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## TEAM WORK IN JAPAN EVOLUTION AS FACT OR FICTION

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On the basis of an overview of the relevant literature, it can be argued that the *opinion* “In Japan, they work in teams” has become ‘standard knowledge’. Because of this development ‘teamwork in Japan’ is a less fashionable topic today than it was a few years ago. Perhaps, the topic would have been totally marginalised if euphoric reports about changes in the traditional Japanese management concepts had not caused excitement in the scientific community.

This community which, in spite of critical sounds, only just accustomed itself to the vested opinions about ‘lean production’, all of a sudden was confronted with its younger brother ‘Post-Lean’ (or ‘New Toyotism’ (Shimizu, 1993, 1995 b), ‘Post-Toyotism’ (Roth & Schulten, 1996), ‘Lean-on Balance’ (Fujimoto, 1997), or ‘Super-Lean-Revolution’ (Kojima, 1995)). Because of this proliferation of names, such literature on new management concepts in assembly plants of the automobile industry in Japan is summarised under the heading of ‘New Japanese Production Concepts’ in this article.

With the emergence of this new literature, a new, and perhaps the *real challenge* to research and researchers on teams in Japan announces itself. For, in this literature it is claimed that an evolution has taken place in the way work is organised at the final assembly lines in the automobile industry in Japan.

In the relevant literature, this evolution is articulated under the general heading of ‘an increase in the self-regulation of teams at final assembly lines’. However, different claims are made about the degree of self-regulation. Given these different claims about the *degree* of self-regulation, it follows that there can be no shared opinion about the *degree of the increase* in self-regulation, i.e. about the actual occurrence and nature of the evolution. At this point, it can be asked whether there are sufficient empirical data available in order to be able to conclude with certainty that such an evolution has actually taken place. In this paper, this question will be answered in three steps. In section 2, the most important modifications in the management concepts concerning the assembly manufacturing in the automobile industry in Japan are discussed. In section 3, a set of requirements which allows for a scientific evaluation of the supposed increase in the self-regulation of teams is presented. In section 4, the relevant literature will be examined in the light of the requirements presented in section 3. On the basis of this examination, it becomes possible to make learned statements about the theoretical and empirical foundations of the claims of an increase in the degree of self-regulation of teams.

## THE EMERGENCE OF NEW PRODUCTION CONCEPTS

### Causes for the changes in management concepts

In the relevant literature, reference is made to a complex of impulses and causes for the modifications in the management concepts, which concern the assembly lines in the automobile industry in Japan. In this literature, the difficult situation on the internal and external labour market, which increasingly pressurised the production system, is mentioned as the most important cause of these modifications. Not only the automobile industry, but also other branches of the manufacturing industry, were confronted with problems related to the availability of human resources. Some of the problems were:

- the decrease of the direct availability of human resources in production areas because of the outflow of young male production workers and the ageing of the labour force (Nikkei Mechanical, 1992, Vol. 6/1; Fujita et al., 1995);
- employers in the service industries had much better chances than employers in the manufacturing industries to attract new workers available on the open labour market (Neues aus Japan, 1992, Nov./Dec.);
- the decrease of the inflow of young workers on the labour market because of demographic developments such as low birth rates and an ageing society (Nikkei Mechanical, 1992, Vol. 6/1; Fujita et al., 1995).

Bad working conditions (the famous *3-kei* jobs) are mentioned as a cause for problems of both retaining and hiring (Nomura, 1992). Another problem is the change in the quality of the available human resources, which is caused by the changing attitudes towards work of young male workers (Asahi Shimbun, 1.9.1992, 16.4.1992, and 23.6.1992). Additional impulses to reconsider or modify traditional management concepts were:

- the critical attitude of the labour unions towards the work conditions and the concomitant demands to reduce working times and to

increase intrinsic work contents (Jidôsha sôren, 1992);

- the public discussion on the quality of life in both the mass media and politics as well as concomitant governmental statements and projects by the *Ministry of Labour* and *MITI* (Asahi Shimbun, 11.10.1992; Tominaka, 1993; MITI, 1992; Morita, 1993);
- critical remarks from abroad on high workloads in production areas induced the Japanese government to demand radical reductions of working times (Sey, 1994).

Given these impulses and causes, it can be argued that the issue of working conditions began to influence the mobility of labour in the late eighties and the early nineties, i.e. on the peak of the bubble economy. Japanese automobile manufacturers developed varying solutions in order to deal with this problem. In the first place, they increased automatization in order to decrease both the workload and the necessary work force. In the second place, they improved working conditions in order to allow the employment of both women and older employees in production areas. In the third place, they increased the attractiveness of production work in order to both retain and hire new workers. Dependent on the investment capability, human resources philosophy, technology, and market position of the manufacturer in question, the organisation of work at the final assembly lines was evaluated and modified in the light of the three aforementioned solutions.

### Modifications in the organisation of work

A considerable number of authors points at new cost intensive solutions in both 'Green-Field-Plants' and conventional assembly plants (e.g. Nomura, 1992; Berggren, 1993; Jürgens, 1994; Sey, 1994; Shimizu, 1995a; Abo, 1995; Benders, 1996; Fujita, 1997; Fujimoto, 1997). In particular, these solutions were implemented in the new Toyota assembly plants of Toyota/Tahara 4 and Toyota/Kyûshû (Miyata), in the new Nissan assembly plant on Kyûshû (Kanda 2), the modernised assembly lines of Toyota/Tsutsumi and Motomachi as well as Honda/Suzuka and the Honda NSX-plant. In literature, improvements of

the working environment, explicit attention to ergonomic aspects of work, changes in assembly technology, and modifications of established approaches towards human resource management, are mentioned. In this context, reference is made to an evolution of the way teams at the final assembly lines in new or modernised plants are organised (Noguchi, 1994 a/b; Shiramizu, 1994; Shimizu, 1995 a/b; Grønning, 1995; Kojima, 1995; Nomura & Jürgens, 1995; Ogasawara & Ueda, 1996; Baisier, 1997; Imada, 1997; Berggren & Nomura, 1997; Ôno, 1998). A central issue in the discussion about this evolution is the question of the increase in the self-regulation of these teams. This issue implies a shift in the discussion about teams at final assembly lines in Japan from 'conventional' to 'new and modernised' final assembly lines.

When the relevant literature is examined on the topic of the degree of self-regulation of teams at final assembly lines in new or modernised plants, it appears that different opinions exist about the *degree* of self-regulation in these teams. In both Western and Japanese literature estimations can be found which range between the Uddevalla-model of *teamworking*, i.e. a form of intensive co-operation between workers which have a broad spectrum of responsibilities (e.g. Fujimoto, 1994; Roth & Schulten, 1996; Fujita, forthcoming) and *relatively independent mini-lines* which only involve a rudimentary form of self-regulation (e.g. Shinohara, 1992; Society of Automotive Engineers of Japan, 1993; Abo, 1995; Grønning, 1995).

### No consensus

Given these varying estimations, it can be argued that there is no consensus about the *degree* of self-regulation of teams at new and modernised final assembly lines in the automobile industry in Japan. Moreover, given this lack of consensus, it is also difficult to reach a consensus about the *evolution* of the degree of self-regulation of these teams. Finally, given these varying estimations of the degree of self-regulation, the question arises whether there is sufficient theoretically founded empirical evidence available which allows for reliable conclusions in this early stage of this new discussion. A first step to deal with this question is to establish a set of methodological requirements,

which can be used to evaluate the empirical evidence presented in the relevant literature.

## METHODOLOGICAL REQUIREMENTS

At least three types of requirements need to be distinguished; empirical, theoretical, and analytical requirements (Sey, forthcoming).

### Empirical requirements

In the first place, theoretically founded data sets, which describe the zero-setting, i.e. the point of departure, of the process of evolution are needed. These data sets have to describe the degree of self-regulation of teams in the automobile industry *in Japan*. It has to be noted that data sets which describe *transplants* (Japanese oversee subsidiaries or joint ventures) are explicitly excluded, for the relevant literature suggests that important differences exist between the organisation of work in transplants and the organisation of work in the parent plants in Japan (see Parker & Slaughter, 1988; Abo, 1994; Mueller, 1994; Mair, 1994; Fleury & Salerno, 1995; MacDuffie & Pil, 1997 a).

In the second place, theoretically founded data sets, which describe the degree of self-regulation in teams in *new and modernised* plants in Japan are needed.

### Theoretical requirements

In order to empirically establish differences between different types of groups ranging from 'nominal groups' to 'semi-autonomous teams' two requirements can be formulated.

In the first place, it is required to develop a *theoretical framework*, i.e. a set of consistent distinctions and definitions, which allows for the articulation of the *specificity* of the distribution of (operational and regulatory) tasks in groups. This theoretical framework has to establish what self-regulation means, which degrees of self-regulation can be distinguished, and how these degrees of self-regulation are related to the distribution of tasks in groups. More in particular, types of regulation and distributions of regulatory tasks need to be differentiated in such a way that the

degree of self-regulation of a team can be established.

In the second place, the theoretical framework needs to be operationalised in such a way that it becomes possible to describe groups at final assembly lines in the automobile industry in Japan concerning the degree of self-regulation.

### **Analytical requirements**

In order to be able to make statements about an evolution in the degree of self-regulation two analytical requirements have to be met.

In the first place, the two data sets mentioned under 3.1 need to be interpreted in terms of the theoretical model mentioned under 3.2. In the second place, the results of this interpretation need to be systematically compared in the light of the theoretical framework in order to establish the existence and direction of the evolution.

## **DISCUSSION OF THE RELEVANT LITERATURE**

On the basis of the methodological requirements established in section 3, it is now possible to review the relevant literature on the distribution of work in and the degree of self-regulation of teams in Japan in the light of these requirements.

Because it is impossible to integrally review the impressive pile of publications available on the topic of the organisation of work in Japanese manufacturing, a selection is made which comprises those publications, which are influential, theoretically founded, and/or based on empirical research.

### **The discovery of 'teamwork'**

Since the first encounters with the 'Japanese miracle', publications on the Japanese production system seemed to be almost obsessed by the idea of the discovery of its hidden secrets. The focus of these publications was on the automobile industry, because crucial increases in productivity were expected from the adoption of Japanese production concepts. Efficiency of the organisation of work and the use of creative potentials appeared as the long sought after Holy Grail. In this context, the

issues of the success and the transferability of Japanese production concepts were raised. The specifics of the co-ordination and control mechanisms in production areas were regarded as essential elements of these concepts. Moreover, it was supposed that teamwork is an important aspect of these co-ordination and control mechanisms (cf. Womack et al., 1990; Abo, 1994; Coriat, 1995; Nomura & Jürgens, 1995; Benders et al., 1996). For this reason, questions about teamwork in Japan became a frequent topic in the past two decennia.

In the seventies, the fascination with the Japanese economic miracle provided an impulse to uncover its secrets. In these years, the first, more or less explicit, references were made to the existence of teamwork as a phenomenon. However, the topic of teams did not yet get the exposure it would receive later on. Teamwork was mainly mentioned in the context of small group activities such as quality circles (e.g. Monden, 1983) or as a metaphor for harmonic co-operation like in sport teams (Ohno, 1988). In their analysis of the literature in the Japanese language, Nomura and Jürgens (1995) conclude that, until the end of the eighties, teamwork did neither play a role in specialised literature nor in the practices of managers in the automobile industry in Japan.

Until the end of the eighties miscellaneous facets of the production system were described which can be related to teamwork such as decision making, job rotation, peer pressure, hierarchies, payment schemes, and quality circles (e.g. Sugimori et al., 1977; Takezawa & Whitehill, 1981; Ouchi, 1982; Bergmann, 1983; Takagi, 1983; Lecher, 1984; Nomura, 1985; Aoki, 1988; Demes, 1989). However, teamwork as such did not yet appear as an important issue on the research agenda. One exception is a publication by Mine (1982). In this publication, Mine points at short-lived experiments with 'semi-autonomous work groups' in Japan. Other exceptions were the publications of Dohse, Jürgens and Malsch (1984) and Jürgens, Malsch and Dohse (1989, 1993). In these publications, a somewhat more elaborated characteristic of teamwork in Japan was provided. More in particular, teamwork was characterised from the perspective of the use of informal aspects of intra-group relations for the purpose of increasing productivity and social integration.

At the end of the eighties and in the first years of the nineties, the number of references to teamwork increased exponentially. The reorganisations, which could not be avoided anymore by Western car manufacturers, intensified the interest in solutions developed by their Japanese competitors. Japanese management was not only eagerly studied, but elements of the Japanese production system such as Kaizen and new production layouts were introduced in Western car factories (e.g. Jürgens, 1989). The most important and influential source on teamwork in Japan was the MIT study by Womack et al. (1990). “Not that study again!”, you may think and probably you are right. This most often cited study on the ‘Japanese challenge’, was widely acknowledged as an invitation to universally apply Japanese management concepts. Teamwork with its highly qualified employees became a symbol of the Japanese success story. At the beginning of the nineties, the MIT-study proved to be the trigger for the development of the lean production paradigm. The growing importance of this paradigm superseded conventional explanations of the success of the Japanese production system such as the harmonic labour relations, high initial qualifications of workers, or traditional group orientation. In the MIT-study, the relation between ‘success’ and circumstances specific for Japan was loosened. Success became within the grasp of Western car manufacturers, “*You can do it too! Just do it!*”. This explains the success of the lean production paradigm. The adherents of the lean production paradigm were less reserved than their MIT predecessors as the idealised descriptions of the principles of Japanese teamwork were concerned. On the contrary, they proved to be rather creative. Central claim in the lean production discussion was that teamwork is a critical success factor; a means to increase productivity and social integration at the same time. In the slipstream of the MIT study, an intensified interest in Japanese management concepts emerged. The discussion on teamwork which was at its peak in the eighties in Europe and had gradually silenced down, once again became a prominent issue. However, because of the broad spectrum of interests of groups of authors and readers (e.g. scientists, managers, and unions), a variety of interpretations emerged. For

this reason, it is no surprise that contrary interpretations emerged both of the characteristic properties of the Japanese production system in general and Japanese teamwork in particular (e.g. different interpretations of the role of contextual factors and consequences for the employees). In this sense, the notions ‘Japanese production system’ and ‘lean production’ are rather general labels for a number of largely normative or programmatic concepts (with the concept of ‘teamwork at their heart’), than an accurate representation of the situation in Japanese production areas.

In the mean time, since the mid-nineties, the euphoria about the supposedly unproblematic implementation of Japanese management concepts, including teamwork, receded. However, this did not imply the end of the discussion on Japanese production concepts. On the contrary, an even more intense discussion started about the possibilities and impossibilities of the *transfer* of Japanese production concepts. At the heart of this so-called ‘transfer debate’ are issues such as the expected effects of Japanese teamwork on learning, professional education (Demes & Georg, 1995), quality of working life and work satisfaction (Kirsch et al., 1996 a/b), fast and flexible product development (Moritz, 1996), socialisation and vertical mobility (Nomura & Jürgens, 1995), effectiveness and productivity (Abo, 1995; Benders & Van Hootegeem, 1996; van Amelsvoort & Benders, 1996; Pil & MacDuffie, 1996; MacDuffie & Pil, 1997 a/b).

Even from this brief chronological overview of the discussion, it can be learned that both the intensity and the topic of the discussion changed in the course of time. The increase in international competition induced an intensified interest in the phenomenon of teamwork in Japan. Now, at the end of the nineties, it appears that the once so lively interest gradually fades away and that a discussion, which lasted for years, comes to an end. Another object of research - “New Production Concepts” - announces itself as a new and promising field for scientific inquiry.

### **Methodological Foundations**

From this short review of the development of the discussion on teamwork in Japan, it becomes

clear that the topic of teamwork has been approached from a number of different angles. Below, these different approaches towards teamwork are to be evaluated in the light of their theoretical and empirical foundations. This evaluation focuses on the ways and means, which were used in order to make both idealised and concrete descriptions of the degree of self-regulation of teams in Japan.

### *Theoretical orientations*

In the text above, it has already been indicated that in recent years a more systematic approach towards teamwork in Japanese production areas has emerged. A number of publications saw the light in which a variety of more or less explicit theoretical orientations were suggested which both support descriptions of the structure of teams and shed a light on the question of self-regulation. For instance, theoretical orientations were developed in relation to the idealised *lean production concept* in order to deal with questions of operational and communicative dependencies at assembly lines (Meer & Gudim, 1996; Schuring, 1996), design principles of lean production (Niepce & Molleman, 1998), and the influence of contextual factors on team design (Benders & Van Hootegeem, 1997). Examples of theoretically oriented approaches which focus on *teams in production work in general in Japan* have multi-skilling (Morita, 1997), forms of co-operation (Kirsch et al., 1996 a/b), and the role of supervisors (Durand, 1995 b) as a subject. In spite of this (relative) increase in the number of theoretically oriented publications, there is still little material available, which focuses on the central theme of this paper; teams at final assembly lines in the automobile industry in Japan. The restrictive policy of editors who seem to embrace the slogan 'The shorter the better', is conducive to the practice of only *suggesting* a careful theory-based deduction of the variables which are used to describe self-regulation of teams. A review of the relevant literature reveals that in actual fact only first attempts to theory formation are presented. What appears, is rather a more or less implicit framework, which supports descriptions of structural features, characteristics, and contextual factors of teamwork. Attention is drawn to a specific number of factors, which could

be relevant for an explanation of the degree of self-regulation of teams. The impression arises that on the basis of characteristics of the work and production process (mass production) and process technological features such as, layout, standard operating procedures, cycle times, material flow buffers, transport technology (conveyor belts), conclusions are drawn about the structure of teams and the degree of self-regulation of teams.

### *Empirical approaches*

The major part of the empirical literature on the work at *conventional* final assembly lines is devoted to aspects of *human resource management* (Demes, 1989; Saruta, 1995; Fujita, 1997; Ishida et al., 1997; Aichi rôdô mondai kenkyûsho, 1998), *industrial relations* (Nomura & Jürgens, 1995), and the *social and technical organisation of work* (Jürgens & Strömel, 1987; Womack et al., 1990; Grønning, 1992; MacDuffie & Pil, 1997 a/b). There is relatively little literature available on the aforementioned aspects with regard to *new* and *modernised* assembly lines. The discussion on so-called 'New Japanese Production Concepts' is still in its infant state; tentative empirical approaches to this subject, by notably Japanese authors, have just started to appear (Noguchi, 1994 a/b; Shimizu, 1994; Ogasawara & Ueda, 1996; Kambayashi, 1996; Imada, 1997; Kino, 1997). The majority of Western reports regarding 'New Japanese Production Concepts' either derive from publications of the manufacturers involved or are based on incipient company visits (Decoster et al., 1995; Boyer, 1995; Roth & Schulten, 1996; Schanz & Döring, 1998).

From this type of indirect approaches to the topic of the 'structure and characteristics of teams', it is certainly possible to deduce important conclusions about (1) the conditions of the possibility of teamwork, (2) the structure of teamwork, and (3) aspects of self-regulation. Such conclusions are actually drawn in the literature on both conventional and new and modernised assembly plants. The problem with these conclusions is that statements about Human Resource Management, industrial relations, and the social and technical organisation of work, are relatively abstract and, for this reason, lack the required degree of detail. Because of the fact that

the respective samples were not labelled unambiguously, it proves to be difficult to make a one to one connection between the results of research and the production areas, which were the objects of this research. Empirically supported comparisons between different manufacturers are an exception. If such comparisons are to be found at all, then it is mostly in literature written in Japanese. This literature, however, appears to be almost completely ignored in the West. Toyota remains the preferred object of research, for empirical research on concrete *innovations* in production concepts is primarily based on descriptions of Toyota, and more in particular, Toyota/Kyûshû. To my knowledge, there exists no theory based, empirical research, which has as its main topic 'teamwork and Human Resource Management and/or organisation of work and/or industrial relations'. For this reason, general conclusions about the existence, character, and role of teamwork in the entire Japanese manufacturing industry seem to be rather daring.

#### *Theoretically grounded explicit descriptions of teamwork*

A review of the majority of the publications cited as publications on teamwork in the automobile industry in Japan reveals that these publications do neither provide a theoretically based empirical description of teams nor were intended to do so by their authors (e.g. Aoki, 1988; Berggren, 1991; Dohse, Jürgens & Malsch, 1984, 1989, 1993; Koike, 1983, 1984, 1990). These, and the indefinitely many other publications, contain a huge amount of information about a wide variety of aspects of the organisation of work. However, only a few publications contain an elaborated theoretical framework to support the empirical description of the degree of self-regulation of teams at the final assembly lines in the automobile industry in Japan. One of the few publications which contains such a framework is Murakami (1997). It has to be noted that, to my knowledge, this is the only empirical research which describes and analyses teamwork at Nissan/Kyûshû and Toyota/Kyûshû on the basis of an operationalised conceptual framework (the Gulowsen approach, 1972). However, even this study does not provide a theoretically based

empirical description of the *specificity* of the distribution of (operational and regulatory) tasks in groups. Not one of the publications mentioned in the list of references below, contains a *theoretically* grounded explicit description of the degree of self-regulation of teams at either conventional, new or modernised final assembly lines in the automobile industry in Japan which meets the requirements specified in section 3.

#### *Undiscovered treasures*

In the Japanese business sciences, the question of 'teamwork in Japan' is hardly a topic of empirical research. This assessment is quite surprising. Relative to the flood of publications on this subject in the West, only a few systematic Japanese studies can be found (e.g. Morita, 1996, 1997, 1998; Okubayashi, 1997). In these few Japanese sources, a number of statements can be found which clearly contradict a not unimportant part of the Western publications on teamwork. For instance, the question arises what the actual object of research is. It appears that if Japanese authors talk at all about teamwork (*chîmu wâku*) in conventional and modern assembly areas, they refer to the *kumi* (large organisational units) in the Toyota production plants. In Western publications, if the object of reference is made explicit at all, teamwork in conventional assembly areas is largely associated with the *han* (small organisational units) in the Toyota production plants (e.g. Womack et al., 1990; Benders & Van Hootegem, 1997). Moreover, a central role is attributed to the supervisors of groups (e.g. *kumi* at Toyota and *kakari* at Nissan) which contradicts a large number of assertions in the Western literature. Recent Japanese research claims that the regulatory capacity of direct workers in the direct production of both conventional and new assembly areas (sic!) is relatively small (Nomura, 1993 a/b; Saruta, 1995; Kino, 1997; Ishida et al., 1997; Ôno, 1998). These claims contradict both the traditional, almost paradigmatic, Western accounts and a number of the less recent Japanese accounts. Even the almost holy theorem of the 'multi-skilled worker' - and hence, the discussion about a presupposed Japanese Post-Taylorism - is questioned in Japanese literature (see the critical discussion by Nomura

(1993 a) and Ishida et al. (1997) of contributions by Koike and one reaction by Koike (1993)).

The theoretical views in the Japanese business sciences on the content of the concept 'teamwork' do not always match the accepted views of Western business scientists. This incongruence can also be found in publications by Japanese authors in Western languages. An examples of this incongruence is the identification of 'multi-skilling' and 'teamwork' (Koike, 1981/ 1991; Hyôdô, 1992; Okubayashi et al., 1994; Kambayashi, 1996). Another example is the variety of conceptualisations of 'self-regulation' or 'autonomy' which range from the degree of participation in the context of institutional democracy (Okubayashi et al., 1994), via largely harmonious labour relations (Monden, 1994), to the amount of regulatory possibilities of workers and teams in the context of their work (Okubayashi et al., 1994; Morita, 1998). Because of these divergent theoretical conceptualisations, a careful approach to the reception of Japanese literature seems to be required. In my opinion, such a careful reception is rather the exception than the rule. This, and a more timely examination of the vast literature in the Japanese language, could have avoided misunderstandings and errors of interpretation which manifest themselves in the current research on Japanese teamwork. In this context, it is necessary to point at the reception mechanism. Japanese interpretations that are untenable are adopted in Western literature, which, in turn, are interpreted in Japanese literature as a confirmation of their own interpretations.

It has to be admitted that a careful approach to the reception of Japanese literature is made even

harder because of the implicit or explicit adoption of theoretical elements and terminology related to the 'quality' of work and socio-technical concepts which were developed in the West. In Japanese literature, these imported theoretical elements are partly connected to other concepts and interpreted differently than originally intended. To make matters even more complicated, the topic of 'teamwork and self-regulation' is only recently approached in the Japanese literature from an explicitly theoretical and empirical perspective. Japanese scientists, themselves, point at this problem of a lack of theoretically based empirical material on teams in the Japanese language (Morita, 1997; Ôno, 1998). Given both this situation and the theoretical requirements formulated in section 3, it seems to be impossible to draw direct and exclusive conclusions on the basis of Japanese research about teamwork at the final assembly lines in the automobile industry in Japan.

#### *Traditional 'teams' and self-regulation*

After this review of important aspects of the theoretical and empirical foundations in the relevant literature on teamwork, an overview of assessments of the degree of self-regulation of teams in conventional assembly areas will be provided below. Especially in the literature on lean production, teams were viewed as highly autonomous units.

In recent years, this interpretation has become more diversified. Japanese teams are described as having little, or controlled, or even as having no autonomy at all. Some examples are provided in table 1:

Table 1. - *Characterisations of respectively the degree of self-regulation and autonomy of teams.*

Authors	Characterisations of respectively the degree of self-regulation and autonomy of teams
Forza, 1996	self-regulating teams
Bösenberg & Metzen, 1992; Bogaschewsky, 1992; Spieß, 1996	high autonomy
Fürstenberg, 1991	autonomous regulation is explicitly intended
Pawlowsky & Wilkens, 1996	discretion about division of labour and some group matters
Baisier & Albertijn, 1995	limited autonomy, no technical autonomy
Benders et al., 1996	curbing of autonomy by means of the use of Standard Operation Procedures
Minssen, 1993	responsible autonomy
Drache, 1995	self-direction but not self-managed
Spieß, 1996	clear limitation of autonomy
Aertsen & Benders, 1993; Mine, 1982	limited autonomy
Fröhlich & Pekruhl, 1996	restricted autonomy
Durand, 1995a; Berggren, 1991	low autonomy
Cole, 1979	controlled participation
Jürgens, 1989; Dohse et al., 1984	controlled autonomy
Jürgens, 1993	limited partial autonomy
Jürgens, 1995	no partial autonomy, no self-regulation of team
Nomura & Jürgens, 1995	self-regulation is not particularly developed
Mishina, 1994 Steinkühler, 1995	'Team has nothing to do with autonomy at Toyota' 'the degree of autonomy is almost zero'

In the respective descriptions and analyses, different aspects of regulation are emphasised while other aspects are not mentioned at all. One of the problems related to the description of self-regulation of teams needs to be mentioned here. It is the problem of the different *levels of aggregation* at which groups can be described. Seen from the *outside*, a team can be described as more or less self-regulating (see table 1).

However, a description of the intra structure of the team in question can reveal that behind, what appeared from the outside as a self-regulating team, a distribution of work can be found that, for example, is based on a hierarchically dominant supervisor who both distributes and controls the work. Although different concrete or idealised descriptions in this literature can be traced back to either an outside or an inside view, this

fundamental difference between assertions made on the basis of outside descriptions of teams and descriptions of the intra structure of these teams is not often explicitly reflected in the relevant literature.

#### *Pro and contra*

That there are different and partially contradictory assertions about the participation of workers in regulatory activities in teams which reflect themselves in the characterisation of teamwork, can be made clear by means of a presentation of two influential projects. The first mentioned project is the 'International Survey of Automotive Assembly Plants World-wide' which was performed by the MIT in the context of 'International Motor Vehicle Production II' about so-called '*High Involvement Work Practices*'

(hereafter, ISAAP II) (Pil & MacDuffie, 1996; MacDuffie & Pil, 1997 a/b). The second project is the book by Nomura and Jürgens (1995) on „Binnenstrukturen des japanischen Produktivitätserfolges“. Both of these projects provide a vast amount of data about a variety of aspects of the organisation of production and work in production areas in the automobile assembly in general, and of teamwork in particular. However, it is not the main aim of these projects to describe the structure of the distribution of work in teams on the basis of an operationalised conceptual framework which allows for the differentiation of empirically given forms of teamwork. In the publication of Jürgens and Nomura (1995), the assumption can be found that there exists a dominant Japanese type of teams in conventional assembly areas. Although MacDuffie and Pil (1997 b) refer to differences between individual Japanese automobile manufacturers, they do not explicitly state what these differences are. Both Jürgens and Nomura and MacDuffie and Pil provide a different interpretation of the nature of teamwork. For instance, in ISAAP II statements can be found on the strong influence of teams on ‘*who should do what job*’, ‘*use of new technology on the job*’, ‘*the way work is done*’ which clearly contradict statements by Nomura and Jürgens that these decisions are made by supervisors. Another contradiction between ISAAP II and the work of Nomura and Jürgens is the level of the influence of teams on performance evaluations (ISAAP II, high influence; Nomura and Jürgens, almost no influence). According to both ISAAP II and Nomura and Jürgens, the majority of workers is involved in Employee Involvement or QC-teams. ISAAP II points at the obligatory character of this involvement and at the same time emphasises the strong participatory character of quality improvement activities. Moreover, it points at the remarkably high number of individual suggestions for improvement. According to Nomura and Jürgens, the role of teams in improvement activities should not be overestimated. On the contrary, these authors emphasise the role of industrial engineering in process design and optimisation.

In neither of the two studies, an explicit conceptualisation of ‘teamwork’ is advanced. MacDuffie and Pil probably trust the

manufacturer’s information about the presence and number of on-line and off-line teams. Nomura and Jürgens too do not tell us anything about the criteria, which they used to establish the presence of teams. With respect to the characterisation of Japanese teamwork both pairs of authors come up with almost contradictory results. In line with the MIT study, the ISAAP II project asserts that teamwork, (1) is the fundamental form of co-operative work in the assembly production, (2) is generally adopted, and (3) has a high participatory character. Nomura and Jürgens come to the conclusion that work is carried out in teams, however, that these teams have a different meaning than Womack’s ‘Heart of the factory’. According to Nomura and Jürgens, teams are important units of regulation for the purpose of human resource development.

Given the review of the literature it can be concluded that different and partially contradictory results can be found on the topic of teamwork in the traditional assembly areas.

#### *‘New Production Concepts’ and self-regulation of teams*

This section deals with the question of how the relevant literature describes the degree of self-regulation in teams in new or modernised assembly plants. Above, it has been indicated that systematic research in Western languages on this issue is still relatively scarce. For this reason, I primarily refer to literature in the Japanese language in this section.

In connection with the innovative layout of a number of new and reorganised assembly lines at Toyota, such as Kyûshû, Tahara, Tsutsumi, and Motomachi, the relevant literature mentions the division of lines into a number of mini-lines. According to the literature, each mini-line equals a *kumi*. Both in the publications of manufacturers and in the scientific publications in the Japanese language these mini-lines are referred to as: ‘*kumi*, *gurûpu*, *chîmu*, (*sagyô*)*shûdan* and *sagyô gurûpu* (which can be lexically translated as ‘group’); *chîmu tan’i*, *kumi tan’i* and *gurûpu tan’i* (lexically, ‘group unit’); *segmento* (segment), *rain* (line), *sutêshon* (station), *kumichô tan’i* (unit of a *kumichô*)’, and so forth. In the majority of the publications in the Japanese language, these

different names refer to process technological features as well units, which consists of a number of workers. In the literature, these names are not used according to a clear rule. The variety of the above mentioned Japanese words makes it almost impossible to either directly translate them as 'team' or to understand them as 'teamwork'. The crucial question is whether these labels either refer to units which meet the criteria for self-regulating teams developed in business science or sociology or refer to mere segments in the production process. This will be the central question in the rest of this section.

Until the end of the nineties, the degree of self-regulation of teams is, against all expectations, a relatively unimportant topic in the Japanese discussion. Only after the completion of the new assembly mini-lines of Toyota, self-regulating teams are mentioned more often. However, explicit empirical research on self-regulating teams has not been conducted yet. What is available on self-regulation has to be collected from general descriptions by Japanese authors of new and modernised assembly lines.

Given this difficult situation, it still has to be asked to what it is that these authors refer to when they say that: "Each group (*kumi*) can manage the work at the line by itself (*jishu unei*)" (Kimura, 1995, p. 188). From the relevant literature it appears that they primarily refer to the new process layout in which the long assembly line is divided into a number of segments, i.e. mini-lines, which are separated by buffers. In this way, these mini-lines are (relatively) loosely coupled, functionally, physically, and organisationally, i.e. separated and in this sense 'autonomous' (*jiko kanketsu*). Ikebuchi (1997) characterises this 'team concept' (*chîmu konseputo*) as a condition for the integration of related steps in the assembly process (*kôtei (sagyô) no kanketsuka no suishin*). In the relevant literature, the aforementioned 'autonomy' (*jiko kanketsu*) of mini-lines is related to the following aspects:

➤ the work contents of the individual mini-lines are stronger functionally related and more 'rounded off' than before. "Teams carry out a number of functional assembly steps (*kôtei no kinô tan'i*)" (Fujita et al., 1995, p. 255);

- in the case of a disturbance at one of the mini-lines, this mini-line can be stopped, while all the other mini-lines continue the production;
- as a novelty, 'in-line quality checks' have been established;
- buffers, e.g. stock cushions (with a maximum of five minutes) allow each mini-line to adjust to differences in the tempo of the production flow;
- "the role of the *kumi*, the *kakari*, and each individual person becomes clear" (Shiramizu, 1994, p. 18);
- management is more focused on individual workers (Fujita, forthcoming). In the traditional assembly organisation, "...employees could make themselves 'invisible' too easily" (Imada, 1997, p. 54). The "...concrete skills and jobs of the employees" become clearer (Noguchi, 1994 b, p. 44).

Given these characteristics, the question arises how 'autonomous' the so-called 'autonomous' mini-lines actually are.

In order to answer this question, it is required to zoom in on the regulatory tasks performed at these mini-lines. Two examples are provided here. The first example is that of the 'line stop'. According to Noguchi (1994 b, p. 44), *individual direct production workers* can stop the line when a disturbance occurs (to this purpose, they use the *andon*-line). Imada reports that, "within the buffer time the line can be stopped according to plan by a *decision of the kumichô* (italics added)" (1997, p. 38). A few pages later, Noguchi asserts that the *entire kumi* can decide whether or not to stop the line (p. 49). The second example is that of the 'in-line quality check' at Toyota/Kyûshû. In this case too, varying reports are provided about who has what kind of regulatory tasks; the individual, the supervisor, or the *kumi* as a whole. Authors such as Fujita et al. (1995) report that a quality control post has been situated at the end of each mini-line. This post is separated from the other workers on the mini-line and is staffed by an *individual employee* from the quality control department. Noguchi, on the other hand, reports that in the case of mini-lines "Each line team (*rain no kaku chîmu*) is made responsible (*jishu*) for the entire work, including the quality check" (1994 a, p. 38).

A few pages later, he reports that, “The *shokuchô* (i.e. the *supervisor* of the *kumi*; the author) is responsible for quality” (Noguchi, 1994 b, p. 44). According to Kino (1997, p. 54) , “...each *kumi* as a whole is responsible for the quality”.

On the basis of these, and other examples, it is not possible to draw clear conclusions about the distribution of regulatory tasks performed at mini-lines (i.e. who is/are responsible for what). This unclarity also makes it hard to assess how ‘autonomous’ the ‘autonomous’ mini-lines actually are. The above mentioned distinction between the outside and inside perspective on groups can be used to explain why this is so. Most of the authors who characterise mini-lines as ‘autonomous’ seem to base this characterisation on an outside perspective. On this basis, they characterise mini-lines as ‘self-regulating groups’ or ‘half-autonomous teams’ (Maruyama, 1995; Saruta, 1995; Fujita et al., 1995; Fujita, 1997). Another image appears when the mini-lines are described from the inside perspective. In this case, it appears that the regulatory capacity varies between individual members of the mini-line. More in particular, it appears that the supervisor of the *kumi* has a decisive responsibility for the regulation of the production process (Noguchi, 1994 a; Shiramizu, 1994; Kimura, 1995).

Given this discussion of the Japanese literature on new and modernised assembly lines, it is time to return to the question of the degree of self-regulation of teams, and to ask what it is that the Japanese authors mean when they say that: “Each group (*kumi*) can manage the work at the line by itself”. On the basis of the overview of the discussion in the Japanese language, it can be argued that the opinions of the different authors vary on the issue of the distribution of regulatory tasks both at the level of the mini-lines and at the level of individual workers/supervisors. The authors seem to agree that mini-lines are relatively autonomous as *sections* of the production process. In the literature in the Japanese language, no clear assessment can be found of the *degree of self-regulation of teams* at assembly lines in new and modernised assembly plants.

As has been indicated above, Western empirical literature on new and modernised plants is scarce.

One exception is the already mentioned publication by Thomas Murakami (1997). This author comes to the conclusion that teams at Nissan/Kyûshû, “...have some input in decision making within their working environment”, and, “can make suggestions, can request and discuss issues with management/supervisors” (p. 57). This places them at the bottom end of the autonomy scale used by the author. Only the teams in Britain have a lower rank on this scale. This rather pessimistic view is contradicted by other Western as well as by Japanese authors who assert that the teams at the new and modernised assembly plants have specific similarities with teamwork in the Swedish socio-technical tradition. In particular, they point at, “rounded off tasks” and “humane work” (Nohara, 1995; Fujita, forthcoming). Kojima (1995) even mentions, “...production in self-regulated teams” (p. 48). So, the only empirical study on the topic of self-regulation of teams in new and modernised assembly plants in the Western literature is contradicted by a large number of other authors.

#### *Revolution, evolution, or no change at all?*

The ambiguities about the degree of self-regulation of teams in traditional, new, and modernised assembly plants in both the literature in the Japanese language and the Western literature reflect themselves in the discussion about the evolution of the degree of self-regulation of these teams. A review of this discussion also leads to the conclusion that there is no consensus among the authors involved in this discussion. To begin with, at one end of the spectrum there are authors who claim that the introduction of the mini-lines at Toyota implies a leap forward in the way teamwork is organised (Fujimoto, 1994; Roth & Schulten, 1996; Fujita, forthcoming). Shimizu (1995a) even claims that, “A new boost is given to ‘teamwork’. Toyotaism thus appears to have entered a new era in which it is possible to speak of ‘autonomization in its true sense, in other words, the ‘autonomization of people’” (p. 400). At the other end of the spectrum there are authors who are sceptical about such drastic changes (Grønning, 1995; Shinohara, 1992; Abo, 1995). Schanz and Döring (1998) characterise these changes only as a ‘continuity in change’ (p. 929).

In this conclusion, the question, which was raised at the beginning of this paper, is answered. This question was, 'whether it is possible in this early stage of the discussion to conclude with certainty that an evolution in the degree of self-regulation of teams at final assembly lines in the automobile industry in Japan has actually taken place'.

In order to deal with this question, three types of requirements have been presented in this paper, theoretical, empirical, and analytical requirements.

A review of the relevant literature on *traditional* production work at the assembly lines revealed that the majority of the research on this topic does not develop a theoretical framework, which allows for the empirical assessment of the degree of self-regulation of teams. Research on Japanese teamwork is research, which has been largely based on recycled and limited empirical material. In addition, and perhaps as a result of the lack of theoretically founded empirical data, the conclusions of this literature on the degree of self-regulation appear to be contradictory. This implies that additional research which meets the presented requirements is needed.

A review of the relevant literature on production work at *new and modernised* assembly lines revealed that theoretically founded empirical material is very scarce (Ogasawa & Ueda, 1996,

p. 55). Moreover, the estimations, which are made by authors, seem to be contradictory.

Given these ambiguities, it is impossible to meet the analytical requirement. For, in order to make unambiguous statements about the *evolution* of the degree of self-regulation of teams, a systematic comparison needs to be made between theoretically based empirical descriptions of *traditional* teamwork and theoretically based empirical descriptions of *new and modernised* teamwork at assembly lines of the *same* manufacturer. *General* statements about a supposed evolution also seem to be impossible because the majority of publications about teamwork in the automobile industry in Japan concerns only Toyota.

Given the lack of theoretically founded empirical evidence which meets the analytical requirements, it is impossible to make a scientifically sound judgement yet on the supposed evolution in the degree of self-regulation of teams in the automobile industry in Japan. Although it is possible that the evolution, which is claimed to have taken place, actually has taken place, there seems yet to be little theoretically grounded empirical material, which substantiates this claim. Adequate empirical research on this issue has to be done.

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