Lean Production Assessed by Karasek's Job Demand–Job Control Model

Roel Schouteten and Jos Benders

Economic and Industrial Democracy 2004 25: 347
DOI: 10.1177/0143831X04044831

Lean Production Assessed by Karasek's Job Demand–Job Control Model

Roel Schouteten and Jos Benders
Radboud University Nijmegen

Comments on the quality of working life (QWL) under lean production have varied from devastating criticism on the one hand, to eulogistic praise on the other. These contrasting positions can be related to researchers' opposing societal stances and resulting interpretations, which are reinforced by the methodologies used and the absence of an external framework to judge QWL. Using Karasek's job demand–job control model, the authors investigate a Dutch plant operating under a lean production (LP) regime in an attempt to resolve the controversy. The jobs in this plant can be placed in Karasek's quadrant of low job demands and low job control, which means that antagonists of LP are right in claiming that the work is monotonous and repetitive, while the advocates' claim that workers have sufficient job decision latitude also holds.

Keywords: job control, job demands, lean production, quality of working life

Introduction

In the late 1970s, the competitive strength of some Japanese companies fuelled a large number of studies into their success. The focus was on the closely related topics 'quality circles', 'total quality management', 'just-in-time' and the 'Toyota Production System'. A second wave of publications was initiated by the book *The Machine that Changed the World* (Womack et al., 1990). The authors advocated 'lean production', a term coined by Krafcik (1988). This researcher was affiliated to a research project designed to compare the performance and organization of car manufacturers around the world. The main findings were that Japanese manufacturers performed better than their 'western' competitors, and that the basis

Economic and Industrial Democracy © 2004 (SAGE, London, Thousand Oaks and New Delhi), Vol. 25(3): 347–373.
DOI: 10.1177/0143831X04044831

for this superior performance could be copied. This message was primarily meant for American and European managers. They responded enthusiastically to the calls for adopting Japanese-style manufacturing, and at the same time the number of Japanese transplants in the USA and many European countries increased considerably during the 1980s. Thus, in the direct way of Japanese investment and the indirect form of emulating Japanese-style working, employees in many countries were confronted with novel conditions. The ample availability of research sites close to home led to an abundance of empirical work on 'working under lean production' by American and European researchers.

Unsurprisingly, Japanese authors were their predecessors. In a first wave of attention to what was to become known as 'lean production', the Japanese journalist Satoshi Kamata worked under cover in Toyota factories in Japan (see Kamata, 1986). He criticized Toyota harshly for long working hours, constant pressure to improve, hard physical working conditions combined with a lack of ergonomic measures, unsure employment for the extensive temporary staff and the tight company control of worker dormitories, to name but some aspects. In another early publication on the Toyota Production System, four Toyota engineers took the opposite view. Not surprisingly, they praised their company's production system for its 'humanization'. They defended the view that avoiding waste means that essentially superfluous and thus meaningless work is eliminated so that employees may only perform useful work. In addition, they stressed various ergonomic measures (Sugimori et al., 1977).

Throughout the last three decades, scholars and unionists have intensively discussed the pros and cons of working under Japanese-style conditions. The polarization in the debate, as already present in the opposing stances of Kamata vs Sugimori et al., has never been overcome, and has perhaps even been reinforced. In this contribution, we aim to contribute to resolving (at least part of) the controversy by using an external framework, namely Karasek's job demand–job control model.

In the next section the two key notions of this article, quality of working life and lean production, are discussed and related to each other. We then identify three key issues in the debates on quality of working life under lean production. To further the debate, we then discuss an external framework and position the arguments of LP proponents and opponents therein. Subsequently, the method-

ology and empirical results are presented, respectively. We summarize and discuss our findings in the concluding section.

Lean Production

Following the publication of the book *The Machine that Changed the World* (Womack et al., 1990), lean production (LP) became a management fashion (Kieser, 1997; Hamde, 2002). As a typical fashion, LP, as introduced in *The Machine that Changed the World*, was kept relatively ambiguous (Kieser, 1997) and thus lends itself to many interpretations (Ortmann, 1995). As Benders and van Bijsterveld (2000) showed empirically, LP became fashionable in Germany especially and a considerable variety of organizational changes were advocated under this popular banner. This further inflated the already ambiguous term 'lean production', as had happened to other management fashions such as total quality management (Easton and Jarrell, 2000) and empowerment (Wilkinson, 2002; Psoinos and Smithson, 2002). A broad understanding of LP is meaningless for our purpose, as it includes a wide variety of working situations and a host of measures with potentially contrasting effects on jobs. To be meaningful, this needs to be narrowed down. Thus, instead of the generic everyday use of 'lean production', we use the term LP in a more restrained and clearly demarcated sense: just-in-time manufacturing as pioneered by Toyota Motors.

For specialists on car manufacturing, *The Machine that Changed the World* contained little news: as the authors themselves point out elaborately, LP was pioneered within the Japanese car manufacturer Toyota Motors (Womack et al., 1990: Ch. 3), and this firm's Toyota Production System had already been the topic of a considerable number of publications (e.g. Sugimori et al., 1977; Schonberger, 1982; Monden, 1983; Shingo, 1983; Ohno, 1988; Toyota, 1992). The Toyota Production System has been largely or selectively adopted by mass producers of passenger cars. For the sake of simplicity, one can say that Toyota's Japanese competitors started adopting the system after the oil crises of the 1970s; American manufacturers felt forced to follow suit in the 1980s, and the publicity around *The Machine that Changed the World* induced the majority of manufacturers in European countries to catch up.

As all other firms, Toyota has many different functional areas, including product development, supply chain management and

manufacturing. As far as the core of this article's interest, the final assembly area, is concerned the Toyota Production System is characterized by so-called 'line production': car bodies along work stations which are placed in the sequence that operations have to be carried out. The ideal is that the products move without interruption along the line. The operation cycle per work station, or 'takt time', tends to be short, typically between one and two minutes at Toyota, yet varies with the requested output levels. Intra-line buffers were traditionally seen to hide quality problems and therefore were relentlessly reduced or preferably eliminated. For this to operate, all manifested and potential disturbances must be weeded out. To ensure that, all operations are standardized and a continuous improvement system is in place to persistently enhance quality and efficiency levels. Just-in-time delivery of parts and finished products is striven for to avoid producing unsaleable items and incurring unnecessary inventory carrying costs.

Quality of Working Life under LP

The sharp contrast between the critical account of Kamata on the one hand and the eulogy by Sugimori et al. on the other, as related in our introduction, has been frequently reiterated in the literature on the Toyota Production System and Japanese management techniques in general. Around 1980, Japanese management practices gained considerable attention in the US (Vogel, 1979; Schonberger, 1982) and the UK. Japanese-style management became a focal point of attention in these two countries, where the substantial increase in Japanese transplants created possibilities to study the system close to home for American (Kenney and Florida, 1993; Fairris and Tohyama, 2002) and British (Oliver and Wilkinson, 1992; Morris et al., 2000) researchers. LP advocates Womack et al. wrote that the system:

> . . . transfers the maximum number of tasks and responsibilities to those workers actually adding value to the car on the line, and it has in place a system for detecting defects that quickly traces every problem, once discovered, to its ultimate cause. (Womack et al., 1990: 99)

This suggests complete jobs with tasks of varying natures and difficulties, considerable workplace autonomy, interaction potential and considerable information provision. The critical tone set by

Kamata was influential and his work was used by, among others, the German authors Dohse et al. (1985) and by Delbridge et al. (1992). In the UK in particular, where the Marxist-oriented labour process approach flourished (Elger and Smith, 1994), critics pointed to intensive worker surveillance, heightened responsibility and accountability, the harnessing of peer pressure (Sewell and Wilkinson, 1992), and never-ending work intensification through *kaizen* or continuous improvement (Conti and Warner, 1993; Malloch, 1997). Although certainly not absent (Parker and Slaughter, 1988; Fucini and Fucini, 1990; Graham, 1995), the critical tone was less dominant in the US, which was the source of many management books which applauded the economic benefits of Japanese management techniques and pointed to positive effects on QWL. A balanced account was given by Klein (1991). On the basis of three case studies, she concluded that the just-in-time regime which led to the elimination of intra-line buffers reduced worker autonomy with respect to work pace, and to more monotonous jobs. Worker autonomy was also affected by the extensive use of standard operating procedures (SOPs). In contrast, Klein saw autonomy enhancement in the possibility to come up with improvement suggestions which often result in changed SOPs. Adler and Cole (1993) also stressed enhanced autonomy in the form of worker involvement in improving working conditions, an aspect which was absent in the hitherto prevailing 'Tayloristic' production systems. Yet as Conti and Warner expressed it on the basis of UK cases, the 'labour process in the visited sites is contradictory, with employees working four hours a month in a very non-Taylorist manner to make their work for the rest of the month even more Taylor-like' (Conti and Warner, 1993: 39). In other words, non-routine tasks only make up a small percentage of total working time, with the effect that the remainder of this working time becomes even more routine. In terms of the difficulty of work, jobs consist of easier and more difficult tasks, yet the proportion of both appears unbalanced. This proportion of non-routine vs routine tasks is related to the classical contingency factor (Sorge, 1991: 165) of 'output characteristics' such as batch sizes and product variety (Benders, 1995). The monotony signalled by Klein (1991) and Conti and Warner (1993) will be more prevalent the smaller the product variety is and the larger batch sizes are. Thus, monotony is not just a function of the way of organizing but also of the prevailing output characteristics (Sorge, 1991: 165; Benders, 1995). These two factors are closely

related, however, as LP is typically applied under 'repetitive manufacturing' (Young, 1992): large numbers of fairly identical products ('variations on a theme') are made for a long period. The monotony in tasks, together with an intensified pace of work compared to 'conventional mass production' as existed in western factories prior to the implementation of LP-inspired changes, is likely to be a main cause of musculoskeletal disorders (Landsbergis et al., 1999: 110, 116; Brenner et al., 2004). In addition, in their elaborate overview of empirical studies on the impact of LP and 'Related New Systems of Work', Landsbergis et al. (1999) also found that in the auto industry, where in final assembly repetitive manufacturing is typically the norm, LP created heightened work paces and changed requirements of workers. As far as operational tasks are concerned these changes concern aspects such as heavier workloads and increased discipline through the strict observation of SOPs, while the effects on non-direct tasks are reported to be mixed (Landsbergis et al., 1999: 117–18). If and when workers are involved in *kaizen* activities, this leads to needs for higher problem-solving skills which may be judged either positively (employee participation and job control) or negatively (cognitive demands). Furthermore, *ceteris paribus, kaizen* leads to routinization and standardization (see Conti and Warner, 1993) and therefore increases monotony. Therewith, paradoxically, higher demands in the sense of involvement in job design through changing SOPs leads to lower demands in the operational activities. It thus does not come as a surprise that empirical work in Canadian and UK 'lean' car assembly showed limited employee autonomy (Babson, 1995; Lewchuk et al., 2001; Yates et al., 2001).

Extensive 'on-the-job' instruction and training, 'multiskilled' and thus versatile workers and symbolic egalitarianism have been pointed out as yet other improvements on the then existing status quo. From a Japanese perspective, Morita (2001) drew attention to similarities between Japanese work units and self-managing work teams, more or less the contemporary hallmark of a good quality of working life, suggesting that both forms differ less than commonly assumed.

Issues in the Extant Literature

Overall, there appear to be several general problems in the existing research. In the first place, societal orientations (Burrell and

Morgan, 1979) influence the positions taken. The debate was coloured heavily by ideological positions, ranging from uncompromised and single-sided heralding of the economic but also social advantages of Japanese management techniques to magnifying their presumed exploitative nature without any eye for potentially positive effects for the quality of working life. As Besser stated about proponents and antagonists: 'Toyotists see exploitation where the welfare corporatists see empowerment' (Besser, 1996: 20). They may be seen as 'interpretative communities' (Fish, 1980) which judge the same situation by different norms.

Second and relatedly, many publications were not empirical and to the extent that they were, participant observation was the dominating research method. With few exceptions (Besser, 1996), participant observation leads to negative ordeals about the quality of working life. Whereas this research resulted in rich insights into 'shopfloor reality' the drawback is that participant observation easily leads to reinforcing interpretations that match pre-existing societal orientations. Despite the abundance of empirical research on LP, only few studies use validated research instruments to measure QWL under LP (Landsbergis et al., 1999).

Third, as our overview makes clear, different elements of LP have different consequences on QWL (Landsbergis et al., 1999; Parker, 2003: 629). To complicate matters, like LP the term QWL is broad and potentially ambiguous. Discussions on QWL are still taking place within many academic disciplines: 'To mention but a few, industrial engineering and ergonomics, industrial and organisational psychology, sociology, cognitive science, applied physiology, medicine, and epidemiology all have insights to offer that inform the discussion' (Landy, 1992: 121). In addition, the ideas about, and the focus on, QWL changed with the rise and decline of different approaches, such as scientific management, human relations movement and humanization approaches. These approaches advocate a variety of goals to reach and consequently measures to take to improve QWL. Many aspects have been studied, with some changes being seen as positive, others as negative and yet others having positive and negative sides.

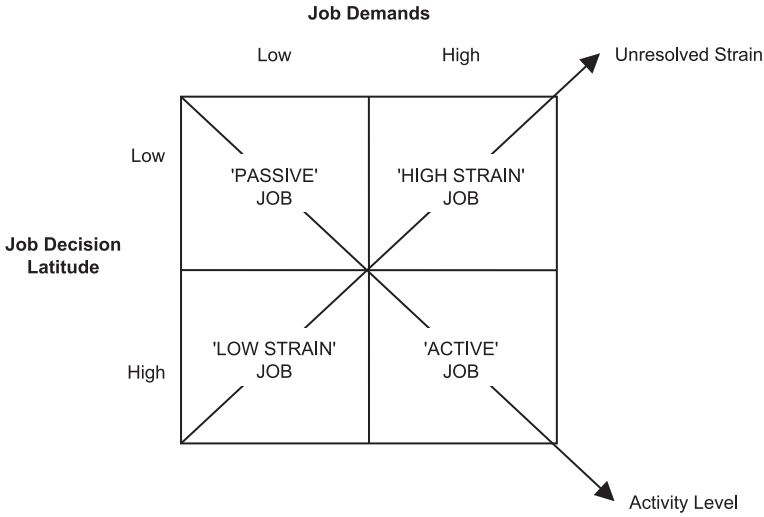
The first issue cannot be resolved by empirical research. Different societal perspectives lead to different norms against which situations are judged. At best, academic debates may benefit from clarifying the differences in perspective so that different judgements on empirical findings can be related back to fundamental varieties in

societal viewpoints. Applied to LP, there will probably always be antagonists and proponents with different societal orientations. However, it should be possible to advance their mutual understanding by using validated research instruments (Landsbergis et al., 1999) which must (1) focus on particular elements of QWL, and (2) be derived from an external framework (Parker, 2003). This allows and forces one to concentrate on a limited number of key dimensions, and can act as an explicit frame of reference according to which LP jobs may be classified.

An External Framework

As argued, there are many discussions from various perspectives on defining QWL. In discussions on determinants of QWL, three different perspectives can be recognized: (1) job characteristics, (2) worker characteristics and (3) the fit between job and worker. Schouteten (2001) showed empirically that from these three, job characteristics are the most important determinant of QWL. Job characteristics can be subdivided into four dimensions of working life: job content, work (or social) relations, terms of employment and working conditions (van Hoof and Huiskamp, 1989). In literature on QWL, job content is generally considered the key aspect (see Hackman and Oldham, 1980; Karasek and Theorell, 1990). Here, Ashby's (1969) 'Law of requisite variety' implies that control capacity should be located where the need for control arises. Jobs should incorporate the decision latitude which is necessary for job holders to solve the problems that may occur. This idea is found back in Karasek's (1979) balance between job demands (control need) and decision latitude (control capacity). Figure 1 presents Karasek's Job Strain Model.

This Job Strain Model claims that job strain results from the joint effects of the demands of a work situation and the range of decision-making freedom (discretion) available to the worker facing those demands (Karasek, 1979). As a result, this model follows a conditional approach in which environmentally based variables determine QWL. Therefore, this model is suited as an external framework to judge QWL in an LP setting. Important job characteristics in achieving the balance between control need and control capacity are the 'wholeness' of the work process, responsible autonomy and the worker's multiplicity of skills (Trist and Bamforth, 1951).



Source: Karasek (1979: 288).

FIGURE 1
Karasek's Job Demands–Job Decision Latitude Model

This means that 'good QWL' is operationalized as a job consisting of complete tasks and sufficient control capacity to deal with control needs conclusively. Complete tasks consist of a coherent set of executing, preparing and supporting tasks with varying levels of difficulty. Hacker (1989) uses the term *Vollständige Arbeitstätigkeiten* (complete tasks or functioning activities) to describe this kind of work: it appeals to various types and levels of skills and knowledge. Following this conditional approach, we define QWL as the extent to which job characteristics offer opportunities to create a balance between control need and control capacity (Karasek, 1979; Molleman et al., 2001).

Karasek's model allows one to position LP antagonists and advocates as far as job demands and job control are concerned. Figure 1 summarizes the types of jobs that result from different combinations of job demands and decision latitude. The authors on LP mentioned earlier may be placed in different quadrants of this diagram. The antagonists emphasize high job demands and strain in the operational and the structural sphere. Operationally, the demands result from (1) tightly regulated tasks (through SOPs and the absence of buffers) and (2) a high work pace. Structurally, demands result

from the factual obligation to participate in continuous improvement (CI). In addition, CI is criticized as workers may only suggest improvements, but are not allowed to decide themselves about their implementation. In both spheres, then, the critics may be held to argue that LP jobs should be classified as high strain jobs, which are characterized by high demands and limited decision latitude.

LP advocates portray the jobs quite differently. While not denying that jobs are demanding, this is held to be beneficial as an antidote to the proverbial statement 'workers are not supposed to leave their brains at the factory gate'. In line with this, CI is held to be a mechanism through which meaningless tasks may be eliminated (Sugimori et al., 1977), leading to the elimination of what Karasek would call 'passive jobs'. In addition, CI is seen as an effective mechanism to change one's working situation and therewith a structural form of job decision latitude. LP advocates then favour a portrayal of LP jobs as being active ones in Karasek's terms.

Methodology

Karasek's stress management model has a high level of abstraction. Its key parameters, job demands and job control, were measured based on several items in the 1972 US Quality of Employment survey. While Karasek's reasoning is applicable at the micro level, macro measures adopted in the 1972 study are not suited for conducting workplace studies. To allow for such work, research instruments have been developed.

Operationalizing our definition of QWL requires measuring control need and control capacity (job characteristics) at the micro level. In addition, as argued, important job characteristics in achieving this balance are the wholeness of the work, which must thus also be measured. Finally, outcome variables, such as job satisfaction, commitment, health and inclination to change jobs, are included as controls (do the job characteristics lead to bad outcomes?).

When knowing what to measure, the question arises as to how to measure these variables. In general, there are two ways in which any concept can be measured: objective and subjective (see, for example, Frese and Zapf, 1988). Mostly, observer or expert ratings are called objective, and questionnaire data subjective. However, these terms are misleading. Frese and Zapf define objective as the reporting of social and physical facts, that is not influenced by a particular

individual's cognitive and emotional processing. Subjective in this sense is tied to one specific individual's perception. However, according to Christis (1998), it is impossible to report any facts without cognitive or emotional processing. In line with constructivist reasoning, he argues that objective data do not exist as all data are gathered through human observation capacities, which by definition entail cognitive and emotional aspects. According to this reasoning, expert ratings are not objective but may be seen as an instrument to reach intersubjective agreement between experts' ratings. A questionnaire, in contrast, does not strive for intersubjectivity but assesses employees' views on different aspects of their jobs. Important, however, is that respondents and users are aware of the underlying concepts of the instrument in use. According to Frese and Zapf (1988), the wording of an item is important in communicating these underlying concepts to the respondents or users. This applies to questionnaire measurements as well as observer (or expert) ratings.

Both measurements generate useful information, each for its own purposes (see Schouteten, 2001: 57–68) and both data sources may be used to complement each other to validate the findings. As a result, we used two methods for measuring job content (control need and control capacity) in this study: an expert rating and a questionnaire. Moreover, in the questionnaire we added outcome variables (as indicators of QWL) as a check (control variable) on the effects the job has on the worker.

Observer Rating

The observer rating used the so-called 'WEBA method' (Vaas et al., 1995). Hacker's concept of complete tasks and Karasek's balance between job demands (control need) and decision latitude (control capacity) were combined in a list of seven characteristics of 'good jobs':

1. Completeness of the work: besides the primary executing tasks, a job should contain preparing and supporting tasks.
2. Difficulty of the work: a job should contain a variety of difficult and easy tasks. The criterion for difficulty is the variety and level of mental processing needed to complete the job. The level of education is not important.

3. Monotony of the work: the job should consist of non-monotonous tasks. Monotonous tasks are defined as short-cyclical tasks that repeat themselves within 90 seconds and take up a great proportion of the daily tasks.
4. Workplace autonomy: the worker should be able to decide upon work pace, order and methods.
5. Interaction potential in the work: the ability to ask direct colleagues for help with problems.
6. Presence of organizing tasks: the ability to ask superiors or other departments for help with problems.
7. Information provision: the worker should get enough information with respect to the work to be done (What? How? How much? When?). Furthermore, this information should be on time, complete and reliable.

In WEBA, an observer or expert (familiar with its background) confronts problems in the work (control need) and opportunities to deal with them (control capacity) with each other. In these seven characteristics control capacity is visible as the sum of workplace autonomy, interaction potential and organizing tasks. The confrontation between control need and control capacity results in a so-called 'profile of well-being', a bar chart indicating the risks per job concerning well-being at work (see Appendix 1).

Questionnaire

The questionnaire used is an extended version of the NOVA-WEBA questionnaire. It is based on the same theoretical background as the WEBA method and it measures the same seven characteristics as the WEBA method, but it is filled out by the workers themselves, instead of an expert. This questionnaire was developed in order to overcome one of the main drawbacks of the WEBA method; the latter is very time consuming and, hence, very expensive. The NOVA-WEBA questionnaire generates results more quickly and is much cheaper, but the results may be different: WEBA offers more detailed job information interpreted by experts, whereas NOVA-WEBA offers a fast but less thorough indication of risks as reported by workers. The latter way presents fewer risks concerning QWL than the first, but both ways complement each other and validate each other's findings (see Schouteten, 2001: 57–68).

The results of initial tests on reliability and validity by the editors of NOVA-WEBA were positive. Based on 1602 respondents in a representative sample of the Dutch workforce, reliability of the scales and validity of the questionnaire were proved sufficient (Dhondt and Houtman, 1996). However, there is a slight difference between WEBA and NOVA-WEBA regarding the measurement of the difficulty of the work. WEBA investigates whether a job contains a variety of easy tasks (that rely on routines) and difficult tasks, whereas NOVA-WEBA investigates whether tasks are considered to be too difficult. Hence, the results on this scale show whether the workers think that the work consists of difficult tasks. As a result, there is a difference between the two measures regarding difficulty. We believe that the questionnaire invokes socially desirable answers (by asking whether the workers should pay attention to their work). Therefore, we only use WEBA for measuring difficulty.

Next to these NOVA-WEBA variables we added measurements of the outcome variables. We used the following scales as outcome variables, derived from other frequently used questionnaires in the Netherlands:

- Satisfaction with job content (based on van der Parre, 1996);
- Need for recovery (derived from VBBA; Vragenlijst Beleving en Beoordeling van de Arbeid [Questionnaire on Perception and Judgement of Work; van Veldhoven, 1996]);
- Brooding about work (VBBA);
- General job satisfaction (VBBA);
- Inclination to change jobs (turnover) (VBBA);
- Commitment (VBBA);
- Health/physical reactions during the work (derived from VOS-D; Vragenlijst Organisatie Stress – Doetinchem [Questionnaire on Organizational Stress – Doetinchem; see Kompier and Marcelissen, 1993]);
- Feelings/emotional reactions during the work (VOS-D).

Case Study

The case study was conducted at Giant Europe Manufacturing B.V. (GEM), located in Lelystad, the Netherlands. This is the only European manufacturing plant of this Taiwanese bicycle brand. It assembles about 300,000 bicycles a year, mainly for the European

market. At the time of the case study in 1999, GEM employed 177 workers, of which the majority (approximately 150) worked in the manufacturing department and the others in the office. Management perceived turnover of personnel as problematic at that time, because as a new organization in that region it was difficult to find suitable personnel, due to a shortage of aptly educated workers in that region. As a result, GEM also hired temporary workers. More than 90 percent of the workers have primary or secondary (vocational) education.

According to the management philosophy, the company is operated based on principles such as just-in-time, total quality control, total productivity maintenance, standardization of work processes and 5S-management (Kammeraat, 2000). These principles are characteristic of *kaizen* management and a lean production structure. While the GEM factory is substantially smaller than the average car assembly plant, this is not problematic for our purpose. What matters are the 'output characteristics' at the shopfloor level. The relationship between output characteristics and organizational structure is a classic contingency argument (Burns and Stalker, 1961; Sorge, 1991). At the shopfloor level, the following output characteristics are relevant for job content (Benders, 1995):

- Product range: number of different products produced;
- Product variability: changes within the product range over time;
- Production volume.

In the case of car plants and GEM, assembly work is characterized by (1) a limited product range, whereby most of the variety may be characterized as 'variations on a theme', (2) low variability, i.e. the same kind of product(s) is/are produced for a substantial period, and (3) substantial volumes. GEM produces around 1000 bicycles a day in two or three batches per line per day. As a result, 'takt time' is short, variability low and volumes high. These output characteristics make the work repetitive in nature.

Lean Production at GEM

Since management philosophy is characteristic of a lean production structure and this factory is mostly an assembling facility (frames are imported from Taiwan), the central department is assembly.

Not only technically, but also geographically is this department the central one, because it is located in the centre of the production hall. All supplying departments are situated around these lines and deliver their products just-in-time to assembly. In this assembly department about 75 workers assemble the different parts to complete bicycles on three parallel assembly lines. Two of these lines are identical and the third is being used for experimenting (prototypes) and training of new personnel. There are also employees who pre-assemble handlebars and luggage carriers. All these parts, along with others such as lamps, breaks, gears, chains, chain wheels, sprocket wheels, cranks and pedals, are assembled on the assembly line where every employee has a fixed position and adds the same parts to every bicycle that passes slowly on a conveyer belt. Assembling 1000 bicycles per day on two lines means that approximately every minute one bicycle is assembled, resulting in a short 'takt time'.

Information about when and where how many output units must be delivered is supplied by the planning department. The information for the assembly lines is supplied through stickers or tags on the first bicycle of a batch (number of bicycles in the batch, materials to be used) and the last one (compare the *kanban* system, see Sugimori et al., 1977). The workers use this information to check their materials and resources. The planning department coordinates the activities in the different departments to guarantee the timely and appropriate supply of frames and different parts to the assembly lines. Generally, all workers at the assembly lines (and other departments) receive just enough resources for the products to be assembled. Every worker must check these resources according to the guidelines in the SOP. This SOP also contains information about the operations for every specific bicycle.

The quality of the products is guaranteed by constant quality checks. Every worker (in every department) is allowed, and in fact expected, to remove all products that do not meet the quality requirements. Moreover, every worker must stop the assembly line or process, by pulling a red rope, whenever problems occur. The assembly line stops immediately, a light starts flashing, and the worker, the team's trouble shooter or the team leader must fix the problem. If problems repeatedly occur, a definitive solution must be found and the line is out of order as long as it takes to find that solution. According to management philosophy these solutions must be devised where the problems occur. In this

bottom-up approach of continuous improvement every worker can and must bring up improvements and adjustments of the work processes. Management uses the principle of 'plan–do–check–adjust' to enhance a continuous improvement culture in the organization. The ultimate solutions to problems and adjustments of the work processes are recorded in the SOPs. Such adjustments, major as well as minor, to the SOPs occur approximately once a month. As a result, the SOPs are also subject to continuous improvements. In this way continuous improvement enhances product quality and work process efficiency levels.

As stated before, some parts undergo a pre-treatment in one or more other departments. The other departments are warehouse, paint street and wheel building. Taiwanese suppliers provide frames and fore forks. These are first stored in the warehouse, where they are checked on quantity and quality (strength and straightness). From the warehouse the frames go to the paint street. There, workers put the frames to a conveyer belt that runs through the wet paint robot and the oven. The painting and drying are automated processes. After drying, workers glue stickers onto the frames, after which the frames are ready for assembly. They receive their materials and resources just-in-time from the warehouse, they work at fixed positions and follow SOPs. The necessary information is provided on tags on the first and last frames or forks in the batch. The workers are also responsible for the quality; after the frames have dried the lacquer is checked several times and in several ways.

There is also a department that pre-assembles the wheels. On four identical machines, spokes, shafts, wheel rims and tyres are assembled to wheels. Every machine is manned by a team of two or three people responsible for (the quality of) their own output. In addition to the production facilities, there are a quality assurance and a technical (engineering) department that support the production departments.

In conclusion, the production departments assembly, paint street and wheel assembly are subject to a typical LP regime: the production system can be characterized as 'line production', 'takt time' is short, there are no intra-line buffers, operations are standardized through the use of SOPs, a continuous improvement system is in place, and materials and resources are delivered just-in-time. Within these three departments the workers are grouped in teams, each team representing a department. Every team has a team leader and one or more so-called 'trouble shooters', team members with

additional responsibilities regarding fixing problems. These job levels per team differ regarding the amount of tasks at fixed positions along the line and responsibilities towards management and co-workers.

The three departments have approximately 120 employees out of a total of 177 working in GEM's factory (April 1999). They account for 63 respondents to the questionnaire (response rate over 50 percent), of whom 51 are co-workers. There was no systematic non-response. These data are used in the next section.

Quality of Working Life at GEM

Coinciding with the definition of QWL we use in this article, the results of the audit can be presented in different ways. First we present the results of WEBA, second the results of NOVA-WEBA, and finally the results of the additional scales of the questionnaire, such as the outcome variables.

WEBA. We used the WEBA method to judge 26 jobs in the entire organization. For this analysis we use only three. We present profiles of co-workers (representing about 100 workers), trouble shooters and team leaders (each representing approximately 10 workers) in the assembly, paint street and wheel assembly departments. The reason for this is that the characteristics of the tasks in the three departments are very much alike, resulting in similar profiles of well-being. As a result, the profiles presented do not represent jobs, but job levels of similar jobs in different departments. The resulting profiles of well-being are presented in Appendix 1.

For co-workers, the jobs are short-cyclical and completeness is limited. This means that the workers do the same short-cyclical executing tasks during a large part of the day. Team leaders who have more responsibilities and extra trouble-shooting tasks score more positively regarding completeness and short-cyclical tasks. The difficulty of all jobs is limited. This can be explained by the fact that most tasks are routine tasks which are repeated frequently. According to the theoretical assumptions of WEBA, this means that there are limited possibilities for the workers for personal growth and development.

With regard to the balance between control need and control capacity the profiles of well-being show that workplace autonomy

is limited for all jobs. This means that there are problems in the work that cannot be dealt with by the workers themselves. However, in most jobs organizing tasks are sufficient to solve all problems. This means that, eventually, all problems can be solved by asking for help from superiors or other departments (in fact, many problems can already be solved by asking for help from colleagues or the team's trouble shooters; this is labelled as interaction potential). So, although workplace autonomy is limited, the balance between control need and control capacity is rather good, due to good interaction potential and sufficient organizing tasks.

Finally, the profiles show that information is well provided. This means that information is timely and accurate and does not lead to problems.

NOVA-WEBA. The results of the NOVA-WEBA for the same three job levels, as shown in Table 1, show, more or less, the same trends as the WEBA analyses. More concretely, these results show that the work for most of these jobs is short-cyclical. The co-workers report limited completeness and a high level of short-cyclical work. The work of team leaders and trouble shooters is less short-cyclical and more complete. All job levels report problems concerning difficulty. As argued before, this scale is slightly different from the WEBA concept of difficulty and we believe that the questionnaire invokes socially desirable answers. Therefore, we stick to the WEBA analysis regarding difficulty.

These results also show that for team leaders and trouble shooters there are few problems regarding interaction potential, organizing tasks and, though less so, workplace autonomy; these scores are lower than .5 on a scale from 0 to 1 (0 indicating no risks, 1 indicating high risks). This means that for these job levels control capacity is good. For co-workers there are problems regarding workplace autonomy and organizing tasks. However, there are few problems regarding interaction potential. This means that co-workers have problems in solving the problems themselves (workplace autonomy) and in getting help from superiors or other departments (organizing tasks). However, in many cases interaction potential (help from trouble shooters or team leaders) is sufficient to deal with problems. As a result, control capacity is rather good.

Finally, for all job levels, there are few problems regarding information provision. This also coincides the WEBA analyses that information is timely and accurate.

TABLE 1
NOVA-WEBA Scores for Three Job Levels in Assembly, Paint Street and Wheel Assembly

Job	Co-Worker	Trouble Shooter	Team Leaders
N	*51*	*5*	*5*
Completeness	.490	.371	.100
Short-cyclical	.825	.667	.333
Difficulty	.494	.711	.867
Autonomy	.536	.467	.133
Interaction potential	.183	.100	.067
Organizing tasks	.523	.120	.080
Information	.298	.527	.182

Note: The mean score for each scale varies between 0 and 1. A low score (close to 0) indicates no or only few risks with respect to that scale, a high score (close to 1) indicates high risks.

In conclusion, the results of the questionnaire data coincide with the WEBA analyses that showed that job content is hardly challenging (short-cyclical and routine tasks), but that there is enough control capacity (mainly in the form of interaction potential) to deal with problems.

Other scales in the questionnaire. In addition to the WEBA and NOVA-WEBA analyses, we used scales to measure outcome variables. Table 2 shows the scores for all respondents on these variables.

Table 2 shows that the scores on the outcome variables are rather low. This means that the respondents report few problems concerning the effects the job has on their emotional and physical well-being. The only rather high scores are on the scales 'need for recovery' (.47), 'satisfaction with job content' (.49) and 'commitment' (.42).

The score on 'need for recovery' can be explained by the fact that the work in the factory is physically exhausting due to the repetitive short-cyclical work. This is in line with the conclusion of Landsbergis et al. (1999) that intensified work pace and demands as a result of LP may lead to physical exhaustion, and even to musculoskeletal disorders. This can explain the rather high scores on 'need for recovery'.

The score on 'satisfaction with job content' indicates that not all respondents are very satisfied with the job content they encounter

TABLE 2
Questionnaire Scores for all Respondents in the Assembly, Paint Street and Wheel Assembly Departments Regarding Outcome Variables and the Fit between Work and Worker ($N = 63$)

Variable	Mean score
Perception of job content	.490
Need for recovery	.466
Brooding about work	.143
Job satisfaction	.238
Commitment	.419
Inclination to change jobs	.290
Health/physical reactions	.090
Feelings/emotional reactions	.298

Note: The mean score for each scale varies between 0 and 1. A low score (close to 0) indicates no or only few problems with respect to that scale, a high score (close to 1) indicates a great many problems.

in their work. Especially with regard to the possibilities for personal development and knowledge development the respondents report rather low satisfaction. Moreover, regarding the short-cyclical and repetitive work and limited possibilities to determine one's own tasks, the respondents also report limited satisfaction. This score on 'satisfaction with job content' correlates with the rather high score on commitment (Pearson correlation coefficient between 'satisfaction with job content' and 'commitment' is .58, $p < .001$). The score on 'commitment' indicates that many workers are not very committed to the job and the organization. This may indicate that these respondents are not very satisfied with their jobs and may already be looking for other jobs (the scale 'inclination to change jobs' scores .29, indicating that some workers are thinking about changing jobs). However, the scores on the other outcome variables do not verify this conclusion, because of the rather few reported problems concerning the effects of the jobs on the employees' well-being. Nevertheless, it may indicate some problems management is not yet aware of.

These results regarding job satisfaction coincide with Karasek's (1979) findings with regard to job dissatisfaction in 'passive' jobs (see also Figure 1). According to Karasek (1979: 298), job dissatisfaction is highest among workers in 'high strain' jobs and lowest in 'active' jobs; in 'passive' jobs, it is somewhere in between. The

results in our study show that the workers are not very dissatisfied; however, they are not satisfied, either. Therefore, this confirms Karasek's results.

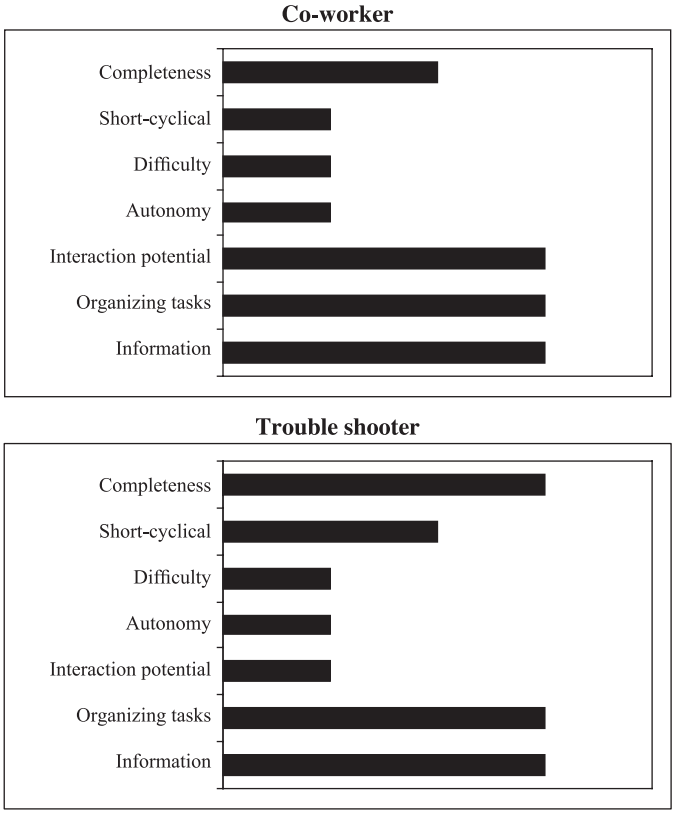
Conclusions

The relationship between LP and QWL has been hotly debated. Some argued that working under LP was detrimental for workers, while others emphasized positive aspects. Among the reasons for the different judgements are contrasting societal perspectives (Burrell and Morgan, 1979), reinforced by qualitative research, the ambiguous and thus multi-interpretable ambiguous definitions of both LP and QWL, and the lack of an external framework supported by validated research instruments (Parker, 2003). While not all of these issues can be completely overcome, we argue that it is possible to further the debate by concentrating on job control and job demands (Karasek, 1979), as far as QWL is concerned, and working in final assembly lines under repetitive manufacturing (Young, 1992), which is characteristic of LP as operated within Toyota Motors. We conclude that job control is low, which also holds for job demands. The low incidence of disturbances at the line means that operators have few problems to solve. Thus antagonists of LP are right in claiming that the work is monotonous and repetitive, while the advocates' claim that workers have sufficient job decision latitude also holds. Somewhat ironically, this is not because of continuous improvement but because of the routinized work and thus low occurrence of operational problems to be solved. Conti and Warner's (1993) observation that continuous improvement in practice does little to improve job decision latitude as such activities make up a minor proportion of total working time also holds in our case. That could be different elsewhere, if and when work is less routinized, i.e. when output characteristics are more dynamic (Benders, 1995). Product variety (the number of products at a certain moment) and variability (changes in product variety over time) mean that production lines must be installed, reorganized and/or (re)balanced, which creates higher job demands.

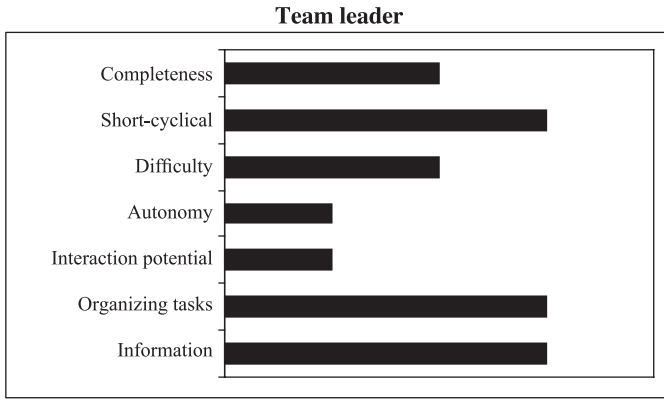
In a similar vein, our findings on job satisfaction and intention to resign are important. Many assembly workers reported rather low job satisfaction and commitment, yet relative to these levels reported intention to resign seems low. Most likely, the meagre labour market

prospects play a role here: assembly workers tend to have few formally recognized skills, e.g. diplomas, which are essential for finding higher qualified jobs. Many workers may either acquiesce in their situation or simply see no alternative. Low intention to resign is thus not necessarily a testimony to LP's attractive working conditions, but may be caused by the absence of good opportunities for finding other jobs.

Appendix 1: WEBA Profiles of Well-Being



continued on facing page



Note: A long bar indicates that a characteristic is sufficient (low on risks) in that job, a short bar indicates insufficient (high on risks), and a middle length bar indicates marginally sufficient conditions regarding that characteristic.

Note

The authors would like to thank Jac Christis and three anonymous reviewers for their comments on an earlier draft of this article.

References

Adler, P. and R.E. Cole (1993) 'Designed for Learning; A Tale of Two Auto Plants', *California Management Review* 36(1): 85–94.

Ashby, W.R. (1969) 'Self-Regulation and Requisite Variety', pp. 105–24 in F.E. Emery (ed.) *Systems Thinking; Selected Readings*. Harmondsworth: Penguin.

Babson, S. (1995) 'Whose Work? Lean Production at Mazda USA', pp. 235–46 in S. Babson (ed.) *Lean Work; Empowerment and Exploitation in the Global Auto Industry*. Detroit: Wayne State University Press.

Benders, J. (1995) 'Output Characteristics as Input for the Skilling Debate', *Work, Employment and Society* 9(2): 329–42.

Benders, J. and M. van Bijsterveld (2000) 'Leaning on Lean; The Reception of a Management Fashion in Germany', *New Technology, Work and Employment* 15(1): 50–64.

Besser, T. (1996) *Team Toyota: Transplanting the Toyota Culture to the Camry Plant in Kentucky*. Albany: State University of New York Press.

Brenner, M.D., D. Fairris and J. Ruser (2004) ' ''Flexible'' Work Practices and Occupational Safety and Health: Exploring the Relationship Between Cumulative Trauma Disorders and Workplace Transformation', *Industrial Relations* 43(1): 242–66.

Burns, T. and G.M. Stalker (1961) *The Management of Innovation*. London: Tavistock Publications.

Burrell, G. and G. Morgan (1979) *Sociological Paradigms and Organisational Analysis: Elements of the Sociology of Corporate Life*. London: Heinemann.

Christis, J. (1998) *Arbeid, Organisatie en Stress. Een visie vanuit de sociotechnische arbeids- en organisatiekunde*. Amsterdam: Het Spinhuis.

Conti, R. and M. Warner (1993) 'Taylorism, New Technology and Just-in-Time Systems in Japanese Manufacturing', *New Technology, Work and Employment* 8(1): 31–42.

Delbridge, R., P. Turnbull and B. Wilkinson (1992) 'Pushing Back the Frontiers: Management Control and Work Intensification under JIT/TQM Factory Regimes', *New Technology, Work and Employment* 7(2): 97–106.

Dhondt, S. and I. Houtman (1996) *De WEBA-Methode. NOVA-WEBA handleiding. Een vragenlijst om welzijnsknelpunten op te sporen*. Leiden: TNO Preventie en Gezondheid.

Dohse, K., U. Jürgens and T. Malsch (1985) 'From "Fordism" to "Toyotism"; The Social Organization of the Labour Process in the Japanese Automobile Industry', *Politics and Society* 14(2): 115–46.

Easton, G.S. and S.L. Jarrell (2000) 'Patterns in the Deployment of Total Quality Management: An Analysis of 44 Leading Companies', pp. 89–130 in R.E. Cole and W.R. Scott (eds) *The Quality Movement and Organization Theory*. Thousand Oaks, CA, London and New Delhi: Sage.

Elger, T. and C. Smith (1994) 'Introduction', pp. 1–24 in T. Elger and C. Smith (eds) *Global Japanization? The Transnational Transformation of the Labour Process*. London and New York: Routledge.

Fairris, D. and H. Tohyama (2002) 'Productive Efficiency and the Lean Production System in Japan and the United States', *Economic and Industrial Democracy* 23(4): 529–54.

Fish, S. (1980) *Is There a Text in This Class? The Authority of Interpretative Communities*. Cambridge, MA: Harvard University Press.

Frese, M. and D. Zapf (1988) 'Methodological Issues in the Study of Work Stress: Objective vs Subjective Measurement of Work Stress and the Question of Longitudinal Studies', pp. 375–411 in C.L. Cooper and R. Payne (eds) *Causes, Coping and Consequences of Stress at Work*. Chichester: John Wiley.

Fucini, J.T. and S. Fucini (1990) *Working for the Japanese: Inside Mazda's American Auto Plant*. New York: Free Press.

Graham, L. (1995) *On the Line at Subaru-Isuzu; The Japanese Model and the American Worker*. Ithaca, NY: ILR Press.

Hacker, W. (1989) 'Vollständige vs. unvollständige Arbeitstätigkeiten', pp. 463–6 in S. Greif, H. Holling and N. Nicholson (eds) *Arbeits- und Organisationspsychologie*, Munich: Psychologie Verlags Union.

Hackman, J.R. and G.R. Oldham (1980) *Work Redesign*. Reading, MA: Addison-Wesley.

Hamde, K. (2002) 'Teamwork: Fashion or Institution?', *Economic and Industrial Democracy* 23(3): 389–420.

Kamata, S. (1986) *Japan aan de lopende band*. Amsterdam: Uitgeverij Jan Smets. (Orig. pub in Japanese, *Jidosha zetsubo kojo*, 1973.)

Kammeraat, R. (2000) 'Welzijn bij Giant Europe Manufacturing B.V. Een onderzoek naar het verbeteren van het welzijn en het verhogen van de betrokkenheid van de medewerkers op de assemblage-afdeling van een fietsenfabriek', Master thesis, University of Groningen.

Karasek, R.A. (1979) 'Job Demands, Job Decision Latitude, and Mental Strain: Implications for Job Redesign', *Administrative Science Quarterly* 24(2): 285–309.

Karasek, R. and T. Theorell (1990) *Healthy Work: Stress, Productivity, and the Reconstruction of Working Life*. New York: Basic Books.

Kenney, M. and R. Florida (1993) *Beyond Mass Production: The Japanese System and its Transfer to the US*. New York: Oxford University Press.

Kieser, A. (1997) 'Rhetoric and Myth in Management Fashion', *Organization* 4(1): 49–76.

Klein, J.A. (1991) 'A Reexamination of Autonomy in Light of New Manufacturing Practices', *Human Relations* 44(1): 21–38.

Kompier, M.A.J. and F.H.G. Marcelissen (1993) *Handboek werkstress. Systematische aanpak voor de bedrijfspraktijk*. Amsterdam: NIA.

Krafcik, J.F. (1988) 'Triumph of the Lean Production System', *Sloan Management Review* 30(1): 41–52.

Landsbergis, P., J. Cahill and P. Schnall (1999) 'The Impact of Lean Production and Related New Systems of Work on Organization of Worker Health', *Journal of Occupational Health Psychology* 4(3): 108–30.

Landy, F.J. (1992) 'Work Design and Stress', pp. 119–58 in G.P. Keita and S.L. Sauter (eds) *Work and Well-Being: An Agenda for the 1990s*. Washington, DC: American Psychological Association.

Lewchuk, W., P. Stewart and C. Yates (2001) 'Quality of Working Life in the Automobile Industry: A Canada–UK Comparative Study', *New Technology, Work and Employment* 16(1): 72–87.

Malloch, H. (1997) 'Strategic and HRM Aspects of Kaizen: A Case Study', *New Technology, Work and Employment* 12(2): 108–22.

Molleman, E., B. van Delft and J. Slomp (2001) 'The Application of an Empowerment Model', *Human Factors and Ergonomics in Manufacturing* 11(4): 339–54.

Monden, Y. (1983) *Toyota Production System*. Norcross, GA: Industrial Engineering and Management Press.

Morita, M. (2001) 'Have the Seeds of Japanese Teamworking Taken Root Abroad?', *New Technology, Work and Employment* 16(3): 178–90.

Morris, J., B. Wilkinson and M. Munday (2000) 'Farewell to HRM? Personnel Practices in Japanese Manufacturing Plants in the UK', *International Journal of Human Resource Management* 11(6): 1047–60.

Ohno, T. (1988) *Toyota Production System: Beyond Large-Scale Production*. Cambridge: Productivity Press.

Oliver, N. and B. Wilkinson (1992) *The Japanization of British Industry: New Developments in the 1990s*. Oxford and Cambridge: Blackwell.

Ortmann, G. (1995) *Formen der Produktion. Organisation und Rekursivität*. Opladen: Westdeutscher Verlag.

Parker, M. and J. Slaughter (1988) *Choosing Sides*. Boston, MA: South End Press.

Parker, S.K. (2003) 'Longitudinal Effects of Lean Production', *Journal of Applied Psychology* 88(4): 620–34.

Psoinos, A. and S. Smithson (2002) 'Employee Empowerment in Manufacturing: A Study of Organisations in the UK', *New Technology, Work and Employment* 17(2): 132–48.

Schonberger, R.J. (1982) *Japanese Manufacturing Techniques – Nine Hidden Lessons in Simplicity*. New York: Free Press.

Schouteten, R.L.J. (2001) *Balances in Well-Being at Work; Measurements, Determinants, and Improvements of the Quality of Working Life*. Capelle a/d IJssel: Labyrint Publication.

Sewell, G. and B. Wilkinson (1992) ' "Someone to Watch over Me"; Surveillance, Discipline and the Just-in-Time Labour Process', *Sociology* 26(2): 271–89.

Shingo, S. (1983) *A Revolution in Manufacturing: The SMED System*. Stamford, CA: Productivity Press.

Sorge, A. (1991) 'Strategic Fit and the Societal Effect: Interpreting Cross-National Comparisons of Technology, Organization and Human Resources', *Organization Studies* 12(2): 161–90.

Sugimori, Y., K. Kusunoki, F. Cho and S. Uchikawa (1977) 'Toyota Production System and Kanban System; Materialization of Just-in-Time and Respect-for-Human System', *International Journal of Production Research* 15(6): 553–64.

Toyota (1992) *Toyota Production System*. Toyota: Toyota.

Trist, E.A. and K.W. Bamforth (1951) 'Some Special and Psychological Consequences of the Longwall Method of Coal-Getting', *Human Relations* 4(1): 3–38.

Vaas, S., S. Dhondt, M.H.H. Peeters and J. Middendorp (1995) *De WEBA-methode, Deel 1: WEBA-analyse handleiding*. Alphen aan den Rijn/Zaventem: Samsom BedrijfsInformatie.

Van der Parre, P. (1996) *Zonder arbeid geen zegen. Kwaliteit van de arbeid, arbeidsorientaties, arbeidssatisfactie en het zoekgedrag op de arbeidsmarkt*. Delft: Eburon.

Van Hoof, J.J. and R.J. Huiskamp (1989) 'New Forms of Work Organization in the Netherlands', pp. 155–73 in P. Grootings, B. Gustavsen and L. Héthy (eds) *New Forms of Work Organization in Europe*. New Brunswick, NJ: Transaction Publishers.

Van Veldhoven, M.J.P.M. (1996) *Psychosociale arbeidsbelasting en werkstress*. Lisse: Swets en Zeitlinger.

Vogel, E.F. (1979) *Japan as Number One: Lessons for America*. Cambridge, MA and London: Harvard University Press.

Wilkinson, A. (2002) 'Empowerment', pp. 1720–30 in M. Warner (ed.) *International Encyclopedia of Business and Management*. London: Thomson Learning.

Womack, J.P., D.T. Jones and D. Roos (1990) *The Machine that Changed the World*. New York: Rawson Associates.

Yates, C., W. Lewchuk and P. Stewart (2001) 'Empowerment as a Trojan Horse: New Systems of Work Organization in the North American Automobile Industry', *Economic and Industrial Democracy* 22(4): 517–42.

Young, S.M. (1992) 'A Framework for Successful Adoption and Performance of Japanese Manufacturing Practices in the United States', *Academy of Management Review* 17(4): 677–700.

Roel Schouteten

is Assistant Professor in Strategic Personnel Management and member of the PARTNER research group of the Nijmegen School of Management, Radboud University Nijmegen, the Netherlands. His research interests include quality of working life, group work, and work–life balance. He is author of *Balances in Well-Being at Work: Measurements, Determinants and Improvements of the Quality of Working Life* (2001).

Jos Benders

is Senior Researcher and member of the Relation Management research group at the Nijmegen School of Management, Radboud University Nijmegen, the Netherlands. His research interests include organization concepts, the history of cellular manufacturing, medieval coinage and the theme 'technology, work and organization'. He has published in several journals including *Economic and Industrial Democracy*, *Journal of Management Studies*, *New Technology, Work and Employment*, *Numismatic Chronicle* and *Organization*. He is author of *Optional Options: Work Design and Manufacturing Automation* (1993), co-author of *Useful but Unused: Group Work in Europe* (1999), and co-editor of *The Symbiosis of Work and Technology* (1995) and *Mirroring Consensus: Decision-Making in Japanese-Dutch Business* (2000).