Training issues for the European automotive industry

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Provides an overview of the results of an investigation carried out for the European Commission. Aims to identify themes and issues in the field of continuing training in the European automotive industry. A large number of interviews were carried out in all the major car manufacturing countries of Europe, and a series of case studies were done on training projects funded by the European Commission within the framework of the FORCE programme on continuing training. Shows that training has become a key element in a far-reaching process of restructuring which is currently under way in the industry. Identifies major fields of interest including training for new work structures; training for co-makership; and new methods and approaches for learning while working. Larger numbers of people are trained than ever before, especially in production. Claims an increasing use of information technology (expert systems) for training is being signalled.

Journal of European Industrial Training
20/8 [1996] 31–36

[ISSN 0309-0590]

In 1992, the European Commission reached an agreement with the Japanese government about the gradual lifting of import restrictions on Japanese cars until the year 2000. As part of its efforts to support the industry in its preparations for the intensification of competition, the European Commission has ordered an investigation into the training needs of the European automotive industry. Among other things, the investigation involved an analysis of training projects supported by the European Commission under the FORCE programme on continuous training. As a result of this investigation, several new training projects have been defined by enterprises, which have been submitted for support under the new Leonardo Da Vinci Programme of the Commission. This article provides anoverview of the issues and themes in the field of training as they were identified in the investigation[1-8].

Restructuring and human resources

The European car manufacturers and their suppliers are engaged in a wide-ranging process of modernization, adaptation, and reassessment of their operations. Intense global competition, new standards of best practice, rapid technological change in both product and process technologies, shifts in consumer demand, and increasingly severe regulations concerning safety, fuel efficiency and emissions are exerting tremendous pressure on all parties involved. What is distinctive about the current phase of restructuring is the growing emphasis on innovation in the areas of human resources management and organizational design. Technological change is obviously still a very important issue, but it is now widely recognized that the mastery of technological change and the effective implementation of new technologies requires flexible organizations and skilled and motivated personnel. What differentiates enterprises is in the end not so much technology, but the human resources that enterprises have at their disposal and the way these resources are utilized.

The industry is moving away quickly from the dated models of mass production. In the past, relatively simple organizations built large numbers of identical cars on the basis of a strict division of labour between various functions. In the course of time, cars became more complicated and the number of models and variants multiplied. As a consequence, the manufacturing organizations became similarly complex. Large bureaucracies came into existence in order to control and co-ordinate these complex organizations. The resulting cost structures were opaque and difficult to control. Today, the industry is trying to find a way back towards simpler organizations, while maintaining a broad range and a large variety of models.

The Japanese car manufacturers, and especially Toyota, have developed some organizational innovations and management techniques, which have enabled them to lead the global industry in productivity, quality and flexibility. Today, it is widely recognized that these organizational innovations, more than any specific technological advantage, were responsible for the great competitive successes of Japanese industry during the past decades. All European car manufacturers and many suppliers are currently undertaking efforts to implement "Japanese lessons" in one way or another. Just-in-time logistics, total quality, total productive maintenance, quality circles, *kaizen* or continuous improvement, simultaneous engineering, co-makership, and lean production are only a selection of the many names under which these Japanese innovations are being taught. As a result, the industry is changing rapidly. Both the internal organization of enterprises and what can be called their "external" organization, i.e. the competitive structure of the industry, the relations with suppliers, and the organization of distribution, are affected.

In order to realize these structural changes, it will be necessary to invest in training in new skills, training in new attitudes, in new forms of co-operation, and in a new entrepreneurial culture. It is also becoming increasingly clear that this will not be a one-time exercise. Although there is currently a need for additional training to support and facilitate the restructuring process in industry, there will be a continuous need for further training in the new work structures. Continuing training is a precondition and a consequence of continuous improvement. The industry of the future will be much more training-intensive than the industry of the past.

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Three clusters in the field of training

The various issues and themes of training currently under discussion in the industry can be grouped into three "clusters":

1 Training for new work structures in:
   - production;
   - research, development and engineering; and
   - the global corporation.
2 Training for co-makership.
3 New methods and approaches for learning-while-working.

Training for new work structures in production

New work structures in production are characterized by the introduction of various variants of teamwork, job rotation and multi-skilling, the transfer of inspection and maintenance tasks to direct production workers, self-regulation and the elimination of hierarchy on the shopfloor, continuous improvement schemes and new logistics (just-in-time). Technological change is continuous, but mainly incremental as far as process technology is concerned, certainly in comparison to the quantum leaps made in automation in parts manufacturing (flexible machining centres), welding (the body shop) and assembly in the early 1980s (robotics).

Training for new work structures in production aims on the one hand to improve the skill level of the workforce by emphasizing the need for every worker to master several skills (polyvalence) and to cope with new process and product technologies. On the other hand, training aims to enable workers to function as team members and to contribute and adapt to new forms of leadership. Training, finally, also aims to enable workers to understand and analyse the process in which they are working and to develop and implement ideas for improvement.

Experience with teamwork has brought a new issue to the fore: the need for a new kind of leadership, especially at what is called the middle-management level

Experience with teamwork has brought a new issue to the fore: the need for a new kind of leadership, especially at what is called the middle-management level. If workers are to work in self-regulating groups; if they are to be encouraged to be creative and make suggestions for technical and organizational improvements; if they are treated as experts instead of "hands", then they must receive the necessary freedom of action, the time and space to take on such responsibilities. In other words: they must be "empowered" and this requires that managers learn to share and delegate power, to trust and coach their personnel, instead of simply giving orders. The capacity of middle management to adopt such attitudes has been overestimated. There is widespread agreement now, that this will require a considerable (re)training effort and, in quite a few cases, people will have to be replaced because they are unable to take on the new role.

Continuous improvement is an effort that impacts on the whole enterprise and not just on production. Nevertheless, most activities under this title have focused on production and sometimes involve considerable training. Often, this training is part of the general training for teams. Training for continuous improvement is specific, where it provides insight in the workings of specific processes. It is generic, where it provides workers with tools for the analysis of problems, instils different attitudes towards the organization, and helps people to deal with, and even support, continuous change.

There are considerable differences in the meaning of teamwork between different enterprises and countries. In Germany and The Netherlands, there is a tendency to associate teamwork with relatively small groups of workers (up to 15 persons), who are in charge of a clearly identifiable part of the production process. Typically, such groups have not only production tasks, but also some "regulating" tasks (planning of work, vacation planning for personnel, etc.), which gives them a certain measure of autonomy. The new organizational units in the car plants of Renault and Fiat can be much larger (60 employees and more) and cover sometimes unconnected parts of the production process. There appears to be less emphasis on "complete tasks" and internal cohesion, and more on effective leadership of the unit leader. The unit leader at Fiat is the manager of a "micro-factory" inside the factory, whereas in the small groups at Opel or Volkswagen, the team leader (or spokesperson) does not necessarily have hierarchical powers.

The training needs associated with different concepts of teamwork must be quite different. In practice, however, these different needs hardly become visible in systematically differing levels of training activities. Besides that, there is a strong general trend towards higher educational requirements for the workforce. The car manufacturers everywhere have tended to hire large numbers of highly trained people, if they were available. This was especially the case in the new greenfield plants, which were often located in regions with high unemployment. Whether these high levels of initial education are actually needed is open to debate. A large part of production work remains relatively simple, short-cycled work, and it is not obvious that a highly qualified workforce will be satisfied with this kind of work. In the absence of alternative job opportunities in the region, levels of open discontent may remain low. Alternatively, discontent could generate pressures for larger job contents and further innovation in

work structures, as it did 20 years ago in the Swedish car industry.

Of course, teamwork is not just an issue in the large automobile plants, but also in the automotive supplier industry. Here too, the role of middle management is considered of crucial importance. In fact, in many of these medium-sized enterprises, middle management is the only layer left between the operational level and the leadership of the firm. A FORCE project contracted by motorcycle producer Ducati (Bologna) has generated a quite innovative product in this problem area (cf. [6]), which relates training needs to the requirements for communication within (new) work structures. The employees concerned are involved directly in the analysis of problems and bottlenecks in the communication processes in their enterprise. A multimedia software package has been produced, which enables them to analyse, in an structured way, the company's communication structure, its deficits and the related training requirements. The software package is called "organizational climate", underlining that communications are analysed from the perspective of the organization as a whole, and not just of primary operational requirements. Another feature of this project has been the heavy involvement of Italian trade unions, both in actual product development (through a union-related training organization) and in the implementation of organizational-climate software and subsequent debate over training needs in the participating enterprises.

Training for new work structures in research, development, design, and engineering

New work structures in research, development, design, and engineering are rapidly moving to the centre of attention in the industry's restructuring efforts. The basic problems to be tackled are, on the one hand, the negative effects of specialization according to technological disciplines in product development departments (resulting in over-engineering), and, on the other hand, the need to improve communications between product development and production departments. Both problems result in long lead times and frequent delays. The main notions with which these problems are attacked are "multidisciplinary project teams" with strong project managers and simultaneous or concurrent engineering.

Nowadays, there is a widely felt need to bring specialists together in multidisciplinary product development teams. By forcing specialists to communicate and explain themselves to each other, a better and earlier compromise between various technological requirements can be ensured. Several organizational measures have been developed to ensure improved and early communications between product development and production. Representatives of the manufacturing department become members of product development teams at a very early stage. Moreover, process engineering starts already during the later stages of product development (simultaneous engineering), giving additional impetus to development to stick to its time schedules and set technical parameters for process engineering and also for external development of outsourced parts.

Training needs in relation to these organizational changes are clearly recognized, but there appears to be only limited interest in co-operative training projects with other manufacturers in this field. The relevant training is expected to reveal too much confidential information, or the issues involved are considered too enterprise-specific for co-operative ventures. This is especially the case for co-operation between car manufacturers. Co-operation between manufacturers and suppliers is a quite different case. In fact, the expression "simultaneous engineering" is nowadays used more often for co-operation between assemblers and suppliers than for the co-operation between different functional departments of one enterprise.

From this perspective, the FORCE project STAPLE (State of the Art in Project Leading in Europe) was particularly interesting, because it involved training for project management in small and medium-sized enterprises. The project was motivated by the fact that suppliers are increasingly involved in product development and need to participate in development teams. The project endeavoured to make a state-of-the art description of industrial project management in the European automotive industry, analysing the different national and enterprise cultures as well as the roles of different actors (project managers, product development managers, engineers and technicians). It was recognized that successful project management requires not just a well-trained project manager, but also adequately trained team members. Team members require training in project planning and control tools as well as in communication skills, when a functional structure of the organization is replaced by a project approach. The project also showed that the project organization is increasingly becoming a tool for managing interfirm collaboration. Managing the interfaces between different project organizations (within assembler and supplier companies) and learning and co-ordinating working methods used in different countries are areas where the training needs are greatest.

Training for new work structures in the global corporation

Although the industry has already considerable experience with multinational

operations, the growing intensity of global planning and interaction, for instance in product development, requires new attitudes, new methods of international communication and new capabilities (knowledge of other cultures and languages) on the part of an increasing number of employees. This is also true for an increasing number of supplier firms, which are asked to supply foreign plants and at the same time are drawn into product development teams. Language courses are only the first step in a sometimes lengthy learning process. Exchanges of personnel between plants in different countries are expected to help to shorten the learning processes appreciably.

Training for co-makership

The tendency to increase outsourcing of parts and components involves more than a simple change in the balance of make-or-buy decisions. Responsibility for the development of a growing number of components is also shifting from the car manufacturers to the suppliers. At the same time, suppliers are under tremendous pressure to improve quality, decrease costs, and improve their flexibility and speed of delivery. The main suppliers have to acquire much more development know-how and technological expertise than they needed in the past. Know-how often needs to be transferred between the car manufacturers and the suppliers. Close co-operation with, and indeed membership of, the product development teams of the car manufacturers is necessary.

It should be noted that knowledge also flows from suppliers to assemblers. The FORCE project "Training to accompany the organization of human resources in a vehicle production project", contracted by Renault, aimed to develop a model for early planning of training for individuals involved in new vehicle projects (cf. [4]). The project was based on the assumption that technology transfer is needed from suppliers to assemblers, when a new technology is involved. When a new component is introduced, "human resources benchmarking" of the component will indicate what know-how needs to be present at Renault and if necessary transferred from the supplier. Renault is concerned about maintaining its core competences as a car designer and assembler and its capacity to control the total quality of its products.

Most manufacturers meanwhile have set up various programmes for supplier development, mainly aimed at cost reductions and quality control. Citroën, for instance, has developed a so-called "one-piece flow" production management system, which aims to organize and control manufacturing flows in close accordance with user demand at any time. Training of the suppliers in the one-piece flow management system is seen by Citroën as a first step towards total quality management. An investigation of the effects of the various supplier development programmes of the German manufacturers showed that their results varied between programmes. Cost reductions were more often realized than quality improvements, according to the suppliers questioned. The programmes used by Mercedes Benz (Tandem) and BMW (POZ: *Prozeßoptimierung Zulieferteile*) were considered most useful by the suppliers[9].

Training needs for co-makership have been explored in two FORCE projects co-ordinated by Lucas Heavy Duty Braking Systems (cf. [8]). The first of these linked projects was aimed at putting into practice the concepts of strategic sourcing in conjunction with Lucas suppliers across Europe. The second was directed towards the development of a structural approach towards continuous improvement processes for individual companies which would support strategic sourcing. Lucas established a series of "technology teams" for specific commodities such as rubber products, springs, castings, etc. These teams visited each of the potential co-maker suppliers to carry out an indepth study of the business. The teams were cross-functional and included representatives from purchasing, quality, design, and manufacturing engineering functions. The members of these teams received special training to acquire the skills needed for the new-style relationship with suppliers. Improvement criteria were established with each supplier in order to achieve mutually established goals. Cross-site visits were arranged with supplier staff spending time, often many days, at Lucas, and vice versa. Joint training programmes were established where need was identified. An international suppliers symposium was held in December 1993, where Lucas and its suppliers reviewed the subject of strategic sourcing and the methodologies used so far. In a next step, the technology teams began to interact directly with the people actually making the product or component, rather than continue with the ineffective practice of quality departments talking only to quality departments. This created a forum for root-cause analysis of any problem and real-time solutions to be established and monitored. By targeting actual defaults in the system or product, and by monitoring preventive actions agreed, the new practices became far more penetrating than the previous supplier-quality-assurance approach could realize. To realize the continuing benefits of this continuing project, the activities outlined above have been supported by major reorganizations within the businesses involved, especially in the manufacturing arena and the support interfaces. A quality manual for suppliers to Lucas has

been developed and supplier quality departments have been established at all Lucas Braking Systems sites across Europe. These centres provide a focus for supplier development activity across the business and ensure that improvement activity is effectively shared throughout the supply chain.

New methods and approaches for learning-while-working

It is now widely agreed that people will have to continue learning during all of their working life. There is no reason to assume that this continuing learning will have to be off-the-job learning. On-the-job learning will become more important, not just in the old form of apprenticeship training, but as a regular feature of every job. Since new work structures involve training for the total workforce, there is a great interest in multiplier systems to cope with large-scale qualification needs. This may involve the introduction of new methods using new technologies, but also the definition and expansion of teaching tasks for senior personnel.

Rover and Ford, among others, have installed so-called "open learning centres" in some of their manufacturing plants. These learning centres feature individual workstations, where people can take various computerized courses. The use of interactive CD (CD-I) and other multimedia systems is increasing rapidly, providing course writers with completely new opportunities to combine sounds, moving pictures and text.

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Possibilities for interaction with the student (e.g. by touch screen) allow for flexible modularized courseware, which individual workers can adapt to their needs and abilities. Located close to the production lines, the open learning centres allow for off-the-job training during part, or all, of the working day without the worker being totally out of reach in case something serious happens. Citroën and Peugeot have also developed new teaching modules for individual use: "Personal Initiative for Training", as well as "Expert Textbooks", which are distance learning modules in topics like diesel technology, electricity, accounting, etc.

Information technology is not just used as a medium to transfer expert technical knowledge, but also as a means to collect and organize knowledge available on the shopfloor. This appears to be a rapidly expanding area of interest for personnel and training management. Tacit knowledge, often based on years of experience, has always played an important role on the job floor. With rising quality standards and increasing job rotation in teams, it is of the utmost importance that all workers are aware of all the "tricks of the trade", which moreover need to be continuously revised in view of changing products and new technologies. Software has been developed, which allows the people in the enterprise to build up a knowledge system mapping all relevant knowledge about processes and machinery in the enterprise. By entering information into these systems, workers learn about their own knowledge, making it more explicit. Using the system for training and information purposes allows for a rapid diffusion of practical knowledge to all workers concerned. The Dutch manufacturer of aluminium components, AMEFO, is currently implementing a knowledge system of this type. The system consists of a large number of modules, one for each part, machine or process, which can be updated regularly. Apart from these specific modules, each of which will be needed by only some of the operators, an introductory module provides the operator with an overview of the knowledge and training material available. Using this introductory module, an operator can select relevant modules together with his or her supervisor.

It is characteristic of these computer-based training tools that they can be used for training of new workers, but at the same time as support systems for ongoing operations. They help workers to get started in a new job, but they also assist in making learning-while-working explicit and communicable. In this context simulation models of production processes also can play an important role. Software for the simulation of production processes was developed under the label "Job Shop" within the framework of a FORCE project contracted by Isvor Fiat, Fiat's training organization. Its first implementation was aimed at the management of body welding operations. As a "computer-based learning environment" Job Shop provides decision makers with new opportunities for learning through conceptualization and experimenting with new practices, which would be difficult or impossible to test in real installations. The simulation exercise also provides for the development of complex cognitive skills in the team members who support the head of the operating unit in dealing with line bottlenecks and interruptions on the line. In that sense, it also fosters a shared understanding of complex organizational processes and systems. As a "decision-making support system" Job Shop gives the manager the ability to create a replication of the system he is responsible for, and to generate information on how it behaves under different conditions: different levels of machine utilization, production volume, speed of the conveyor, number of work stations in queue, etc. In other words, it enables the manager to analyse an operating system without disturbing it.

The large-scale outflow of older and experienced workers in the framework of rationalization measures has hightened the need to take good stock of the experience available on the work floor. On the basis of such stock taking, it can be foreseen if there is a threat of an "experience gap" opening up and early training and learning experiences for younger workers can then be organized. Methods of career planning, which have hitherto been applied mainly to managerial staff, are now also applied to skilled workers and even to semi-skilled workers. Skill matrices and individual training plans, including job rotation, are increasingly being introduced as part of the regular functioning of production teams. New methods for individual as well as group evaluation, and for the recognition and compensation of learning performance, have also been developed and/or have become an issue for collective bargaining. As a consequence of these changes, the role of personnel departments is also changing. The recognition of the strategic importance of human resources management has resulted in a more prominent place in the corporate organization and in the provision of more resources to develop concepts, methods, and systems. This expansion of the planning and development tasks of central personnel departments is accompanied by a decentralization of the execution of new personnel management, with various tasks being devolved on foremen, team leaders, and the teams themselves.

Where emphasis is shifting from off-the-job learning to on-the-job learning and learning while working, the role of training departments is also changing from a "teaching provider" to a "consultant in matters of training and organizational change". These changes are also becoming visible in a different, more independent status of training departments. Isvor Fiat is an independent company, which is responsible for training in all parts of Fiat, but also supplies services to outside customers. Volkswagen too has recently combined all its training activities in a new company, Volkswagen Coaching GmbH. As noted in the UK case study of FORCE projects contracted by Lucas Heavy Duty Braking Systems, the Lucas Training Centre at Cwmbran (South Wales) is functioning as a fully independent business unit, providing training services not only to Lucas but to other automotive and non-automotive enterprises in the region.

Conclusion

There exists a broad consensus in the European automotive industry today that organizational development and the related training are key issues that need to be tackled in order to improve the competitive performance of the industry. Compared with the situation a decade ago, the focus of management interest has shifted away from technology and towards human resources as the basis for competitiveness. A large number of training programmes have been initiated, but most observers agree that much more still needs to be done.

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