

1-1-1990

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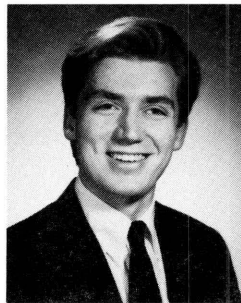
Recommended Citation

Harter, Peter F., "Just-In-Time Manufacturing and Industrial Democracy: Are They in Conflict?" (1990). *Perspectives on business and economics*. Paper 4.
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JUST-IN-TIME MANUFACTURING AND INDUSTRIAL DEMOCRACY: ARE THEY IN CONFLICT?

Peter Harter



The only tradition that we need bother about is the tradition of good work.

Henry Ford, 1926

Introduction

The “new manufacturing environment” and the principles of industrial democracy are frequently proposed as solutions to the competitive woes of the United States. Part of this new manufacturing environment is the just-in-time (JIT) concept. As a relatively new system of manufacturing, JIT alters the traditional structures of authority, power, and responsibility in the workplace. These changes in turn introduce new stress in the form of worker self-discipline — stress which allegedly harms the worker rather than improves the quality of working life. Moreover, critics of JIT sometimes contend that this new form of stress puts JIT directly in conflict with industrial democracy (ID).

In this article, I argue that JIT is not in conflict with industrial democracy because workers under JIT are empowered (i.e., en-

abled) to produce “good work.” In order to explain the relationship between JIT and ID, I first briefly discuss their characteristics. I then analyze the various criticisms that JIT causes harmful stress. Next, I review the organizational changes brought about by JIT and how they make the manufacturing environment conducive to ID. Finally, I explain the interdependence between JIT and ID.

The Characteristics Of JIT And ID

JIT challenges many of the tenets of traditional manufacturing operations. JIT causes a continuous process of change to become a part of the manufacturing process by eliminating waste and increasing productivity all in order to fulfill JIT’s essential purpose: to provide the right resources in the right place at the right time. (Orlandini, p. 6b–20) JIT simultaneously eliminates waste and adds value to the product by balancing, synchronizing, and improving the flow of the manufacturing process. As a result, JIT entails major organizational changes.

Indeed, JIT creates new relationships among workers, between workers and management, and between firms and their buyers and suppliers. (Sayer, p. 43) Foremost is the change in the relation of the worker's physical activity with production, from one of a pushthrough method to a throughpull method. Throughpull methods demand that every process produce parts only when they are needed and only in those quantities needed. Here workers on a production line are "internal" customers of each other, as they order and receive products on which to work. (Hay, p. 57) The throughpull method of production is reflected in the operation of a supermarket:

In a supermarket, the customer determines what happens. Customers come to the supermarket, knowing that there are always going to be small quantities of whatever goods they need The customers, in effect, have told the employee what to put on the shelves by what they have taken off That is a pull system because the customer has determined what happens next. The customer in a very real sense pulls the rest of the operators, because he or she puts a specific demand on the business. (Hay, pp. 105–106)

Notice that under JIT this "supermarket" method of production pertains to both internal customers and external customers. Such a change in relationships signifies JIT's restructuring of traditional orders of authority and power. What ultimately occurs in a JIT firm is that the workers, as internal customers, have greater decision-making power, responsibility, and influence.

Like JIT, ID also embodies an organization-wide cultural change from traditional manufacturing. ID provides for a dynamic working environment which gives all employees the freedom to challenge, to disagree with peers, to experiment, and to show initiative. (Rubinstein, p. 27) In such an environment the worker has the ability to affect another person's or group's ability to achieve its goals (i.e., empowerment). (Baglio, p. 60) Moreover, the goals of any ID program are improvement in morale, productivity, and quality (of both the product and the firm as a working environment in which to

have pride). However, ID should not be confused with mere representational forms of democracy, such as the popular but inadequate quality circles of the early nineteen-eighties.

Indeed, ID aims to create conditions for active worker participation in the management of important parts of their work process. (Adizes and Borgese, p. 84) Similarly, JIT requires workers to be pro-active in their work roles in that they contribute to the self-government of their work teams or their work cells. For instance, at Harley-Davidson Motorcycles, JIT's throughpull method of work requires workers to find and solve problems before they occur and to be innovative in their work so as to continually improve efficiency. It also requires workers to constantly communicate with their fellow workers, managers, and customers in order to reassess their work and product and to anticipate and implement needed change. (Reid)

It is important to emphasize that the goal of ID is greater worker autonomy. But JIT's organizational changes create just such an environment. Under JIT workers develop and improve themselves under the stress of a self-generated and self-imposed discipline. Of their own accord, workers reduce waste, suggest innovations in the manufacturing process, and communicate with fellow workers, managers, and customers in order to exchange information which will lead to further improvement. This self-discipline in turn enables workers to govern themselves, to exercise decision-making control, and to implement change where needed.

Criticism Of JIT

JIT is seen by some to be in conflict with ID because JIT causes stress that allegedly is harmful to the worker. For example, Mike Parker and Jane Slaughter, outspoken critics of JIT, label JIT as "management by stress." (Parker and Slaughter, [a], p. 37) Generally, critics contend that JIT hinders the improvement of working conditions by increasing operational rigidity and production speed, thereby curtailing ID. There are two particular characteristics of JIT which are most often criticized: automation and "making things fast."

Autonomation

Autonomation is the design of machines to stop automatically as soon as a defective part is produced or to reject any defective part fed into them. Also, with autonomation a worker can start one machine on a cycle and move to another (instead of waiting for one to finish) because the machines do not have to be "minded." (Sayer, p. 52) Autonomation reduces waste in both worker activity and production of goods. However, critics view autonomation as harmful to the worker because it allegedly causes operational rigidity and, as an indirect result, severe increases in production speed. Also, some critics go so far as to say that autonomation requires perfect job performance. Overall, the critic's conception of autonomation is that it creates a more difficult work environment.

In fact, however, autonomation can actually free the worker from some of his more routine duties. For instance, because autonomation designs machines to detect defects before starting work on a batch or even on an individual piece, the worker is relieved from such duties and has more time to analyze the production or to figure out how to make an improvement. In other words, the worker is released from performing some overly repetitious tasks and is enabled to think more about the nature of his work and how he can go about it better. One proponent of this view is Bruce Lee, Director of the United Automobile Workers' (UAW) Western Region, who is directly involved in the joint venture (NUMMI) between General Motors and Toyota. According to Lee:

Every team that figures out a simpler way to get a job done is speeding up production. But the team members are not moving faster or working harder. They are increasing the plant's productivity and competitiveness while making jobs easier. (Lee, p. 2)

Concurring with Lee is Richard Lubben, a JIT expert, who argues that the type of operation which uses autonomation works because employees learn to discipline themselves by continually analyzing their methods of work, in contrast to a reaction-based ("just-in-case")

system. (Lubben, p. 42) But an increase in order and discipline does not necessarily require perfection from workers nor does it create an inordinate degree of difficulty for workers.

"Making Things Fast"

Closely related to autonomation is the issue of how quickly things are made under JIT. It is true that JIT increases productivity and, hence, earns the label of "making things fast." But the productivity gains do not arise through sheer acceleration of the production line. Rather, JIT production tends to be faster (Suzuki, 1986, p. 18) because of its continual elimination of inefficiencies and waste in the manufacturing process (i.e., better plant layout and throughpull cooperation in cycle requirements and pacing). This elimination process is sustained by the contributions of the workers. Worker participation in both maintenance of efficient production and innovation toward further improvements is what really "makes things fast."

The allegedly harmful stress of making things fast is sometimes blamed on JIT's elimination of buffers (i.e., waste). Buffers are the idle time which results from long setup times, from bottlenecks somewhere up the line, from rework (i.e., fixing a product after it has been already completed on the line), from preventative maintenance tasks, and from the shifting of responsibility for quality checks to the individual worker. As Andrew Sayer puts it:

The reduction of the "porosity of the working day" through elimination of idle time...increases the intensity of work and associated stress....As output per worker is likely to increase markedly, the effects on employment in both direct and indirect production are likely to be negative. (Sayer, p. 66)

However, Sayer's criticism, that the effects of JIT's elimination of buffers on the worker are negative, fails to take into consideration just what it is that is enabling and motivating workers to complete their tasks faster (i.e., without buffers): the desire to produce a quality product that satisfies the customer.

Sayer's criticism is reflected in Parker and

Slaughter's observations on the NUMMI plant:

[JIT's] operating principle is to methodically locate and remove protection against breakdowns and glitches. To identify both weak and strong points, the system, including its human elements, operates in a state of permanent stress. The weak points break down, indicating where additional resources are needed. Just as important, points that never break down are assumed to waste resources. (Parker and Slaughter, [a], pp. 38-39)

What Parker and Slaughter imply here is that the JIT strategy of eliminating waste wherever it may be found is harmful to the worker. But Bruce Lee of the United Auto Workers strongly disagrees with Parker and Slaughter, calling them "aging revolutionaries" of the 1960s era. Contrary to the impression which one gains from their commentary on the subject, Mr. Lee reveals that neither Mr. Parker nor Ms. Slaughter has ever worked at NUMMI, nor have they interviewed or talked with any of the workers. (Lee, p. 2) Parker and Slaughter's views may well be at odds with the typical NUMMI worker's experience with JIT.

It is true, of course, that JIT's attack on waste does reduce free time (buffers) between tasks and is an attempt to have a worker working continuously while on the job. (Klein, p. 60) But this does not necessarily mean that the stress the worker is under is thereby harmful. This is so because the worker — the autonomous self-disciplined worker — influences, if not leads, the attack by making changes in the manufacturing process through his own innovations. For instance, through the elimination of waste, JIT can actually reduce the amount of physical strain on the worker. It is also an objective of JIT to simplify the physical act of setting up. (Hay, p. 55) What is more, employee innovation in production planning has led to the simplification of work and to the reduction of physically debilitating work, as has been observed at both Harley-Davidson Motorcycles (Reid, pp. 152-61) and at NUMMI. (Lee, p. 2)

Embedded in the "making things fast" criticism of JIT is the assumption that the speed of the line is set solely by management. In

reality, JIT firms produce at the rate required by both their external and internal customers. (Hay, p. 57) In contrast, traditional companies (i.e., non-JIT firms) produce at the machine rate — a rate which focuses on the rapid amortization of the costs of setups and of expensive equipment. The machine rate is discordant because it represents a production strategy that causes uncoordinated increases and decreases in the speed of the production line. Simply put, the machine rate fails to take into account all of the steps involved in the production process. The machine rate also fails to utilize the capabilities of workers to improve production efficiency and to produce goods for customers at the times customers want them. Moreover, the machine rate means the production of large inventories of parts, in contrast to JIT's finishing of goods quickly by manufacturing in smaller batches (which is a better way to get customers what they want when they want it). It is also important to notice that the machines, not the workers, set the pace. (Hay, p. 35) Thus, machine rate production is actually more likely to cause harmful stress because the speed of the line and the organization of work is beyond the control of the worker.

JIT also provides for considerable worker discretion in regard to the speed of the production line. (Lee, p. 2) In their role of internal customer, workers alone are in a position to vary the speed of the line. Line speed might be changed to overcome "bottlenecks," for example. Worker discretion is also integral to JIT's provision for a "smart" flow of materials, manpower, and machines because the typical worker (as a result of the continual education and training necessitated by JIT) is knowledgeable in more than just one or two tasks. Under JIT the worker thus better understands how the plant as a whole operates and is therefore enabled to continually change how he works. Worker innovations are especially significant in the areas of productivity and quality.

Beneficial Stress

At this point, the beneficial or "good" stress resulting from JIT's continual reduction of waste should be apparent.

Consider, for a moment, a simple rubber band. It has no value when laying loosely in a box. But, if you stretch the rubber band and place it around some straws or a deck of cards, it is doing useful work. This is what is meant by good stress, producing just enough discomfort to overcome the inertia of the status quo, so we can move ahead. (Wantuck, p. 31)

A little discomfort is sometimes necessary, therefore, in order for solid learning and substantive improvement to take place. The stress that comes from the intellectual challenges of JIT's flexible throughpull manufacturing system represents "just enough discomfort" for the worker to gain the self-discipline and the desires necessary to bring about improvement in the organization.

It is also under the "stress" of self-discipline that the worker develops a spirit of satisfaction with the changes and learns to regard the changes as accomplishments. Such accomplishments can truly provide a feeling of fulfillment for the worker in his activities. (Lawler, p. 32-33) Indeed, the self-discipline inculcated by JIT is the means to achieving progress and to overcoming the dissatisfaction and consequent inertia so often associated with maintaining the status quo.

JIT's Organizational Changes

Helping to instill worker self-discipline are the various organizational changes effected by JIT. These are primarily changes in the organizational culture, with new worker-management relationships (characterized by flattened hierarchies) filling the gaps left by the old, narrow hierarchial relationships. (Suzaki, 1987, p. 225) The effect of such changes is the "empowerment" of workers, with the new relationship between managers and workers enabling workers to become more productive and to contribute more to the improvement of the firm.

Characterizing the new relationship brought on by JIT is the spirit of a "shared destiny." (Suzaki, 1987, p. 204) Indeed, under

JIT some old behaviors, such as the narrow definition of a worker's skill and task responsibilities as laid out by union contracts, have to be abandoned. (Lawler, p. 217) Specifically, there are two areas of major organizational culture change brought about by JIT which so "empower" the workers: adversarial relationships and levels of hierarchy.

Adversarial Relationship Culture is Changed

JIT engenders new forms of cooperation between management and workers in helping to phase out the "us vs. them" attitude prevalent in so many traditional organizations. The continual drive toward improvement necessitates management and workers joining together to solve problems. Preliminary, but crucial, steps in JIT's empowering of employees through culture change concern job titles, pay structure, and "perks." For example, at GM's new Saturn Corporation, a cooperative relationship between management and workers was part of the original design and was built into the organization:

Old job titles will be replaced with neutral ones and blue-collar workers will earn a salary, just like managers. Both will earn bonuses based on performance. And although the UAW will keep the right to strike, it will try to agree on changes on pay by consensus with management instead of formal bargaining. The union will have a say in managers' salary too. (Edid, pp. 65-6)

Another way management and workers are brought together by JIT is through the elimination of many middle-management and quality-inspector positions. This opens up direct ties between upper levels of management and workers on the production line. This change may be, in fact, the most fundamental contribution of JIT toward eliminating the adversarial relationship. Typically, the inspection process fosters bad feelings between the inspectors and the workers. Inspectors are usually seen as "spies" who are out to "get" the workers and to point the finger at labor for mistakes. Moreover, because the inspection process is reactive

in nature (Wantuck, p. 39), it precludes worker participation, thereby allowing the worker to abdicate the responsibility for quality in his work. It is important to understand that this abdication of responsibility constitutes a denial of ID.

In contrast, compare the proactive worker source inspection process which is part-and-parcel of JIT. As Bruce Lee of the UAW argues:

[In] a system where every assembly worker is a quality inspector, the plant's line managers are the ones under pressure to prevent snafus that keep the worker from doing his job right. The pressure . . . is not from the top down, it's from the bottom up. (Lee, p. 2)

Under JIT, problems are anticipated and continuous improvement is fostered, because the worker can provide and receive immediate and substantial feedback and information necessary to contend with problems most effectively.

Hierarchy

Also tied to the issue of adversarial relationships between management and workers is that of hierarchy. As already mentioned, JIT causes changes in manpower with fewer inspectors, supervisors, and middle managers needed in a JIT manufacturing system. Here one can see JIT's flattening of the management structure. (Jaques) Hierarchy is changed as JIT laterally restructures relationships between labor and management through its implementation of cross-functional teams. (Dumaine, p. 53-4) This metamorphosis is currently at work at NUMMI:

"Unless management relinquishes the reins and pushes decision-making down as far as it can and lets people who know the job handle the problems, employee involvement," says NUMMI's Mr. Childs, "will never become a real business weapon in the battle to become competitive." (Verespej, p. 64)

Here, power must proceed through a true, downward delegation, thereby empowering the workers with authority. (Cope, p. 23)

Interdependence

Industrial democracy is a demand-driven phenomenon in the manufacturing environment. Labor wants a greater voice in the operation of the organization. JIT, however, is a supply-driven phenomenon because its changes in the work place empower workers and thus provide for worker autonomy. Managers must realize that in order to increase profits, productivity, quality, market share, and customer satisfaction, they have to change how they utilize human resources. Empowerment through JIT is the needed change. As Corning CEO Jamie Houghton states: "If you really believe in quality, when you cut through everything, it's empowering your people, and it's empowering your people to lead teams." (Houghton, as quoted in Dumaine, p. 52) The interdependence of JIT and ID rests on empowerment itself, the types of control a worker has under JIT's provision of autonomy, and on participation, the means of empowerment.

Empowerment

Empowerment is the ability to affect another's capability for achieving the goals of the firm (Baglio, p. 61), and one consequence of empowerment is an increase in worker autonomy. Worker autonomy is readily increased by arranging the workers in teams. Texas Instruments Vice-President James Watson, creator of a system of hierarchy of teams that gives them authority to act, guarantees that if "you came across someone who says teams didn't work at his company, it's because management didn't take an interest in them." (Watson, as quoted in Dumaine, pp.55,58) It is autonomy that gives employees the freedom to exercise their creativity and therefore the fuel to become more efficient and more productive.

In a traditional manufacturing environment, individual creativity is too easily forgotten by management or suppressed by the worker. However, JIT keeps people aware of their autonomy and its potential power because JIT delegates sufficient authority to workers to do the jobs demanded by their positions. (Baglio, p. 61) In the exercise of this power, the worker's

awareness of his autonomy is thereby bolstered.

The most essential part of empowerment is **decision-making power**. The sharing of decision-making power between workers and management enhances the efficiency of the whole JIT process. It also illustrates a worker's authority over his work. Ralph Stayer, CEO of Johnsonville Foods, claims that productivity increases of 50% at his firm resulted from workers having more autonomy in their work. Stayer also argues that large productivity gains will not occur unless the authority to act is delegated. (Dumaine, p. 55) One example of worker decision-making power in JIT manufacturing can be seen in a device known as the "andon board," which hangs over the production line. Along the production line there are cords which workers can pull to stop the line if there is a production or a quality problem that cannot be remedied quickly. If a cord is pulled a light flashes on the andon board, signaling the specific station experiencing the problem.

Empowerment also means **increasing responsibilities** for workers in the JIT firm. Greater control over the manufacturing process is handed over to the workers by the managers because of JIT's requirement of a "feedback loop" — a cyclical activity requiring workers to evaluate actual performance, compare it with the performance standard, and resolve any differences between the two. (Juran, 1988, p. 22.69) Both the number and the types of responsibilities for workers must be augmented to the point where workers sustain the improvement gains. For instance, workers must prevent equipment deterioration and breakdown. Also, workers must manage supplies, as well as deal with the mistakes and incompetence of colleagues. (Juran, 1988, p. 22.69)

Empowerment cannot succeed without continual **education**, diversified **training**, and increased **skills**. Education about the firm as a whole helps to break down barriers of antagonism between management and workers. Moreover, workers become able to comprehend their own roles more fully within the firm's operations as a whole. For instance, consider this simple question: How does a worker know when the time is appropriate to take a coffee break? With education and train-

ing that encompasses most aspects of the firm, a worker can realize on his own when such a break is in order. Dumaine describes Chaparral Steel's educational efforts of getting workers to comprehend their roles in this way:

[We offer] a course that not only describes what happens to a piece of steel as it moves through the company, but also covers the roles of finance, accounting, and sales. Once trained, a worker understands how his job relates to the welfare of the entire organization. (Dumaine, p.58)

JIT is consistent with this form of education. For instance, because JIT's continual reduction of buffers engenders "new" processes of manufacturing, workers are constantly being "re-educated." Workers learn more and more about the manufacturing process as a whole because the process never becomes standardized. Indeed, their roles in effecting changes in the manufacturing process become increasingly prominent. Put simply, JIT creates a manufacturing environment guided by a sophisticated method of learning-by-doing. (Sayer, p. 53) At Saturn, for example, education and training is an integral part of the manufacturing process from the very first day. New hires initially receive five days of technical lessons and "cultural education." Following that, employees receive 750 hours or more of ongoing training. (Treece, pp. 59–60) In many JIT firms managers and workers use video cameras and stopwatches to analyze each step in the manufacturing process in order to find more efficient and safer ways to manufacture by identifying and eliminating waste.

JIT also generates worker concern for the quality of the product, the processes, the systems, the firm's reputation, and customer relationships (both internal and external). This concern can manifest itself in the feeling of **ownership**. For instance, Amot Controls Corporation specifically defines "ownership" to be a situation in which the worker is in charge of his own job, designs his own work area, and is responsible for the product as a whole, not just the parts upon which he may have worked. Indeed, the concept of ownership in JIT organizations leads to worker responsibility for and

pride in the quality of products leaving the plant. (Reid, p. 75)

In a JIT organization, once individual creativity, decision-making power, increased responsibility, education, and ownership have come into being, the worker effectively gains control over how he manages his work and his influence in the firm. Such control is referred to as **autonomy**.

Autonomy

According to Edward E. Lawler III, an authority on employee involvement management, the work teams that JIT creates are self-managing in nature because they control important parts of their work process. "Autonomous" here means that workers not only have responsibility for a significant area of the workplace, but that they also make a number of decisions concerning when and how the work will be done. (Lawler, p. 102) Autonomy also implies authority for self-governance. An individual worker within a work team may not **appear** to be autonomous; however, he is autonomous in a sense because he contributes to the "governance" of his work team. Furthermore, since work teams are not permanent in nature (unlike quality circles), the worker has the opportunity over time to contribute to the governance of a myriad of operations because he will in the long run be a member of many different work teams.

An example of the development of autonomy under JIT has taken place at Penn Fibre, a supplier to the automotive industry. As a result of JIT, Penn Fibre has experienced improvements

not just in product quality, accuracy, and on-time delivery but in morale, and improved employee relations . . . Penn Fibre's employees are better trained and now have a more personal involvement in the making of their products . . . because each one of them has the responsibility to make sure that every order is produced and shipped correctly. (*Purchasing World*, p. 39)

Indeed, autonomy grows as the worker develops a necessary sense of deep and sincere per-

sonal involvement in the management of the manufacturing process and the firm.

Autonomy under JIT brings about three categories of control for the worker to exercise. First, workers know what they are supposed to do because the organization's goals and targets are both visible and communicable via dialogue (not just via monologue). Furthermore, they are aware of the link between performance and reward. Second, workers better comprehend their work because of continual training, education, and "multi-skilling." Third, workers regulate their own work processes and tasks (Juran, 1988, p. 17.4-17.5), acting with largely uninhibited authority and changing their behavior if the desired results are not achieved. They also select their own associates and leaders. In other words, the workers possess the means needed to conform to the planned goals (Juran, 1988, p. 6.32) of the organization because they have the ability to make responses that influence the handling of problems and to choose the solutions they deem necessary.

When a worker has autonomy he usually also has more flexibility and potentially greater job satisfaction. (Lawler, p. 102) Accordingly, there is often less harmful stress associated with the job. It is important to understand that the achievement of those goals which a person has set for himself is usually more rewarding than the achievement of someone else's goals. (Juran, 1988, p. 10.28) Moreover, the reward and feeling of personal satisfaction which usually result when workers are entrusted with independent problem-solving authority can sharply reduce turnover rates. (Lawler, p. 33) It is important to recognize that there is a great deal of frustration generated by the repetitiveness and the menial nature of jobs characterized by standard operating procedures. It is here that JIT, through autonomy, provides a way to avoid the harmful stress which results from such frustration.

Participation, The Means of Empowerment

JIT empowers workers by getting them actively involved in the management of their work. According to Edward Lawler, there is a higher level of involvement of employees under

JIT because it is they who are the line experts and it is their information which is vital toward any progress. Simply put, the worker possesses the greatest potential for important innovation. And JIT's empowerment succeeds because it is based on the recognition that the most undeveloped source of improvement is on the shop floor, where 80 percent of personnel spend 99 percent of their time. (Wantuck, p. 29) Human resources, communication links, and vital information all lie waiting on the shop floor to be put to better use. Empowerment provides the opportunities for these resources to go into action.

Specifically, JIT participation consists of worker involvement in the activities of process control and process improvement. Process control is the prevention of adverse, undesired change in the operation of a firm — from the production line to general management. Process improvement is the planning and creation of beneficial, desired change (e.g., improvements and innovations) in such areas as products, management style, working environment, and perhaps even corporate strategies. (Juran, 1988, p. 10.25) These two activities are interdependent and operate in tandem on a continual “plan-do-check-act processing system management cycle.” (Juran, 1988, p. 10.25–6)

Participation under JIT is consistent with JIT's overall aim to eliminate waste. At Honeywell, participation itself is continuous in nature because it is a process that regenerates itself from project to project, from innovation to innovation, from solution to solution:

It is living because it is generated by the people, not something imposed by senior management. It is not a static structure run by managers and supervisors but a tool used by all levels of employees . . . to improve our business. (Larson, p. 233)

Constituting the successful operation of JIT and its worker empowerment through continual participation are the various forms of the team concept. Xerox is one firm that has enjoyed considerable success since utilizing JIT. Although Xerox's work teams (called “family groups”) have not turned the plant into a “resort,” grievances have noticeably dropped since

JIT was implemented. (Holusha, b, p. D11)

The essential element of the team concept is the activity of joint problem-solving. Even JIT critics such as Parker and Slaughter qualifyingly admit that a team structure “could be useful to workers on the line — if its purpose were to enhance communication and coordination among peers.” (Parker and Slaughter, [a], p. 43) Indeed, problem-solving is fueled by such an exchange of information through worker communication and coordination. Witness the experience of Motorola's Participative Management Program (PMP), which according to Barra

involves everyone in ongoing problem-solving and decision-making processes. This process ensures that all Motorola employees have the opportunity to contribute quality improvement recommendations in methods and procedures (based upon their job knowledge and newly acquired skills). (Barra, p. 48)

Supporting Motorola's PMP are eleven communication principles and values which give everyone the tools with which they can ensure universal involvement:

- Really listening to others.
- Knowing who Motorola's competitors are and what we have to do to stay on top.
- Learning to trust and respect others.
- Taking time to think about how we feel about others.
- Giving people suggestions that will help them, and letting them know we notice the good things about them.
- Not being afraid to ask questions and never embarrassing others who do.
- Working hard to understand and get along with co-workers and supervisors.
- Caring about the people we work with.
- Congratulating people on good work and good ideas.
- Being a part of the team.
- Understanding that people are different and have different ways of looking at things. (Barra, pp. 48–49)

Motorola's success has been great because these eleven values and principles have made worker contributions to the decision-making process a

common part of everyday activity instead of a rare phenomenon. (Barra, pp. 48–49)

There is also specific evidence of a greater spirit of cooperation among employees (Weisz, p. 33) once the commitment to JIT has paid off.

[Motorola's] employees learn faster and better under PMP, and they keep their work place cleaner . . . Cooperation between shifts is much improved. They overlap and leave notes for each other on what to watch for. They are beginning to think like managers. When something goes wrong in a process, employees willingly help each other instead of saying, "That's not my responsibility." Problems surface more quickly. The rate of turnover is improving because employees find that their jobs are more meaningful and interesting. (Weisz, p. 33)

Indeed, JIT provides for increases in worker participation through new avenues of communication and coordination which go beyond the confines of the production line. For instance, JIT's "partnering" of manufacturers and suppliers has raised worker participation, communication, and cooperation to new levels. Partnering has evolved as a matter of necessity; for in order to meet JIT's demands for delivery timing and consistency of quality requirements, closer relationships between manufacturers and their suppliers were necessary. Manufacturers have reduced the number of suppliers they rely on, making the maintenance of the relationship with any one supplier that much more important. Moreover, JIT causes an increase in communication and coordination between workers within both the customer's and the supplier's firms. And underlying the increases are the new contacts which develop between workers on both manufacturers' and suppliers' production lines. In order to continually improve delivery time, product design, and product quality and to deal effectively with changes in the demands of the external customers of the

manufacturers (the ultimate consumers), workers have been given greater latitude to cooperate directly with persons outside their station. Indeed, workers responsible for any part of a product must be enabled by management to work with those responsible for all other parts of the product. This expansion of communication avenues, a result of partnering, is a valuable resource upon which both JIT and workers thrive. JIT's employee empowerment thus simultaneously necessitates and facilitates an organizational change in the environment of the work place; and as a result of such empowerment, the workers contribute directly to the information exchanges between customers and suppliers.

Conclusion

The role of the worker in the new manufacturing environment has been changed for the better by JIT. Because of JIT's creation of work teams, increased responsibilities, increased education and training, greater decision-making authority, and general participative management measures, JIT is not in conflict with industrial democracy. Primarily, JIT empowers workers by providing them with opportunities to work with greater autonomy through the means of worker self-discipline. Critics of JIT assert that this self-discipline causes harmful stress for the worker and that JIT, therefore, makes working life worse. However, the experiences of companies like Motorola, Harley-Davidson, Xerox, NUMMI, and Saturn are evidence of the successful changes brought about by JIT. These firms show how JIT can empower the worker and thereby produce positive results for both workers as well as firms. Indeed, JIT works so well with the principles of industrial democracy precisely because JIT sustains that "tradition of good work" by changing the role of the worker.

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