

LEAN PRODUCTION AND WORKER HEALTH: A DISCUSSION

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New systems of work organization have been introduced by employers throughout the industrialized world in order to improve productivity, product quality and profitability. Such efforts have taken a variety of forms and names, including lean production, total quality management, re-engineering, and modular manufacturing, and have often been extolled as reforms of Taylorism and the traditional assembly-line approach to job design. While the new systems can introduce profound changes in the way work is designed, few studies have examined the impact of such systems on work injuries (especially work-related musculoskeletal disorders) or on job characteristics related to job strain (i.e., jobs defined by high demands, low control, and low support), which has been linked to the development of hypertension and cardiovascular disease. In addition, lean production and related new work systems may impact on worker skill development, co-worker support and solidarity, and union strength, and may, in turn, be modified by union efforts.

Therefore, we asked a number of researchers and educators in the field to discuss the impact of lean production on worker health and safety and related job characteristics. Paul Adler, University of Southern California, has studied the New United Motors Manufacturing, Inc. (NUMMI) auto assembly plant, a GM-Toyota joint venture in Fremont, CA, and compared it to Scandinavian auto plants on productivity and quality, as well as ergonomics. Paul Landsbergis, Cornell University Medical College, has conducted studies on the impact of work organization on high blood pressure, heart disease and psychological distress and has taught ergonomics and occupational health. Following a debate between Landsbergis and Adler, commentary is provided by: Steve Babson, Wayne State University, who conducted a study of job characteristics and health at Mazda (now Auto Alliance) in Flat Rock, Michigan; Jeffrey Johnson, John Hopkins University, who has conducted epidemiologic studies of work organization and cardiovascular disease in the U.S. and Sweden; Michelle Kaminski, University of Illinois, who directed studies of the impact of new work systems on health and job characteristics at six unionized U.S. companies; Nancy Lessin, Massachusetts Coalition for Occupational Safety and Health, who conducts educational programs on the impact of new work systems on health and safety for unions and their members in a variety of industries; John Paul MacDuffie, University of Pennsylvania, who has directed the International Assembly Plant Study, carried out through M.I.T.'s International Motor Vehicle Program; Katsuo Nishiyama, Shiga University of Medical Science, an ergonomist who has studied the health effects of Japanese production management; Sharon Parker, University of Sheffield, has conducted studies of the impact of lean production practices on job characteristics and health among British electrical and auto manufacturing workers; and Charley Richardson, University of Massachusetts/Lowell, who has written and taught on the impact of new work systems on health and safety, skills training, and collective bargaining in various industries. You are encouraged to respond to this dialogue with your thoughts and comments.

LANDSBERGIS: Paul, after reading your paper (Adler, Goldoftas & Levine, 1997) on ergonomics at the NUMMI auto assembly plant, a GM-Toyota joint venture in Fremont, CA, I find myself disagreeing with one of your central points. You argue that workers at NUMMI

suffered work-related musculoskeletal disorders (WMSDs) not because the Toyota production system of work design was so regimented (standardized work cycles of 60 seconds), but because it wasn't implemented quite right. The problem with your interpretation is that it flies in the face of so much research on job control, stress and health. Karasek's model that high job demands and low job control lead to stress-related illness has been strongly supported (Karasek & Theorell, 1990; Schnall, Landsbergis & Baker, 1994). Repetitive, short-cycle work is a risk factor for musculoskeletal disorders (Kuorinka & Forcier, 1995).

ADLER: In our view, lean production-type work organization, based on detailed standardization and short work cycles, is a double-edged sword. It can considerably degrade ergonomic outcomes if it's implemented poorly and without sufficient safeguards for workers' health. But if it's implemented correctly it can improve ergonomic outcomes, at least compared to the more traditional approach of the Big Three automakers, where the work was characterized by short work cycles but lots of worker autonomy in how they performed their tasks (no one cared, as long as it got done!).

My understanding of Karasek is that the generalization linking control and illness outcomes works fine on average, but there is a large proportion of variance unexplained by his model. Specifically, there are some Tayloristic (i.e., highly regimented, low control) job environments that lead to health problems, but others don't. I think that much of this unexplained variance is probably due to the difference I draw between Adespotic Taylorism@ and Ademocratic Taylorism.@ On average, health outcomes are better in less Tayloristic environments, and that would be sufficient argument in favor of job designs allowing workers more control -- if it were true that such work designs allowed approximately equivalent (or better) efficiency outcomes. But some kinds of production -- in particular, the mass production of standardized products like cars -- operate far more efficiently (in simple, technical-economic terms) under Tayloristic designs. So then the question becomes: can low-control, Tayloristic job designs be compatible with reasonable health standards? I interpret Karasek's data as allowing us to answer this question with a "maybe." That's why good implementation of the lean model is important.

LANDSBERGIS: I don't see that the traditional approach of the Big Three provided for "lots of worker autonomy". Taylorism in those plants did enable workers to keep some knowledge of the production process to themselves, which allowed them to carve a few seconds out of every cycle for rest (or socializing). But it's still a very limited form of autonomy compared to other jobs. And it is precisely the type of autonomy (those extra seconds) which "lean production" is designed to remove. I'd also say that the unexplained variance in Karasek's model is far more likely to be due to variance between individuals or other work site factors. You argue that some low control (Tayloristic) environments might not promote worker injuries and illnesses. You argue that if lean production is implemented well, it is not necessarily unhealthy. But can you be more specific?

OCCUPATIONAL HEALTH AND WORKER "VOICE" -- U.S. AND EUROPE

ADLER: What would good implementation of lean production look like? The first thing is that workers would have to feel that efficiency of production is a salient goal -- rather than just the

bosses' goal. And second, workers must have a voice -- a say -- both in the details of work design and in the broader process of plant governance. Under those conditions, short-cycle, low control Taylorism would be what I call democratic Taylorism.

LANDSBERGIS: This seems to be a very idealistic view! In practice, workers' belief in the importance of efficiency can be manipulated. More importantly, workers can only have a real say when they have a strong union fighting for their interests -- one that can force modifications to a lean system to make it less unhealthy. The main problem is that we rarely see such conditions of "worker voice." In most cases "giving workers a real say in job design" would lead away from Taylorism -- when people have some choice they will push for more humane working conditions. And not just in the very micro dimensions that you talk about. Consider all the other variables besides standardized short cycles which we could discuss. For example, reducing line speed to reduce the injury rate. Or consider the major improvements made by unionized workers at Mazda, now Auto Alliance, Flat Rock, Michigan (Babson, 1993; 1995; Slaughter, 1994) or at CAMI, a GM-Suzuki joint venture in Ingersoll, Ontario (Robertson et al., 1993), following strikes or strike threats:

*Improved staffing through a Temporary Assignment Pool of workers to fill in for absent or injured workers. (This undermines one purpose of teams: peer pressure to discourage absenteeism, or to encourage working while injured.)

*Fairer access to training

*Increased transfers between departments

*Joint committees on health and safety, ergonomics, training

*The right to elect or recall team leaders

*Team leaders' duties in contract

*Increasing work loads due to absenteeism is forbidden

*Temporary assignments offered to workers on the basis of seniority

*Some limits on line speeds and job standards

*Ergonomics programs

*No reprisals for reporting injuries

Or, consider Scandinavia and Germany, where workers have even greater voice. The job designs that workers endorse in those countries are a long way from the regimentation of lean production (Applebaum & Batt, 1994).

ADLER: Many of the improvements made at Flat Rock and CAMI strike me as wonderful. And NUMMI has already implemented quite a few (notably, a full-time ergonomics rep and a joint ergonomics committee). Others seem to me less straightforward. In particular, I am not sure that Team Leaders (TLs) should be thought of as team spokespersons, subject to election and recall. At NUMMI, Team Leaders are considered more like lead hands -- a position with primarily technical requirements -- and TLs are jointly selected by union and management based on work performance and performance in preparatory classes. Why should TLs function as workers' reps when union coordinators (shop stewards) are there to play that role?

But more fundamentally, your argument shifts the discussion away from the micro issues of work organization. I want to try to keep the focus here, since I think our ideas on these issues

play a big role in shaping our assessment of work systems. On this score, I fear that the unions in Europe have led workers into an impasse, since in their rejection of more regimented job designs, they are unnecessarily holding industry back from urgently needed productivity and quality improvements -- improvements that could be had without jeopardizing workers' health. The disagreement between us is that I think that "giving workers a real say in job design" does not necessarily lead away from highly standardized, short cycle jobs, whereas you seem to think it does.

LANDSBERGIS: I don't think you can analyze micro aspects of job design in isolation. In Europe, industrial workers accept some regimentation, but it's counterbalanced by a great deal of influence over working conditions and line speed, and real apprenticeship programs for skill development. Compare this to the very limited skills training in the U.S. More generally, the whole context is different: a major element of "voice" is union representation. Such representation, as you pointed out, was weak at NUMMI until stress and injuries led to a more militant union posture. I'd point out too, that before they were elected, Team Leaders at Mazda were clearly impediments to participatory management, by playing favorites in providing access to training or job rotation (see Babson, 1993).

ADLER: I agree that unions in the US in general and at NUMMI in particular have rarely had the power they need to give workers effective voice.

THREAT OF JOB LOSS

LANDSBERGIS: I would take my argument a step further: commitment and voice come from having choices and control -- otherwise they can become forms of subtle coercion or brainwashing. When there are few other well-paying jobs in the area available to people without college education, people will put up with a great deal of stress and regimentation to support their families -- but that's hardly "commitment" or true "voice"!

ADLER: To my mind, this is a complex issue. It is true that workers often accept terrible conditions only because they fear for their jobs; but what would these issues look like in some ideal kind of society, one without coercion? Allow me to set one parameter so we can stay in the domain of the "even remotely conceivable" -- let us imagine a society that has not yet reached a level of technological and/or spiritual sophistication at which people wouldn't need to work to satisfy their material needs. I would argue that in such an ideal society the broader community would still demand that workers work as efficiently as is compatible with their health and dignity.

I don't think this little "thought experiment" is far from workers' minds when they try to make sense of the pressures they come under in industry today. Yes, when workers hear the message "Work harder, or you're out of job", many recognize the threat of job loss as a power play by capital against labor. But my impression is that many workers also see this threat of job loss as a side-effect of forces whose logic and legitimacy they accept, namely the development of an increasingly integrated world economy (see Adler, 1993, for some quotes that are pretty eloquent). In this second perspective, some activities that have been conducted in the US can only be made more competitive -- and thus economically viable -- by working a lot smarter and maybe even somewhat harder. But that doesn't mean the work has to be unhealthy.

LANDSBERGIS: If the threat of job loss was solely due to our "inefficiency" we would be in a much better position today, since after all we still have the most productive economy in the world. While workers may see the logic of the global economy (including NAFTA), most do not accept its legitimacy -- they know it is based on multinationals securing increasingly cheaper and non-unionized sources of labor. They are aware of industries that leave the U.S. for sweatshop conditions overseas where workers may earn \$1-2 a day. Even in the auto industry, there are many locations producing cars with labor costs lower than the Japanese. How far do we want to reduce our standard of living?

ADLER: You take us into a complex set of questions, and they are all important. But I am not sure that they change anything in my analysis. In some cases, jobs can be retained in the US by working harder and smarter and without impairing workers' health. In other cases, keeping jobs in the US would require high protective tariff barriers: in some of these cases, a short reprieve to allow an industry to modernize may make a lot of sense; but other cases may be genuinely hopeless, and workers would be better off mobilizing to demand that government provide retraining and new employment opportunities in jobs that justify the high education and infrastructure levels of the US. In all these cases, it is obvious that many firms will use the opportunity to put the squeeze on workers.

LANDSBERGIS: The UAW and others have demanded retraining and new job opportunities, and they have won it to some extent in contracts. But what about non-union workers or workers in weaker unions? Is there legislation pending to this effect? Hardly. We need a larger effort to organize workers worldwide to raise their standards of living and improve their working conditions, or we will continue to simply compete with each other for lower wages and more stressful working conditions.

COMPETITIVE PRESSURE AND LEVELS OF CONTROL

ADLER: I agree entirely with that. But you seem to assume that competitive pressure is always and only a pretext for bosses to increase their share of the pie at workers' expense. This is sometimes true, but other times, competitive pressure is seen by workers as more legitimate; and in some of these latter cases, "win-win" solutions can be found. More fundamentally, if workers are ever going to become a "leading force" in our society (i.e. not just another special interest, but the dominant factor shaping policy), it will be by showing that they are capable of representing society's general interests -- and more capable than the corporations and their lobbyists and representatives. If indeed competitive pressure were always just a pretext it would make sense to adopt the "militant" view you advance; but if I am right, then a different kind of strategy is required, one where workers' organizations take the lead in proposing restructuring programs that protect workers at the same time as they advance society's general interests.

LANDSBERGIS: The priority should be to encourage unions to do a better job of educating their members on how the "competitive pressure" argument is manipulated to degrade wages and working conditions. It's an argument that's even used within the U.S.: Which U.S. plant will work faster and for lower wages to get a parts contract or an assembly plant? It's called Awhipawing@ and it's got very little to do with real efficiency -- it's just the result of limited worker power, influence, voice.

ADLER: Do you really think workers are just dupes if they accept some responsibility for reducing costs? I hear workers saying "Why should American consumers have to pay an extra \$2000 a vehicle just because managers and workers can't learn to work effectively in the plant?" I don't think that they say this just because they have been brainwashed.

LANDSBERGIS: And some workers at NUMMI, Mazda and Subaru considered their co-workers who had been injured on the job to be "slackers" -- and pressured them to not report injuries or to return to work too quickly after injury. This is surely one of the most dangerous aspects of the lean production system. Peer pressure is powerful and lean production deliberately promotes peer pressure. Once peer pressure gets going, it will push people to work while they are injured, and blame other workers for other management failures.

ADLER: You seem to assume that peer pressure is basically internalized self-exploitation. I think that sometimes it is, and sometimes it's not. When managers do succeed in manipulating workers, peer pressure can be really nasty stuff. But when workers have a say in how things are done, one of the consequences is that they are going to accept responsibility for their work outcomes, and that means that they will hold both themselves and their work colleagues accountable. That's a big change from the "good old days" when the only pressure to perform came from the boss, and when the working-class hero was the worker who could get away with the least work effort. (See ARivethead@ by Ben Hamper.) When workers find themselves in this new situation and start taking more responsibility for production, it will certainly take a while to find a new "balance" between the individual and the group, and new forms of respect for each other. Peer pressure can get out of hand until they find that new balance. But that doesn't mean that peer pressure is always internalized self-exploitation.

LANDSBERGIS: The "good old days" came about because of Taylorism, a system in which workers had little power. Once workers were trapped in that system, resistance took the form of solidarity and being as creative as possible to provide spaces for play and rest. Under the new system of lean production, peer pressure is not some aberration, but a clearly designed explicit function of the team system to eliminate those spaces and to reduce solidarity. Your psychological analysis of finding a new balance misses the real problem: lack of decent employment alternatives makes peer pressure more dangerous because it promotes "macho" attitudes about injuries among workers and managers. It's hard to accept that the "good" deal you've gotten is unhealthy for you.

ADLER: Agreed.

SOCIAL COSTS OF LEAN PRODUCTION

LANDSBERGIS: You assume that lean production is more efficient. But are lean methods of production truly more efficient if their true costs -- costs that are currently borne by society, are taken into account? These costs, of course, include occupational injuries and illnesses, including chronic illnesses such as WMSDs, hypertension and heart disease. In addition, there are the social costs to families of absent parents due to forced overtime.

ADLER: I agree completely with this framing of the question. And I don't doubt that lean production implemented under autocratic management and without regulatory safeguards will indeed generate large negative externalities that need to be forcefully addressed. But I think the

democratic, participative version of lean production can be socially as well as economically beneficial compared to the feasible alternatives.

LANDSBERGIS: I'm not sure you're taking all these social costs into account, though. Your article says that ergonomics outcomes in Japanese auto plants are improved because older workers are usually moved off the line. But if only young healthy workers can do such stressful jobs, what do the rest of us do? What happens to the older, the injured, the weaker? They are not treated very well in Japan.

ADLER: I agree that a decent society would create productive work opportunities for the whole range of people. And in general I am troubled by work, even well-paid work, that so wears down the body that it can't be sustained over a whole lifetime without severe risk. On the other hand though, there are quite a few occupations that are not considered permanent or "for everyone" -- and not only because they are physically debilitating. Take flight attendants for example. In their case, it is not physical wear and tear so much as the toll on non-work life, which varies with age, family status, and lifestyle.

I am not sure that we should condemn a priori any job design that is so demanding that it can't be sustained for more than a few years. Economists use the notion of "compensating differentials" to express the idea that some jobs pay more than others because they are dangerous. I'm not sure this concept actually explains much wage variation, and I'm even less comfortable with the idea that we should be willing to let higher wages compensate for dangerous conditions -- as distinct from simply undesirable job conditions. On the other hand, I think that it's not uncommon or unreasonable that career paths lead workers away from very grueling jobs after a while. I would fault NUMMI for not having a career-path policy that ensures this. However, there are some mitigating circumstances. First, the first and largest cohort of NUMMI workers were already relatively old when they were hired by NUMMI -- the UAW forced NUMMI to give hiring priority to laid-off GM-Fremont workers. Moreover, even without a formal policy, most of the GM-Fremont veterans at NUMMI have in fact left the most demanding jobs (those on the assembly line) to become Team Leaders, to retire, or to take jobs off the line.

LANDSBERGIS: First, flight attendants are working many more years now and many are breadwinners. Second, I agree, we need to have many more jobs in the U.S. that have career paths, that allow workers to move up out of the dirty "high strain" jobs, that allow workers to develop skills. If that is occurring for the GM-Fremont veterans, that's great. Unfortunately, the trend throughout the U.S. economy, as you know, is otherwise -- longer work hours, involuntary overtime, more job insecurity, more outsourcing, fewer career paths, more sweatshops, agile companies and virtual jobs. Many elements of lean production are being applied throughout the economy. Where do people go when there are few "off-line" jobs left? Japan hardly offers a healthy alternative. Its low pensions force many retirees to work in low-paid, high-insecurity supplier shops. How many off-line well-paid jobs are there in the many non-union U.S. auto supplier firms -- which far outnumber auto assembly in numbers of employees, and where workers have little "voice"?

WHO BENEFITS FROM LEAN PRODUCTION?

LANDSBERGIS: One of my main concerns with your argument is the way it seems to hide the essential question: who benefits from these trends in methods of production?

ADLER: You seem to think this is a purely rhetorical question, that the answer is obvious. I disagree with the "militant" view according to which only capitalists gain from these new methods. It just doesn't ring true for the situation at NUMMI anyway. There is not a soul there who wouldn't prefer working at NUMMI to working at GM-Fremont. I think that's a pretty decisive test.

LANDSBERGIS: GM-Fremont vs NUMMI, a choice between lousy jobs and somewhat less lousy jobs, is not a fair choice. No one I know defended traditional work life at GM. The UAW under Walter Reuther tried for years to have a say about how cars were made, but were defeated in those attempts. We should be debating GM-Fremont vs NUMMI vs Saturn vs Volvo, if we want to see what kinds of methods workers would gain from.

ADLER: In two recent articles (Adler & Cole, 1993; 1994), I've tried to analyze that debate. In those articles, we argue that working conditions were certainly preferable at Volvo's Uddevalla plant (vs NUMMI), but (a) working conditions under NUMMI's (more-or-less-) democratic Taylorism were in the acceptable range, and (b) Uddevalla's economic performance was simply not in the ballpark. If I could be convinced that Uddevalla could have both its high-control job design and a reasonable level of efficiency -- even if efficiency was, say, 10% below NUMMI's -- believe me, I would be a fervent advocate of the Uddevalla option. But all the evidence I have seen suggests that those wonderful features of Uddevalla's work design were going to keep it from ever attaining anything close to NUMMI's efficiency. So I conclude that Uddevalla represents a hopelessly utopian solution, and that democratic Taylorism is the best we can do for now when it comes to high-volume production of standardized products.

LANDSBERGIS: First, it is too simplistic to say that working conditions at NUMMI were in the "acceptable range" -- they are only "acceptable" if alternative jobs are worse. Problems of work-related musculoskeletal disorders (WMSDs) and other injuries at lean plants such as NUMMI (Adler, 1997), Subaru-Isuzu (Graham, 1995), Mazda (Babson, 1993), and CAMI (Robertson et al., 1993; Lewchuk et al., 1996) are well-documented (see also Berggren et al., 1991; Parker & Slaughter, 1994; Landsbergis, Cahill & Schnall, 1996). We do not know about WMSDs at non-union plants, but it is likely that they are more prevalent. And conditions only became more "acceptable" at Mazda, CAMI -- and NUMMI -- when their unions took action to modify the lean system. They only became more "acceptable" at other auto plants when OSHA intervened in response to union efforts. (Ergonomics also seems to be better at Saturn because the workers and the union played a major role in the design of production. It was not inherent in the lean system.) Again, one clearly designed function of the team system is to break down traditional worker solidarity and promote identification with the company and peer pressure, precisely those factors which make it more difficult for unions to take concerted action on improving working conditions.

ADLER: I think you might be right that progress in working conditions at some Alean@ plants has happened by moving away from lean production principles. Moreover, some people have argued that we see something similar going on in Japan now in changes that the auto companies have made in their plants as a result of labor shortages. But a closer look at Toyota plants in Japan shows that they have made great improvements in working conditions by refining their

imple-mentation of lean production -- not abandoning its basic principles. That way, they retain and improve its quality and efficiency outcomes even as they improve the working conditions. I will be very interested to see if quality and productivity improve or degrade at Flat Rock and CAMI.

ROLE OF UNIONS, GOVERNMENT, AND WORKER STRATEGIES

LANDSBERGIS: Your paper argued that the role of unions in providing voice and regulating working conditions (along with OSHA) is essential in making lean production more humane. You also pointed out how a weaker union local at NUMMI failed to adequately protect workers. Stronger unions at Mazda and CAMI fought to humanize their lean systems. Thus, key issues in assessing the spread of lean production in the U.S. are: why is the % of unionization so low? and why is the political influence of working people (for example, a very weak OSHA) so low? So, in practice, would you argue against the spread of lean production until unionization was more prevalent and government regulations stronger?

ADLER: You seem to suggest that since workers are in an overall weak position in the US today, progressives and unions should simply oppose lean production. I disagree. The main reason is that I don't think you can see this as a purely win-lose proposition: management loses considerable profit potential by taking the "low road" where lean production ideas are implemented as speed-up and wage-cutting and merciless downsizing. Coercive implementations of the lean production model have a far lower return-on-investment than "high road" implementations, and workers should, I think, exploit this tension for all it's worth. So I would recommend that workers fight for the "high road" implementation of lean production -- rather than opposing lean production outright or letting management do it however they felt like for fear of "getting into bed with management". On the other hand, it's pretty obvious that if management tries to take a low road, workers will resist by any means necessary.

LANDSBERGIS: Do you really believe that companies will give up the benefits of coercive, low-road lean production just because it might be less efficient in the long run? U.S. based multinationals seem pretty short-sighted in such matters. Isn't it fair to conclude from the history of their opposition to all kinds of ideas that would improve both social welfare and long run profitability that they are Acongenitally myopic@? Doesn't your whole approach depend on strong government action to force firms onto the Ahigh road@?

ADLER: Yes, I think government should play a substantial role in encouraging firms to take the high road rather than the low road.

LANDSBERGIS: But you'd have to agree that the prospects look pretty dim for any U.S. government in the foreseeable future adopting such a policy -- unless we are able to develop a European style labor party and/or reduce the influence of business on the two major parties! So in reality, lean production is most likely going to be implemented in ways that do hurt workers.

ADLER: I share your fears. But now you're not arguing that low-control jobs are intrinsically bad for workers health. You seem to have accepted my argument that Taylorism in its democratic form would be okay from a health point of view -- but you want to argue that this is a purely speculative proposition since the prospects for democratic Taylorism are so slim.

LANDSBERGIS: I would agree that when workers are able to exercise more influence and control through militant union activity, then Tayloristic systems not only become more

Ademocratic@ but increased worker control will mean improved health outcomes. But first, given the current state of US society, I can't see this control reaching high levels. Second, if in some isolated firms workers did achieve a decent level of control, the health outcomes of Ademocratic@ Taylorism would still be inferior to the non-Tayloristic alternatives. Third, workers in these firms would use their power to move away from Tayloristic job designs.

ADLER: That expresses nicely our points of agreement and disagreement. We agree on your first point: I think the chances of US workers achieving a decent level of control are only modest at best. But we disagree on the other two. I think the shops with real worker voice and democratic Taylorism will have good health outcomes, and that workers in these shops will see the combination of democratic Taylorism's superior efficiency and decent health outcomes are the better way to go. So perhaps one way to move our discussion forward would be some more empirical research on these hypotheses.

COMMENTS:

STEVE BABSON: The bottom line is this question of whether the changes negotiated at Flat Rock and CAMI contradict or correct the essentials of lean production. I tend to think it's the former. One of the changes Paul L drew attention to was election of team leaders; Paul A responded that this didn't seem to be necessary when there was a functioning steward system. I would point out to Paul A. that he can't have it both ways: he can't champion the "modern" and "progressive" nature of lean production, and then invoke the adequacy of a steward system developed for the previous system of work organization. Steward systems -- where they exist, and they are largely gone in most Big 3 plants -- were only briefly capable (in the 1940s) of instantly addressing workplace disputes over task assignments, workload, etc.; they very quickly became systems of formal grievance handling in an increasingly lengthy process of quasi-judicial review; as this happened, the working line steward gradually disappeared (for a lot of reasons), leaving only the District and Shop committee reps of today. NUMMI and Flat Rock have both restored the working line steward (called "coordinators"), but their role is still primarily the ad hoc adjudication of disputes.

The important point is that such a system may be adequate to traditional Tayloristic practice in which changes in tasks, job loading, assignments, etc. were periodic but not continuous; in a lean system, however, change is supposed to be literally continuous. Ad hoc adjudication can't handle the far larger number of changes, many of them potentially contentious, that occur as jobs are rebalanced and workers are flexibly reassigned. Since it is the team leader who carries out many of these new tasks, it is inconceivable to me how Adler can see his/her role as simply "technical" or just a re-habed version of the lead-hand (odd again how such traditional roles supposedly fit in this brand-spanking new system). Another quibble: "lead hand" as I understand it means one thing in the skilled trades (tool and die "leader", etc.) and something very different in production realms: "pusher", "straw boss," etc. If the team leader is simply appointed by management, as was more or less the case initially at NUMMI, this so-called "lead hand" becomes a junior foreman, which is why this so-called "technical" position was later made a joint appointment-- evidence enough that it is more than just a technical position. The question is: while joint appointment is certainly better than management appointment, is it still so far

removed from the team's capacity to play a direct role in the choice that team members still view the team leader as somewhat imposed?

MICHELLE KAMINSKI: I would like to share some evidence from another auto plant, Ford's Wayne Integrated Stamping and Assembly, represented by UAW Local 900. Wayne represents an alternative to the lean production system, one that is competitive in today's economy. It uses a team concept that was jointly developed by the union and management. Prior to 1987, this plant was part of a larger assembly facility managed in a traditional (i.e., Taylorist) manner. In 1987, Ford approached the UAW about adding a stamping operation onto the existing assembly plant. In exchange for the new jobs, management wanted a Modern Operating Agreement (MOA) that included teams, a single job classification for production workers, and pay for knowledge. Production began in 1990 with teams in place. After 5 to 7 years of team operation, surveys and interviews show very high levels of worker satisfaction with the team concept, with reported declines in injury rates and stress levels (Kaminski, et al., 1996).

How did they achieve this? Union leaders and managers created a process in which the entire workforce had an opportunity to participate in the design of the new workplace. They developed a training class which all workers were required to attend. The purpose of the class was to identify obstacles that get in the way of making a car with zero defects. The workers identified obstacles and proposed solutions, and the union leadership worked to translate their suggestions into the contract language (including an elected team leader who would not just be a company stooge). Thus, all workers had input into the design of the new work system before it was put in place, and not just the opportunity to correct problems after the fact. The contract had to be ratified before the new system was implemented. It passed overwhelmingly, with 97 percent of production workers and 83 percent of skilled trades voting in favor of it.

The union leadership at Wayne took on the non-traditional role of workplace design, but did not neglect their traditional union roles, as can happen when a team concept is implemented. The union is involved in equalization of overtime within an area, has an annual area-wide bump based on seniority, notifies high-seniority workers about openings on preferred jobs, and conducts a weekly plant walk-through. Unlike NUMMI, there has been no dissident challenge to the union leadership. The plant chair has been reelected three times, and has run unopposed each time.

Workers at Wayne say they have more control over their jobs under the team concept than under the previous Taylorist system. Do we see health effects associated with this change? Unfortunately, the data is largely anecdotal. Because of a host of changes, including new equipment, a new bargaining unit, and the addition of a work process (stamping) that was not part of the old bargaining unit, it is not meaningful to compare the injury rates of the new unit (team concept) with the old unit (traditional management). However, managers, workers, and union leaders all agreed that injury rates are now lower. They attribute this to two factors: job rotation and the installation of equipment with better ergonomic design. Virtually all jobs in the facility are rotated within the team. Most jobs rotate daily, some weekly. Regarding equipment, one worker said:

They had these manual weld guns that you had to tug and pull and lift, and you had to pick all your parts up by hand, even the big ones, and put them on. Now we've got push buttons. You put on small parts and for the big parts, the hoist comes over and puts it down and you just hit the buttons.

In addition, the union has an ergonomics representative who works to monitor injuries and make improvements in equipment wherever possible.

In any workplace, the pace of work is an important issue. Under lean production, the pace is increased periodically, and workers often complain about stress. At Wayne, 43% of the workers we surveyed said the pace of the job is indeed faster than it used to be. But while 33% said the amount of stress on their job is higher, a greater number (43%) said their job is now *less* stressful. This is consistent with the idea that increased control can counter the effects of high job demands.

Our assessment is that workers at Wayne are much happier with their jobs under the team concept and likely suffer fewer injuries. But, we must emphasize, this is *not* the result of lean production. Instead, we believe it is the result of extensive worker involvement in the design of the team concept, and a pro-active union that monitors and enforces both the team concept and traditional union issues, such as overtime and seniority rights. Notably, union leaders and managers emphatically state, "This is not a lean production plant."

I would also like to address some of the broader issues raised in the discussion above. I was intrigued by the use of the term "Democratic Taylorism," since there was nothing democratic about Taylor's original ideas of Scientific Management. It sounds like what Adler means by "Democratic Taylorism" is a particular technology—the assembly line—coupled with worker voice. But my experience suggests that the more closely one's work is tied to an assembly line, the less possible it is to have any real voice. At the Wayne plant for example, some workers are tied to the assembly line while others are not. In the stamping department, which is the area least connected to the line, workers are able to stockpile their product so that when there is a problem and they have to shut down the presses, they can continue to feed good parts to the next stage in the process. Thus, they are not shutting down the entire plant to fix a problem that is isolated in their area. Clearly, this is not "Lean." Workers from all departments agreed that employees in the stamping department have more control and discretion than do workers in other areas.

The lean production model holds that when problems are found that cannot be fixed immediately, a worker should stop the production line. Then, because it is so costly for the line to be down, supervisors, engineers, team leaders and whoever else is available rush to solve the problem so the line can be restarted. In practice, for the very same reason—because it is so costly for the line to be down—workers on assembly lines are often pressured by management *not* to stop the line.

This is tied to another key point by Adler, one with which I agree. If workers are to be viewed as a leading force in society, they must show that they represent society's general interests better than corporations do. Workers often do this in a way that is visible on the shop floor, but not outside it. In virtually every manufacturing plant I have visited, in a wide variety of industries, workers say that they are sometimes pressured by their direct supervisors to ship products that have defects. Workers themselves generally do not want to do this, because they

believe that they are risking the future of their plant when they do so. Why do supervisors do this? It's not because they are evil, incompetent, or Aunenlightened.@ Quite the opposite: it=s because they know the score--they get paid for getting products out the door on a certain schedule. And if it doesn=t go, they make less money. In spite of all the rhetoric about quality, this is still an issue in many places. I once witnessed a manager (in this case, 2 levels above a first line supervisor) berate a worker for not stopping the line because of a quality defect. Apparently, the worker and manager had had this discussion several times before. When the manager asked why he didn=t stop the line, the worker said, ABecause if I stop the line I hear it from my supervisor.@ And the manager said, AAnd if you don=t stop the line, you=re gonna hear it from me.@ Most workers care about the quality of their product, but managers sometimes make it difficult for them to act on that concern. Unfortunately, I think that until recently, the labor movement has not effectively communicated workers= concerns for the interests of the customer or society as a whole. Much more could be done in this direction.

Finally, I am somewhat concerned about the statement that workers should adopt the goals of efficiency. As both Adler and Landsbergis might agree, this only makes sense for workers when managers demonstrate a commitment to worker goals as well. Such goals might include job security, skill development, and a healthy work environment. The protection of a union contract helps ensure that management acts in accordance with these goals. But where managers promote an anti-worker agenda, such as downsizing and de-skilling, one cannot expect workers to accept management goals.

KATSUO NISHIYAMA and JEFFREY V. JOHNSON: The relationship between Japanese Production Management (JPM) and death due to cardiovascular disease (CVD) has been an important topic of debate in Japan since the 1970's (Nishiyama & Johnson, 1997). Japanese have named sudden CVD deaths karoshi, which means '>death from over work'. However, there are no epidemiologically sound estimates of the incidence of karoshi. Only 20-60 deaths each year from overwork receive compensation from the Ministry of Labor. The total number of CVD deaths in the 20 to 59 age group is about 35,000 per year, with estimates of work-relatedness raging from 5% to 33% (from about 1,750 to 11,000 deaths). According to a 1982 case study, karoshi deaths were associated with long working hours, shift work, and irregular work schedules. Most karoshi victims had been working long hours, equal to more than 3,000 hours per year, just before death (an average of 60 hours per week).

Deaths may only be the tip of the iceberg, the most visible indicator of the health effects of overwork in Japan. Some researchers suggest that karoshi may be typical of a new class of occupational disorders that are called gourika-byou or "diseases of rationalization." Other such disorders include occupational cervicobrachial disorders (OCD, referred to as RSI or CTD in the United States). Large corporations and the state have refused to compensate most victims of these disorders on the grounds that these conditions were unavoidable due to the requirements of improved productivity, or that work as a cause of these disorders has not been proved. Yet, for example, more than 6,000 of 40,000 telephone operators of national Telegraph and Telephone Public Corporation suffered from OCD from the late 1960s to 1970s.

Japan has much longer working hours than any other industrialized country (2,159 hours in 1989, 236 more hours than in the U.S.). In the 19th century, annual working hours for the

United Kingdom and United States were around 3,500 hours. The political actions of the labor movement in these countries forced a substantial decrease in the number of working hours, even before medical science proved its necessity. Shor notes the comparatively recent problem of longer and longer working hours in the United States -- although these are still much less than is usual in Japan. In Japan, the number of male workers who work more than 3,120 hours a year (i.e., more than 60 hours a week on average) has increased from 3 million in 1975 (15% of employed male workers) to 7 million in 1988 (24%).

JPM involves more than just designing and producing the highest quality product or service. It focuses on reducing the cost of labor through the elimination of "waste" -- defined as anything not absolutely essential to production. "Waste" includes buffers between operations, slack time, waiting time, walking time, holidays, vacations, and rest breaks. This process of work intensification has resulted in night shift work, increased scheduled and unscheduled overtime and holiday work, unpaid "voluntary" work, and "homework". The society has been infused with JPM ideology such that working 24 hours a day is seen as exemplary, even idealistic behavior. Companies inculcate in workers their role as associates of the firm, sharing the same goals as management rather than having their own distinct interests. JPM increases management control and undermines the independence of labor unions, using various devices to break workers collective resistance and rebuild group solidarity on the basis of management goals.

There is a considerable difference between socially engineered groups that have been constructed to maximize productivity and to maintain managerially oriented norms and values from the '>worker's collectivity' which is the construction by workers themselves of social support systems that are adaptive forms of response to industrial demands and pressures. We would anticipate that lean production or JPM would tend to eliminate worker-oriented social support and collectivity B considering it either an obstacle to increased productivity or as merely a form of unnecessary >waste.'

It is possible that the measurement scales developed to test the Demand- Control-Support model of work stress may not be able to capture what is particularly stressful about JPM. Many of the current work content instruments were developed to examine the characteristics of Taylorism, where there was little, if any, participation in decision making, and very little group work. Without understanding and measuring the organizational context of decision making and group activities, it is likely that current instruments will over-estimate the amount of work control and social support employees actually have in JPM firms. There is a great need to study the health consequences of JPM more concretely, with specifically designed measures, and in an epidemiological rigorous manner through international comparative research.

JOHN PAUL MACDUFFIE: Lean production differs from mass production in its impact on workers, their daily shopfloor experiences, and the set of outcomes important to them -- including safety and health -- in two fundamental ways.

First, lean production is highly dependent on worker contributions of effort, skill, attentiveness to production problems, and flexibility in responding to (and helping solve) those problems. As a result, managers under lean production have a strong incentive to manage workers in a way that supports and encourages contributions of this kind. Lean production is

A fragile because of its dependence on both supplier and worker capabilities and hence a much higher vulnerability to system failures than mass production (Shimada & MacDuffie, 1987/1998). Managers face the immediate prospect of seriously diminished performance (in productivity, quality, and delay as well as in costs of worker injuries and grievances) if they fail to manage in a way that elicits such contributions. There is no guarantee, of course, that managers will approach lean production this way. However, if they do not, they will not only suffer ongoing operational performance detriments but will also damage the capability for dynamic performance improvements that underpins lean production's economic advantages over mass production. This is more than a claim that lean production's impact on workers depends on whether it is implemented well or poorly. Lean production, in terms of work organization and patterns of shopfloor interaction, will quickly migrate back to mass production if managers are exploitative of workers.

Second, for most workers, the opportunity (some might say a requirement) under lean production to make cognitive as well as physical contributions to the production process is beneficial and highly preferable to the worker role under mass production. While I agree with many of Adler's arguments, I've never felt that characterizing lean production as a democratic Taylorism captures what is most intriguing about its logic. For me, the fundamental characteristic of Taylorism is not a detailed division of labor but the separation of conception from execution. Taylor said that the best way to guarantee massive problems in production is to allow workers to think. Lean production not only wants workers to think but can't operate unless they do.

Does lean production only want workers to think about things that benefit management and profitability and ultimately weaken worker outcomes? No. It's true that worker cognitive contributions are directed towards production system improvements. Yet, these can and do include, in the lean production plants I've studied, improvements in safety and ergonomics (removal of hazards, elimination of awkward work positions and weight-bearing tasks), in reduced walk time and better working environment (lighting, placement of tools and materials, physical comfort), in arranging the flow of tasks in a way that makes more sense from the worker's point of view.

I agree with Adler that workers are also motivated to contribute to efficiency improvements under lean production, even if it means working a lot smarter and maybe even somewhat harder, because they have accepted the idea that efficiency is necessary for competitive survival. But if managers only accept worker ideas that lead to productivity improvements, while ignoring ideas that improve safety, ergonomics, work environment, job flow, and/or quality, workers will quickly perceive this, and are then likely to withhold their cognitive effort from an effort bargain that has become too zero-sum. There is little managers can do to coerce workers to provide cognitive contributions in this situation. From my experience, workers do respond positively to having the chance to use their brain on the job and to seeing their ideas clearly related to outcomes they value: the quality of the product; their sense of involvement and pride in their work; their long-term employment prospects; and the competitive fortunes of their company.

There is a strong chance that the actions unions will most naturally take to keep management honest around the potential exploitation of workers may also limit the

opportunities workers have for cognitive contributions. Unions are understandably concerned that *kaizen* not lead to Aspeedup@ and that team activities not lead to undue peer pressure. Yet the safeguards that unions are most inclined to install, where they have the opportunity, may well limit the occasions and scope for workers to use their brains in shopfloor problem-solving. (See MacDuffie, 1995, for a longer discussion.) These are my concerns when I see the contract-based rules at Flat Rock and CAMI which limit the demands of lean production on workers C in contrast to the way the UAW local at NUMMI addressed ergonomic problems (detailed in Adler, Levine & Goldoftas, 1997).

But surely, some will say, there is a better way than either lean or mass production, best represented by the socio-technical systems (STS) design at Volvo=s Uddevalla plant. In economic terms, I agree with Adler that Uddevalla would have not come close to matching the productivity and quality performance of the better mass production plants, not to mention the best lean production plants. But even purely from the perspective of work organization, Uddevalla and the other Volvo STS experiments overemphasized individual and group autonomy -- a characteristic undoubtedly important to workers but perhaps even more important to the academic observers studying these topics. Underemphasized in this autonomy-centered view of individual and group control over work methods, pace, and sequence, in my view, is the individual and group learning that occurs in a tightly-linked highly-interdependent production process in which all participants are involved in ongoing problem-solving efforts. Adler and Cole (1993; 1994) characterize NUMMI as better for Aorganizational learning@ than Uddevalla, with the latter viewed as better for individual learning. I=m not sure I agree with their latter point. Workers at Uddevalla certainly learn a vast amount of the many assembly tasks required to build a Awhole car@ but I dare say that workers at NUMMI, over time, probably develop more Asystem knowledge@.

I will be happy if we reach a world in which the dominant work processes, both in manufacturing and service settings, all require workers to be active, thinking participants in their jobs. Then our debates can focus on which kinds of Aon-the-job@ thinking are best in terms of worker health, economic wellbeing, and opportunities for meaningful work. Until that time, I stand firm on the idea that lean production has it all over mass production in terms of all of these outcomes.

SHARON PARKER: At the outset, I believe it can be somewhat confusing to talk about the effects of 'lean production' on jobs. Commentators have different models of lean production and what it constitutes. Even if, as Taira (1996) argued, lean production in its 'fully implemented form' is a specific concept distinct from mass production and socio-technical systems (STS) models, this is often not the case in practice. The implementation of lean production is often partial (involving some aspects and not others), and there is considerable variation in terms of the human resource management (HRM)/industrial relations (IR) practices that accompany it. An initial requirement, therefore, is to be clear about what lean production involves in the particular case.

Given the above, it is clear that the effect of lean production on shopfloor jobs will depend on the particular mix of initiatives that are introduced. Some have the potential to enlarge and enrich shopfloor jobs (e.g. the inclusion of indirect tasks into operating jobs, multiskilling,

quality circles), whilst other initiatives (such as Just-in-time) can be harmful, especially in terms of employee control. For instance, removing buffer stocks between work units can serve to reduce individual control over the timing and pace of work, and standardizing procedures can reduce individual control over work methods.

Nevertheless, it is unlikely that the effects of particular lean production initiatives on jobs are pre-determined, but are influenced by a range of factors, including the choices made by management. I illustrate this by considering the case of an off-road truck manufacturing company that had implemented various lean production initiatives (e.g. quality circles, standardization of procedures, etc.). In an effort to further drive down lead time, a moving assembly line was installed (replacing stage build, where a group of assemblers assembled the chassis). Lead time was indeed reduced, as was the number of quality defects, showing the 'success' of the initiative. However, using a quasi-experimental research design, we showed that, after the installation of the line, employees had decreased individual control and skill utilisation, increased stress, and had developed narrower and less strategic role orientations (Parker & Sprigg, in press). We asked ourselves two questions that have wider significance.

First, *would outcomes for employee jobs and well-being have been different if an alternative approach to implementation had taken place?* Employee expertise was used to design the technical aspects of moving line system (it would have been an impossible task without such input), but there was no employee involvement into the design of the work organisation (requests for job rotation, for example, were ignored). We have shown elsewhere that employee participation in the implementation of lean production systems can help to combat potential negative effects (Parker, Myers, & Wall, 1994).

Second, and perhaps even more pertinent: *can other work design changes be made to 'compensate' for the deskilling and loss of control?* In addressing this issue, it is important to distinguish between individual and group control. Although the former is reduced, autonomy can be enhanced at the group level. New and Clark (1989), for example, suggested that by allowing Just-in-time (JIT) groups to queue a set amount of parts, team members can have autonomy over day-to-day scheduling; Klein (1991) cited a situation where group members were free to change their work methods as long as product specifications were met. In an electronics company in which employees worked in self-directed work teams, we observed increased levels of group levels of control after the introduction of JIT (Mullarkey, Jackson & Parker, 1994). In this case, following appropriate training, employees were able to choose how JIT would be introduced within their areas, the targets they were aiming for, and so on. Thus, principles of lean production were introduced without a detrimental effect on employee well-being and with considerable benefits for the company. In the case of the moving line, we have recommended allowing employees greater group control (such as over the pacing of the line, target-setting, decisions to rotate) as well as increased role breadth (such as involvement in training, ordering parts, organizing maintenance).

As this example illustrates, there are likely to be choices surrounding how initiatives are introduced, and how work is configured. We need to know more about these choices, and their implications for individuals and organisations within particular environments. In the case of the moving line, modifying the system to enhance group level control is likely to reduce long-term costs that could occur if the current strategy is continued (e.g. costs associated with rising absenteeism, IR problems, accidents, incidence of repetitive strain injuries (RSIs)) and could also

have organisational benefits (e.g. reduced costs of supervision, increased skill development of employees). The point is that we have little evidence regarding the real cost implications of alternative work design choices, especially of >hybrid= lean production/ STS models. Indeed, the prevailing assumption that the STS model is >always less efficient= needs to be more fully investigated (e.g. there is controversy regarding whether Volvo's Uddevalla really was less efficient and whether this was the real reason for closure). Such investigations need to take into account all of the costs, short-term and long-term, and should investigate the possibility that the type of environment might influence the effectiveness of different choices. Research conducted by colleagues (Wall et al., 1991), for instance, has shown that in highly uncertain production environments, enhanced employee control can promote greater performance.

Identifying 'win-win' work design choices is an important goal, and I believe, an achievable one. However, the real challenge is then to convince organizations to make more appropriate choices. I agree with the commentators that most organizations will continue to be short-term focused and myopic about human aspects. Union representation is critical but insufficient; government intervention is needed to ensure broader social factors are put on the company agenda.

CHARLEY RICHARDSON and NANCY LESSIN: The debate between Adler and Landsbergis raises some key empirical and philosophical questions surrounding new work systems and their impact on the workforce. It is difficult to respond to all these issues in a limited space.

ADemocratic Taylorism@ seems as good a place to start as any. Taylorism is not simply non-democratic, it is the antithesis of democracy -- designed specifically to remove any decision-making or control from the workforce. The fact that lean production, in some of its forms, recognizes the critical role of worker knowledge and Atrades@ limited input (within rigid constraints) for presumably unlimited access to the database of worker knowledge should not confuse us about the question of democracy. The head of Harley-Davidson clarified this point when he defined empowerment as Afreedom within fences,@ fences built by management (and not by consensus). (We also note that the concept of democratic Taylorism fits nicely with the peculiarly American view of democracy -- where the rich have two parties to do their bidding while workers have none.)

Despite Taylor, workers have always used their knowledge of the work process in two ways: as a source of general bargaining power; and to create for themselves the breaks and downtime that make work more bearable. The fact that the needs of the current competitive process require that management Ago back to the well@ on a regular basis to harvest that knowledge certainly threatens the control that Taylorism sought to create. But this has simply forced management to come up with new ways of maintaining ideological control while eliciting worker input and integrating that input into a management-controlled production process. Enter the continuous improvement approaches of lean production.

Adler=s core dilemma is that he is looking for an answer within the confines of a system fundamentally hostile to workers. He recognizes the dangers of lean production when he states that A...lean production implemented under autocratic management and without regulatory safeguards will indeed generate large negative externalities that need to be forcibly addressed.@

But he then turns reality on its head with the standard out: AI think the democratic, participative version of lean production can be socially as well as economically beneficial compared to economically viable alternatives@ (emphasis added). If it isn't economically viable under the current system, we can't talk about it. If it doesn't work for the capitalists, it doesn't work. But Adler resolves this contradiction by suggesting that under democratic Taylorism workers would adopt efficiency as their own goal and then have a say in both the details of work and in the broader process of plant governance, what he calls Aa real voice in how things are done...@

However, efficiency is not an absolute concept but is rather socially defined. The epithet Ainefficient@ has been used to attack unions and working conditions in every sector, and to support destruction of jobs, speeding up of work and elimination of the mechanisms of worker control over their work places such as seniority systems, and job classifications. For decades, the labor movement has fought to defend and create Ainefficiencies@ in the production process. Coffee breaks, production limits and staffing levels are all designed to improve the production process from a worker perspective and are all inefficiencies from a management perspective.

What does it mean to Ahave a real voice@? The idea of a reasoned debate between the demands of capital and a powerful organized workforce is certainly one to aspire to, but it is not present at NUMMI. Talk of a Areal voice@ ignores the reality of capitalism where the major decisions are made by, and in the interest of, investors and where control over capital gives the owners power over, and allows them to blackmail, the workforce.

In this context, we find Adler=s use of the term Aacceptable range@ to describe conditions at NUMMI, as he accepts the demise of Uddevalla, to be particularly disturbing. He argues that Aone of the consequences (of workers having a real voice) is that they are going to accept responsibility for work outcomes, and that they will hold both themselves and their work colleagues accountable.@ Adler would like workers to have a say in their lives, but want them to adopt management goals of efficiency first, and thereby give up the power that would give them any real say.

Workers have always held themselves and colleagues accountable at work, but the real bottom line question is accountable to whose set of values. When workers set limits on how much work they should produce on a given day, which has happened in almost every job, union or non-union that we have worked at, they accept responsibility and hold both themselves and their colleagues responsible. But these limits recognize the workers desire for a reasonable pace of work. This was exactly the type of accountability that Taylor sought to eliminate. If management provides 5 people to do work that would more reasonably be done by 6 or 7, the workers, pushed by the competitiveness argument and denied other responses, will hold each other accountable for doing their Ashare@ of the work. And if there are no limits on the demands placed on the workforce, which there aren't in a continuous improvement, lean production environment, then workers will be pushed, and in turn will push each other, to continuous speed-up. While Adler concedes that Apeer pressure can get out of hand until they find that new balance,@ in a continuous improvement environment, that balance is not allowed. The lesson of the andon lights is that if they are all green, there are wasted resources in the system. And the Toyota Production System, which Adler refers to positively, has as a basic tenet that when equilibrium is in sight, 10% of the resources should be removed from the process.

If a job includes an awkward posture or motion, a risk factor for repetitive strain injuries, the workforce might come up with a way to re-design either the job or the workstation to eliminate the awkward posture. This is what is seen as the classic Win-Win situation, since eliminating the awkward posture might also contribute to productivity, as well as reduce the costs of injuries. But this is also where the problem kicks in. The newly designed process is only the starting point for the process of Aimprovement@ that drives all of the Awaste@ (known to the workforce as a chance to catch your breath) out of the system. Thus, at the end of the day, the worker is pushed harder than ever, producing more than ever. No one would argue for maintaining awkward postures, but lean production advocates ignore the need to set clear limits, to prevent the new methods from opening the door to increased repetition and lack of rest. It is here that the core goal of the system, increasing productivity in the name of competitiveness, takes over.

In summary, Adler fails to see the system of lean production as one which explicitly uses worker knowledge to constantly increase efficiencies by removing workers from the system and pushing those remaining even harder. It is the lack of limits in the system that requires powerful worker intervention. It is the lack of worker power that we should be discussing, and whether lean production builds or undercuts workers= ability to collectively exert power in their own interest -- through its processes of aligning workers to management goals (such as carefully defined efficiency or competitiveness) and harvesting worker knowledge for integration into a system that management controls.

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