers and the union for wage and employment security has led to a growing interest in the new forms of work organization based on group principles. Multi-skilled workers would not automatically become redundant if a certain job specialization became obsolete. Also, the formation of work groups, with differing jobs between which group members rotate, offers the possibility for demanding that a group wage level be raised to that of the highest wage level job within the group. This necessitates the acceptance of (previously unpopular) job rotation. Thus it has been co-determination rights of works council involvement in work organization which have furthered the movement towards work integration and the introduction of production groups in West Germany.

SUMMARY AND CONCLUSIONS

As we have seen, the traditional orientations of union policy in the factory have changed considerably in the 1980s. In figure 2 we have distinguished four types of union policy and demands regarding new technology and the organization of work.

Figure 2: Types of union policy orientation at factory level

traditional emphases for demands	new emphases for demands
<p>"protection oriented"</p> <ul style="list-style-type: none"> * no work intensification * no discrimination in the selection of personnel * employment security * securing the wage level 	<p>"prevention oriented"</p> <ul style="list-style-type: none"> * personnel planning * structuring technology and work (ergonomy) * breaks for resting * new training, reduction of working time
<p>"compensation oriented"</p> <ul style="list-style-type: none"> * wage increase (quality circle, etc.) * wage bonuses (e.g. for stress) * social benefits (e.g. early retirements) 	<p>"participation oriented"</p> <ul style="list-style-type: none"> * participation in problem solving * participation in regulating manpower usage * participation in decision decision making

The diagram shows that the emphasis of the demands of the British unions in the 1980s are still oriented toward the traditional areas of protection and compensation. As opposed to this, the union policies in the USA and in West Germany have developed further towards reorganization concerns: in the spirit of an increased "participation orientation" of the UAW and a "prevention orientation" of the IG Metall. The most significant change in factory-level industrial relations is found in the American case. The changes introduced there have been a matter for the staffs and top representatives from the companies and the unions. The impulses and concepts which have arisen at the factory level out of the traditional regulatory forms and practices, and in this sense have come "from below", have been minimal. Nevertheless the changes which were introduced from the top

have also taken root at the factory level in the meantime and have changed factory-level industrial relations. The unions in the factory have largely abstained from developing their own ideas in the framework of the jointly supported "participation oriented" programs. As a result factory-level union policy is rather indifferent or sometimes opposed to joint union-management programs.

In the British context, industrial relations practices at the factory level do not hinder conventional measures of rationalization but have not been conducive to the introduction of new concepts of work organization and participation. The unions generally find themselves being in a purely defensive role in regard to the measures. The loss of employment and the competition between the "sister plants" on the continent undercut bargaining power on the shop floor and increased the pressure for changing factory-level industrial relations. This pressure for change has not meant busting the union, but did involve weakening shop floor militancy.

In West Germany the introduction of new technology and work organization has not caused pressure for changing factory-level industrial relations as it has in the U.S. and Great Britain. Organizational changes and job design are negotiated centrally and decentrally, brought up by the company as well as the union. This corresponds to an orientation of union policy, which, in the course of the 1970s, developed its demands increasingly oriented toward "prevention". The statutory rights of the works council to information and participation have led to the practice of cooperative problem-solving patterns at the factory level in West Germany. At the same time the works council members and union representatives were able to develop their own concepts and alternatives for designing the forms of labor deployment, not least because of the institutions of co-determination. We did not find such an independent profile of union policy at the level of job design in either of the other countries studied. It was possible on this basis to negotiate future oriented arrangements between management and works councils which form a "strategic reserve" for future adaption requirements. With this, the institutions for labor market policy and vocational training have had

the function of a productivity resource for the restructuring process of the 1980s.

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Chapter 3: Team-based Work Organization in German Car Plants - An Account of two Cases

1. Introduction

A new pattern of work organization seems to be evolving in German auto plants based on production groups or teams. The emphasis of organizational measures on the shop floor seems to be shifting away from the individual to the group as the focal unit of production control. Under the influence of the discussions being held

- (a) within the framework of organizational development theory which has focussed for a long time on work in small groups in the USA, as well as
- (b) the development of new production concepts in Sweden with small groups and without the assembly line as the main regulator of work organization, and finally
- (c) the discussion of Japanese production organization and the role of team work in Japan,

team concepts have gained increasing weight in the long-term consideration of auto companies regarding their future work structures.

It does not need to be expounded further here that the group has a central status as a productivity resource in the Japanese system of production. The group, with its possibilities for positive as well as negative sanctioning of its members, forms a basis for the organization of learning and qualification and, also, for ensuring efficiency and individual performance. The Japanese system of production in any event has provided the evidence that decentralization of responsibility can go along harmoniously with efficiency and quality perform-

ance; indeed that there is a positive relation between the two.

The group system in Japan stands in the center of a system of production control which we have described elsewhere as 'Toyotism' (Dohse, Jürgens, Malsch 1984). The essential characteristic is that the control of individual work attitudes towards performance is exercised, not through experts and in a system of rigid regulations and performance targets, but through a system of production control which continuously exerts pressures to improve performance and which is based on the readiness of each worker to step in and aid his fellow worker in order that the group can meet its output quotas, quality targets etc.

Team-based work structures are in a very early phase of their development in German auto firms. So far, there is only one company which has firmly committed itself to the team concept and by now (June 1987) has one third of its hourly work force organized in production teams or production groups. But other companies may catch up soon. In conceptualizations of work organization in factories of the future they all companies seem to give production teams a central role.

The most comprehensive draft of a corporate structure built on work groups with decision-making responsibilities shifted to a great extent to these groups can be found in the agreement between GM and the UAW on the Saturn Corporation in the US. But for several years now, new plants of GM-Europe have also introduced production teams as their organizational center-piece. The following points demonstrate the far-reaching nature of these plans:

1. The integration of the previously separate areas of responsibility for quality control, maintenance and production in one team.

2. The election of a team spokesman by the team members; participation of the team in decisions on selection of new co-workers, on transfers in and out the team.
3. Self-regulation of work within the team area regarding the allocation of work among the team members; input of the team in decisions on work methods, process layout.
4. Shared responsibility in monitoring the budget, in particular monitoring the flow of material in order to minimize inventory (Kanban system); participation in problem analysis, promotion of cost and quality consciousness.

Obviously, there are quite a number of objective and subjective "functional prerequisites" to make these principles workable: for example, changes in the wage system, in the role of supervisors, in attitudes and practices of management as regards the use of human labor.

The plants which implemented the new principles encountered many difficulties. In some cases the introduction of certain principles have been postponed, but overall the commitment to the new approach has not been weakened in those plants so far. (cf. Jürgens, Dohse, Malsch 1984)

At the heart of these problems lies the necessity of a fundamental re-thinking of the traditional mode of labor deployment governed by Taylorist principles. Especially, these principles have become entrenched on the shop floor of production facilities in Western companies. In the attempt to simplify work and make use of cheap labor to the largest possible extent, work structures were created which have become more and more dysfunctional. The results of this traditional organization is discarded now as "overspecialization" and "overstupidification" of labor.

There are too many lines of demarcations between various work functions and related functional worker categories, and by taking the planning and decision-making functions away from the shop floor, work has become degraded there, 'using the hands of the workers only and not their brains'.

In the attempt to overcome these negative effects of Taylorism, production teams or work groups now play a central role. In the following, I will examine two cases of German assembly plants which comprise new forms of work organization. In both cases, group principles play an important role. However, the group function differs substantially in the cases, opening up the issue of how different forms and functions of teams arise in different work environments and in the context of differing corporate strategies and union demands.

This issue of different forms and functions of teams would also be of special interest in a comparative Japanese-German perspective. Although the team and the related work organization lie at the heart of the Japanese production system and its success, thus fostering the diffusion of team principles all over the Western world, very little is known about such different forms and functions.

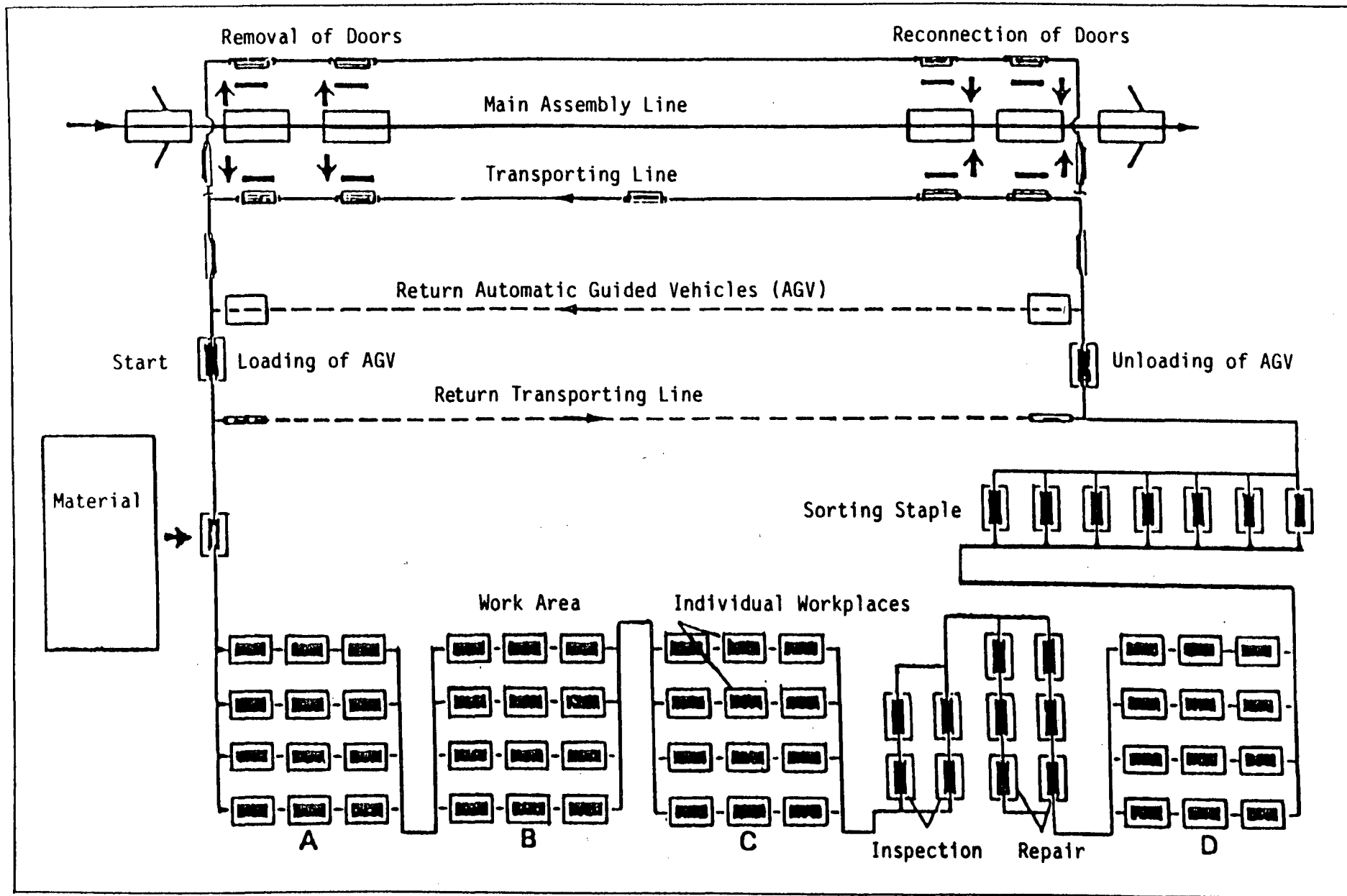
2. Two Approaches to team-based new work structures

Case A:

In the construction of a new assembly line for a new car model, firm A has decided to introduce a modular concept for the assembly of doors. After the cars come out of the paint shop, the doors are taken off the bodies again and

Figure 1.

Schematic Representation of Modular Door Assembly



loaded pair-wise on automated guided vehicles (AGV). The AGVs bring the doors past four different work areas, where they are provided with windows, mirrors, padding, handles etc. Every work area consists of up to 15 work stations and the AGV automatically seeks an empty station. After inspection, the completed doors are returned to the main assembly line and re-connected to 'their' bodies, which in the meantime have been further assembled (provided with seats, etc.). (See figure 1).

Almost all workers working in the new modular assembly unit came from the old assembly line. All door assembly workers are considered to be in one group. They rotate between the different work areas under the direction of a general foreman (Meister). (For a comparison of the supervisory structure between a Japanese and a German plant cf. Jürgens/Strömel 1986).

The division of labor has been reduced, but it has remained limited to the integration of formerly separate assembly operations. Inspection is still a separate activity and does not belong to the jobs among which the production workers rotate. In principle, of course, some kind of self inspection would be quite feasible in this modular set-up. Maintenance and repair of the AGVs have become responsibilities of the central maintenance department and will remain so in the foreseeable future. The two general foremen in the unit also have a quite traditional package of tasks, although they are now equipped with a terminal which - among other things - can tell them where every AGV is and which is used to draw up status reports on the current shift. One completely new job was introduced into assembly operations by the new set-up. There is one engineer per shift sitting in a

separate cabin in the door assembly unit who is responsible for the functioning of the technical system as a whole, i.e. for the data processing links connecting the different parts of the system.

Several considerations could be mentioned to explain why company A chose to introduce this set-up:

1. To ensure efficiency under conditions of greater flexibility in production schedule.
2. To improve working conditions.
3. To develop the grounds for further steps in the direction of dock assembly in other plants of the corporation.

The increasing variety of models creates problems of line balancing, of course not just with doors, but with many other components as well. Such problems can be reduced by modular assembly outside of the main line.

Against the enormous costs of installing the system (140 AGVs have been installed for door assembly alone and the system also uses more space than a conventional line, stand important savings due to higher efficiencies. Some of them are clearly visible, like the elimination of at least 34 door assembly jobs (less waiting and walking, less cycle losses). Others are less visible but not unimportant. With the doors taken off many other activities become easier (require less time) and material can be put closer to the line. In the old system doors were often damaged in the course of assembly operations. With the new system there is less damage and consequently less repair. Also, in the new set-up the worker him- or herself pushes off the AGV after finishing his/her job, which means that there will be less unfinished work and consequently less need for inspection and repair than on an ordinary line.

Another effect of the introduction of this system was to improve the quality of work. In fact, deliberations started with arguments in favor of a modular assembly of the cockpit which on the main line involves a lot of unpleasant overhead work. After it was decided to assemble the cockpit off-line, the modular assembly of doors was a logical extension of that plan. Quality of work is clearly improving with the new system. It allows for much longer work cycles than the continuously moving assembly line. Work cycles in the door assembly area now range between 3.5 and 10.5 minutes.

Also, the AGVs automatically adjust to the level of workpiece (three different heights) to the characteristics of the workplace, i.e. to the kind of work to be done.

The third reason puts the new set-up and the corresponding working pattern in the context of the overall strategy of the corporation with respect to assembly operations. This corporation seems to have made the decision to take the direction of dock production and AGVs worldwide and thus overcome the area of assembly line production and its disadvantages. Case A serves as an experimental ground in that strategy.

Getting away from assembly line production brings up the question of control. Of course, new technology provides new ways to control the workers. Every workplace in the new system has a light which starts burning as soon as the time allotted for the job has been used up. The designer's idea presumably was, that this switching on of the light would be automatically adjusted to the length of time required for the individual doors involved. This system, which would have implied strict control over individual performance, was rejected by the works council. Another proposal by management, to have the lights burning as soon as the longest possible cycle time (10.5 minutes) had elapsed, was also rejected. Instead, it was agreed that the light starts burning after the average

cycle time has passed, over five minutes, which deprives the lights of almost any meaning. But this does not seem to have much importance. The transparency of the layout and the insularity of each workplace makes it visible to both superior and fellow workers when somebody takes a little break before pushing off his AGV. On the normal assembly line it was possible to work ahead a couple of cars and then have a little break of "earned idle time". In the new system the new AGV is constantly waiting and automatically enters your workplace as soon as you push off the one you have just finished. The point is that nobody can see that you have just been working very hard, doing three pairs of doors in record time and now want to enjoy the well deserved cigarette. Thus, the workers do have problems with this set-up more because of the constant intensity of work than because of the intensity itself. The majority of workers who worked under the old assembly line conditions, were quite discontent with the new conditions in the beginning.

Case B:

Firm B has introduced a form of teamwork in its modern body shop, where almost all welding operations have been taken over by an army of about 140 robots and some dedicated machinery. The body assembly line has been divided up into three sections (floor pan welding, under floor assembly, and body assembly), which are decoupled by means of buffers. There is one team in each section which is thus technically and physically clearly separate from the others. The production of sub-groups (for instance side and rear panels, roofs) is also de-coupled and apportioned to separate production teams. Each team is responsible for production, and partially also for maintenance and quality inspection in its section. The interesting new feature of this set-up is the transfer of maintenance and inspection tasks to a production team. Direct and indirect work have been re-divided. Of course, there are still separate departments for

quality assurance and maintenance/repair, but several more or less routine tasks of these departments have been transferred to production. Incidentally, not only the tasks, but also several dozen workers (inspectors) have moved out of quality into production, i.e. they have become direct "productive" workers. The more noticeable aspect of the new set-up, however, is the increase in responsibilities for production workers, which has been made possible by an extended training program.

Teams are not homogeneous like the groups mentioned in our first case. Each team consists of one line foreman (Straßenführer), one or more robot/equipment-monitors (Anlagenbediener), one or more inspectors, several parts loaders and usually some other personnel if required. In the context of the discussion about new production concepts, the tasks of the parts loaders are of special interest. A management representative describes them as follows: "The loaders' tasks basically involves keeping the parts supply silos for the automatic welding systems filled and placing small parts in the magazines and fixtures. In addition, they have a monitoring function to perform in the section of the plant which they can see, with a view to identifying malfunctions as soon as possible or initiating preventive action before they occur. Furthermore, they perform minor repair and maintenance tasks in their areas, for example the replacement of electrode-caps and assisting the line foreman and the equipment/robot monitor or skilled repair staff if more extensive repairs have to be carried out." (Heizmann 1984, p. 111) The line foremen and the robot minders are obviously the more qualified persons on the team. Long before the new production line started up, about 40 skilled workers (Facharbeiter) of the old body shop were selected for these functions. They received about 25 to 30 weeks training. Apart from their responsibilities for production, it is also their task to teach the loaders and encourage them to assist in main-

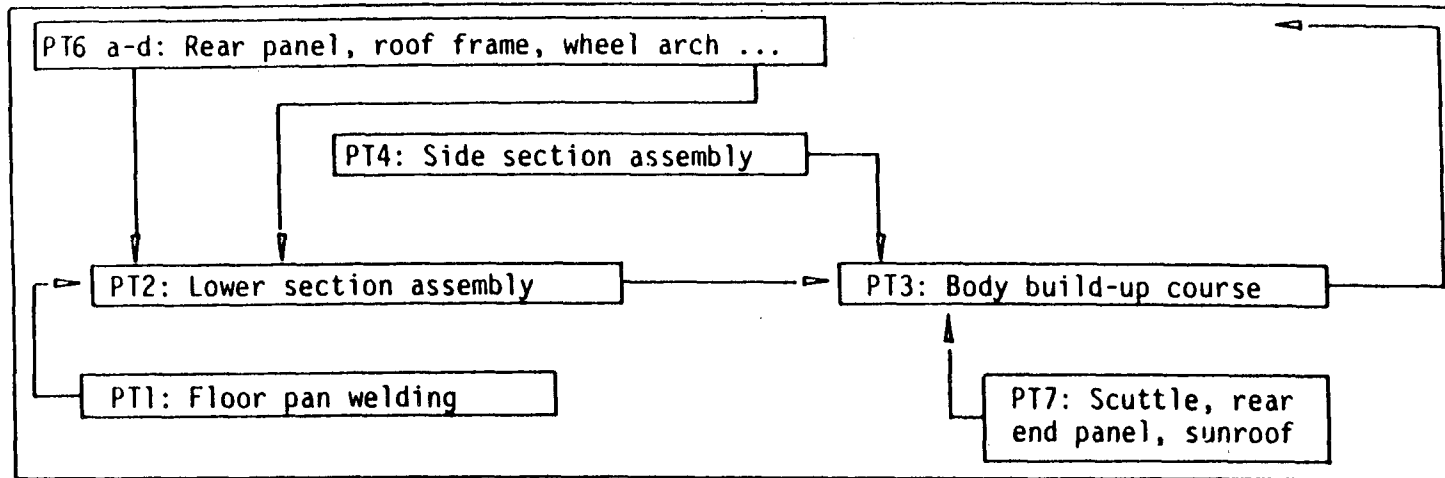
tenance and repair activities. Management's expressed aim is eventually to bring all loaders to the level of installation/robot minders. All robot minders will then be expected to carry out maintenance work as well as loading tasks. Moreover, team members are expected to assist in specialist repair and maintenance work, which is currently carried out by the separate maintenance department, in order to make a further transfer of tasks to direct workers possible. Figure 2 provides a summary of the functions of one production team.

Management's motives for the new set-up are clear: skilled work is mostly needed when there are problems and production comes to a stand-still. Unskilled work (loading) is going on, when the line runs without problems. If both kinds of work are carried out by the same person, it can be expected that the presence of many qualified workers will increase the uptime of the installations, which is becoming an important consideration where capital intensity of production is increasing rapidly.

3. Comparing A + B

Clearly, case A and case B differ widely in terms of work tasks, automation level and the job profiles all of which had to be taken into account when the new working patterns had to be designed. Assembly of the doors is still a manually dominated process with a flat qualification profile of the jobs involved. (Nevertheless, the job design in case A did not even include the job of quality inspection into the task spectrum of jobs which were to be rotated in the groups). The primary purpose of rotation is to enhance transfer flexibility within the system and to avoid rigidities which could evolve from a structure where individual workers could regard certain docks as their proper workplace.

Figure 2. Production Teams in a body assembly shop



Layout of production teams in a bodysHELL assembly shop

- | | |
|--|---|
| <ul style="list-style-type: none"> ○ Loading parts from bins and conveyors into magazines and fixtures ○ Loading silos of parts-feeding fixture ○ Controlling part supply ○ Cleaning the installations ○ Monitoring the production equipment ○ Rectifying malfunctions in parts-feeding fixtures | <ul style="list-style-type: none"> ○ Changing robot welding tongs and checking zero/datum points ○ Checking for wear, renewing and setting up of welding electrodes ○ Maintaining, repairing and renewing water/air hoses of machinery ○ Maintaining and renewing secondary wiring incl. insulation ○ Monitoring and refilling air supply oilers |
|--|---|

Summary of functions in production team

There is no specific meaning to the "group" other than yard-sticking a certain variety of jobs to be rotated among the members of a certain work area. One main advantage from the point of industrial engineering is that the balancing of individual jobs is obtained more easily in this set-up. The "system" shall preclude situations of a "jam", or overload, arising in an individual work station where in Japan the fellow workers would be required to help out.

The "group" in case B clearly has a more extensive meaning than in case A. The impetus is not any longer coming from balancing problems but from the problem of minimizing machine down-times. Of course, the range of qualifications required under these conditions is far wider than in case A, i.e. from pick-up jobs like loading to the jobs of programming the robots and doing maintenance. Thus, there are also skilled jobs (Facharbeitertätigkeiten) encompassed in the system.

There is a steep qualification difference ranging from the skilled jobs to the unskilled jobs of the "parts loaders" in case B. Although the latter do receive some further-qualification, it is not possible to rotate them into the skilled jobs of the team. The same holds true for the quality inspectors and other semi-skilled workers of the team. Thus, the team consists of "specialists" who share the overall team responsibilities but do different work functions. Only in the long run it is expected that by learning on the job within the team and by further-qualification, job rotation between all team members might become feasible. In the meantime, job rotation on a more limited scope takes place between the more skilled workers and their jobs on the one hand and the semi- and unskilled and their jobs on the other.

4. Production groups or production teams - two ideal types

Obviously, the account of the two cases referred to two very different contexts of work of functional necessities and of motives related to work organization. This seems to be a clear distinction between two types of such work organization which, in practice, is often referred to as the "group" or the "team".

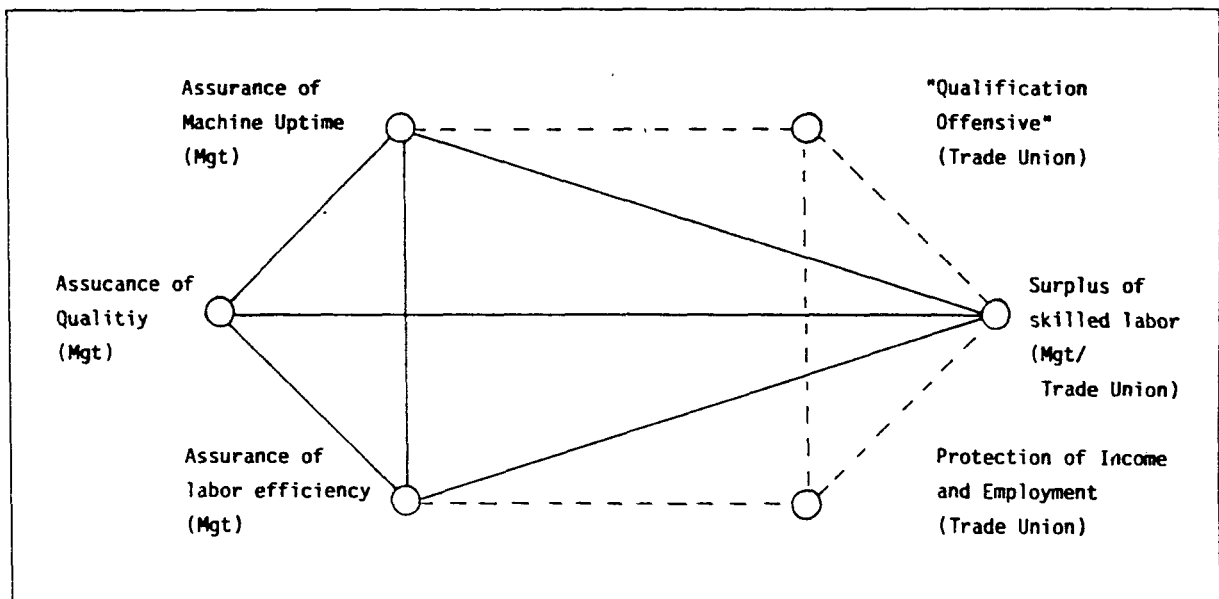
- According to this distinction, the members of a production group belong to a cooperative work unit, which tries to achieve the utmost flexibility of all group members being able to perform all the various functions and jobs within the group area by means of job rotation and further-qualification;
- The members of a production team, on the other hand, belong to a cooperating unit, in which everybody remains specialized to do specific tasks; the goal of universal or multi-skilled workers, able to do all the jobs within the team, may exist under a long-term perspective, but is no immediate concern in this case.

In practice, there are both types of work organization, sometimes evolving even in the same plant. Production groups are prevalent in the areas of production which are still dominated by manual labor like the trim and final assembly areas of assembly plants. Production teams are prevalent in highly mechanized areas, like in the assembly plants, the press and the body shops.

The functional "points of reference" to create production groups are direct labor efficiency, i.e. the problem to balance the work load among the team members, the responsibility of the team for product quality and the flexibility in labor deployment within the team. The scope of different jobs and different qualification requirements is low, the main mode of further-qualification being on-the-job training.

The prevailing "point of reference" for introducing production teams is the assurance of machine uptime. The scope of jobs within the team goes from skilled trades functions requiring specific off-the-job training courses to the new unqualified jobs of parts-loading, etc.

**Functional Necessities and Motives to
Reorganize the Division of Labor in Production**



For a more systematic approach to the various group- or team-based forms of work organization which can be found in practice it is necessary to deal more specifically with the various "points of reference" of each specific case. Each point of reference is related to specific interests or motives to reorganize the division of labor from the point of view of management and of the trade union. Exhibit 1 gives an overview.

In the following I want to discuss each of these "points of reference" briefly:

(1) assurance of machine uptime:

As a consequence of the enormous investments of the auto industry in process technology, problems of manning, labor efficiency and wage costs have become secondary considerations in the areas that are highly mechanized. For example, due to mechanization and automation in the body shop of one German assembly plant which was restructured recently, the hourly personnel working here was reduced from 200 to 25 per shift. They are working side by side with about 150 industrial robots, grouped together in a number of highly complex automated assembly cells. By far the main point of concern of management is to keep these complexes running and avoid machine downtime. The size of the facility makes it necessary that everyone working in the surrounding be responsible to monitor the machines in order to prevent downtime or, if something happens, to fix the problem quickly. In such areas, the differentiation between the direct productive personnel and indirect productive personnel such as quality assurance, maintenance and logistics has become obsolete. Removed from the direct production flow, everyone in this area is serving the machine functions. Vigilance and preparedness to act quickly if necessary is by far more important than making sure that everybody has a full work load at any time.

(2) Direct labor efficiency is still a point of reference for the reorganization of work. However, this holds true only for the still manually dominated

areas of production. Here, problems of manning, of assuring a full work load to everybody at any time, i.e. to assure efficient line balancing, is a growing concern. The main cause lies in the market strategy followed by most of the auto companies nowadays. The attempt to cover the broadest possible range of customer preferences by offering a broad range of products, has led to an explosion of the variations of models and options offered by companies in recent years. According to the statements of management representatives, this model and option complexity is even greater in Western companies than in Japanese auto companies.

The problems of model and option mix accumulate in the areas of trim and final assembly especially. The variation in job content from work unit to work unit may be 30% and more. The manning level required to cope with high option models will thus be "underdeployed" whenever low option models come along. So far, even the most advanced computerized systems cannot make sure that the preplanned sequence of work units in the actual production flow can be maintained. Thus, preplanned line balancing to assure a stable work load and labor allocation remains futile.

The higher manning level required to cope with model mix problems in the area of trim and final assemblies are still an important cost factor. Around 40% of the hourly wage costs to produce a car stem from the assembly areas. Thus, there is high pressure to cope with these costs, and reorganizing work to assure more flexibility of labor is a contribution to this end.

- (3) The assurance of quality is a third point of reference for reorganizing work. One of the most important consequences of the "learning from Japan" - movement within Western management at the beginning of the 1980s has been the fundamental change as to the approach to quality problems resulting from production. It has been understood that there is a relationship between the degradation of direct labor and the amount of quality inspection and repair work necessary in production. The reduction of quality inspection as a separate indirect job category and its transfer back into direct production has been the starting point in many cases to introduce production groups or -teams to let them self-regulate quality assurance in their area (Qualitätsregelkreise etc.).
- (4) With unemployment rates in some labor market areas as high as 20%, there is growing pressure on the labor market since the beginning of the 1980s which enables companies to recruit workers with skilled trades' certificates for unskilled or semi-skilled jobs. In addition to that, the internal apprenticeship programs of the companies have been expanded to allow a greater intake of new apprentices for labor market reasons, and especially because of union demands. The graduates of these apprenticeship programs (a three to three and a half year state-controlled qualification program which is the prerequisite for the formal status of a "skilled worker" in the German system of occupational qualification) can no longer be absorbed by the skilled trades departments (maintenance etc.). Therefore, they, too, are now assigned to production

jobs in most cases in German auto plants. The resulting surplus of skilled labor is not a functional point of reference per se, but it is an incentive, a seduction for management to reorganize labor. It makes possible the recruitment of skilled workers for jobs in direct production and - as the German system of wage differentiation is based on the actual work and not on the qualification and potential of the worker - to pay these workers accordingly. The labor market has thus effected a devaluation of the costs of skilled labor and the German companies have been profiting from this effect. The rates of skilled workers with certified metal- or electrical/electronic occupations employed "under value" in direct production ranges between 30 and 50% in auto plants situated in economically depressed regions. There are other plants, though, situated in urban regions which have rates of skilled workers employed in direct production of around 10 % and below.

The loading up of semi-skilled jobs with skilled workers in German production plants is an important prerequisite to allow for new forms of work organization transferring skilled workers' functions to direct production workers. At the same time the under-status deployment of skilled workers creates pressure to structure work in a way that suits skilled workers' aspirations and demands for satisfying and qualifying work. Management must foresee that as soon as the labor market pressure is reduced many of those well-qualified or skilled workers in production might quit to look for other jobs outside the company. (Generally, there is no discrimination

against mid-entries in German firms).

Regarding the regional distribution of plants with more or less commitment to the concept of production teams the surplus of skilled trades on the regional labor market seems to be one of the main explanations.

There are two "points of reference" supporting work reorganization which result from the policy of the trade union and the institutionalized interest representation (Betriebsrat) in German plants: the demand for qualification and further-qualification and the demands for income and employment protection in case of technical and organizational restructuring. As mentioned before, the wages are tied to the actually performed jobs. Thus, a broader range of different jobs performed within a team or a group will protect the individual worker in case "his job" becomes less demanding due to technical or organizational changes and it enhances his job security in case his job becomes eliminated. Thus, labor union representatives regard group or team work with job rotation and correspondingly higher qualifications for each group member as protection against downgrading and job loss. Thus, team or group work has become an arena of work organization measures in which management, trade union and works councils find common terrain, although there are many controversies as to the details (Jürgens et al. 1986). Of course, the trade union and the works council would prefer the introduction of work groups which would upgrade the lower-ranking workers to the level of the highest qualification and wage group included into the team. Management

would prefer production teams with shared responsibilities but specialized work tasks and differentiated wages.

A particular concern for the union in this respect is the question of "residual work". This term relates to the new unqualified work functions like parts-loading, simple machine-tending and pick-and-place work which constitute a large share of the jobs remaining after automation. These work functions are often regarded as evidence of a polarization of qualifications resulting from "technical progress". The occupational structure before restructuring of the plants was dominated by semi-skilled production jobs, such as in the body shops of auto plants, welding, soldering etc. . After the restructuring the amount of control tasks, such as machine monitoring etc. increased (from below 5% to more than 30% in the case of two German assembly plants which were restructured recently), and at the same time, the amount of residual work functions increased from nearly 0 to 40% and more of the new jobs. These new unqualified work functions have to be seen as temporary, as mechanization gaps which will be filled probably by future mechanization measures. Now, an important point for job design from the perspective of the union is whether "residual functions" of the new work set-up are integrated with the more qualified of the system or are just bundled together as residual jobs and thereby residual workers are created - with low income and low job security. Job rotation that incorporates residual jobs thus constitutes a means of protecting employment.

5. Summary and Conclusions

There is a growing awareness of the necessity to "deTaylorize" work structures in German auto companies and the concepts of production groups or production teams play a central role in the considerations towards new production concepts. The scant information which exists about new forms of work organization in other industries indicates similar developments in the electrotechnical industry.

Certainly, one important impulse for these new considerations is the shift from manual labor-dominated production to heavily mechanized and automated production structures. Here, new forms of work organization focussing on the necessity to assure machine uptime are evolving - very much remindful of a similar development in the process industry (chemical industry etc.) a decade and more ago. (Cf. Kern/Schumann 1984). But the formation of production groups or -teams is not restricted to areas of high mechanization and automation. A fundamental change towards the organization of quality assurance in production and the problems of model-mix connected to the market strategy of "flexible specialization" (cf. Sable/Piore 1985) are causing a reorientation with respect to work organization in the manual-dominated areas of German auto plants, as well.

With respect to manual-dominated areas, the shift to group- or team-based work structures in several instances in German auto plants went along with fundamental changes in the production lay-out, such as eliminating the conveyer belt as the traditional backbone of work organization. With this measure, a whole world of new possibilities for restructuring work is opened, carrying new challenges and opportunities for workers and management. This leap into new concepts of production lay-out which is regarded as complementary to new forms of work arrangements like production groups or -teams by many German experts, does not seem to be welcomed by the Japanese.

The recent trend in Germany of increasing team or group-based production concepts and of personnel policies which make greater use of the labor potential of the work force - on the foundation of a surplus of skilled labor - seems to indicate a convergence of work organization principles between German and Japanese plants. But with the trade union and works councils developing their own concepts and demands related to new forms of work organization there seems to be a greater variety of approaches in practice. Introducing new forms of work organization thus becomes a subject of bargaining, controversies and "labor politics".

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