TECHNOLOGICAL CHANGE AND
ITS INSTITUTIONAL CONSTRAINTS:

THE POLITICS OF PRODUCTION AT VOLVO UDDEVALLA

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CITATION AND REPRODUCTION

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Economic competitiveness and industrial reorganization are at the core of the current political-economic debate in all OECD-countries. One of the most important contributions to the debate was the 1990 report of the International Motor Vehicle Program at MIT, published under the title The machine that Changed the World (Womack et al. 1990). In the book, the claim is made that a new method of production has given Japan the competitive edge; the system consists of a few relatively simple organizational recipes, all essentially geared toward the elimination of waste and slack in the production system. The implicit point of the book is that, once it is picked up by Western companies, it will work wonders for them as well. The model is called "lean production," in fact a somewhat unhappy choice of name, since it mainly builds on the basic principles of conventional mass production -line assembly, dedicated machinery, interchangeable parts and standardized tasks (Piore & Sabel 1984)- and embellishes this system.

In the book and in subsequent newspaper interviews, the authors consistently dismiss -on questionable empirical grounds and with highly inappropriate and inadequate language- one production system that runs counter to just about everything lean production stands for: the stationary manual assembly by craftsmen and women in the Volvo Uddevalla plant.[1] In the Uddevalla factory, there are no machines and, hence, no machine pacing, almost no engineers, a minimum of managers, and workers stand still while they assemble an entire car (any car!) over the course of a few hours. For a proper understanding of the differences: lean production systems run, because of their "over-engineering" into trouble with cycle times over two minutes, since workers cannot easily remember the complete choreography of all the "nutting" and

"bolting." In Uddevalla, workers take two hours to finish about one fourth of a car -the entire drive train system, the entire interior, etc. (the best sources for a description in English of how the Uddevalla plant operates, are Berggren 1992; Clarke 1991; EIU 1991 and Ellegard et al. 1992a). They are able to do so, because they have learned, during a sixteen-month training program, how these functional units operate (and therefore see how each part contributes to the operation), rather than learning how screw number 9675 has to be fixed in the prescribed way, during the two-to-five minute cycle the assembly line allows them.

Given how different this production system is, the vigorous dismissals of the Uddevalla model, in which engineers and managers play a largely subsidiary role, should come as no surprise. The decision by the Volvo Group in the fall of 1992 to close the Uddevalla plant in the spring of 1993 was therefore a small but important element that spoke for itself: the company is, after all, in business, and in business, profitability counts. Ergo: if Uddevalla closes, it must be that there are good business reasons. Costs must be too high and productivity too low (FT and WSJ at the time of the announcement in Nov.1992). Vindicated, "The Machine" became for auto executives what "The Capital" was and is to orthodox Marxists.

Yet the facts do not really match this distorted picture of the world. The Uddevalla closure is, in no sense of the word, a "rational" business decision, but the end result of a protracted high-level power game within Volvo, between Volvo and Renault, its new partner, and inside the Metalworkers Union in Sweden. And even productivity in Uddevalla was, at the moment the closure decision was made public, roughly comparable to the average of car plants in Europe,

better than almost every other European luxury car plant and superior to almost any other Swedish car plant.[2]

What, then, happened? In this paper, I will try to answer this question by making three arguments. The first one is that the characterization of economic performance of the Volvo-plant in Uddevalla -both in the newspapers and in the allegedly more "serious" literature (particularly in Womack et al., 1990, and in Adler and Cole 1993)- is seriously wrong: productivity in the plant is not only a lot higher than is suggested, both when using the "standardized" methodology of the IMVP project and the measures developed as a critique that take into account the entire amount of work associated with final car assembly (Williams et al. 1992), but when taking into account improvements outside the strict production sphere, but with important repercussions for the organization of work, such as product design, organizational restructuring, etc., the potential for productivity improvements is tremendous.

The second claim deals with the role of the Swedish metalworkers' union during the development of the plant and during the few years that the plant has been operative. Whereas the unions played a crucial role in the discussions that eventually led to the plant, it appears, from the interviews I had with local representatives, that currently (i.e. the beginning of April, a few weeks before the closing) the union work inside the plant is limited to very conventional servicing of the membership: solving administrative problems with sick leave, grievance procedures, etc. Apparently, and despite the innovative role of the union in the initial stages of the development process, there is no institutionalized structure to follow up on this series of innovations. With hindsight, then, the relative lack

of attention the union paid to strategic management issues -they only dealt with, as one of the interviewees put it, "how to build a car"- made the plant exceptionally vulnerable to changing preferences in union and corporate leadership.

The final point I will make in this paper is that politics, not economics is the cause for the closing of the Uddevalla plant. The alliance between Volvo and Renault has given the traditionalists in the Volvo Car Corporation the upper hand (not in the least because Renault's recent improvements in productivity have largely been based on Japanese-type work processes). The overcapacity problem that Volvo faced, and which forced lay-offs, made very clear that between the Uddevalla Metall local and the Torslanda local (in the biggest Volvo plant), things were never quite as nice as they seemed: the Torslanda local, the biggest one in Metall, negotiated with Volvo the closings of the two innovative plants in order to safeguard its own constituency.

Combined these three points lead to the inevitable conclusion that any explanation for the closure solely based on Uddevalla's productivity performance is simply insufficient and misleading, and that, by extension, lean production may have won the battle of ideas, but it did not do so solely on its merits as a production system.

This paper consists of four parts. The first examines Uddevalla's productivity performance and its future potential, and will conclude that economics is not a particularly convincing argument for the plant closure. In the second section, I will take up the argument that politics explains the plant's fate. Yet in order to fully understand the last act -the fall of 1992- it is necessary to go back to the early years, and the work of the Uddevalla project group between

1985 and 1989. I will pay particular attention to the role of Meta 1, the Swedish Metalworkers Union, in these initial phases. In the third part, the two previous stories will then meet, and I will try to reconstruct the politics of the closure decision. In the fourth and final section, I will use the material on Uddevalla to belabor a point about the political sociology of process innovations. My final conclusion, and the thought with which I am closing this paper, is that production systems a la Uddevalla do not face a bright future, despite the obvious economic potential, because -as Gramsci taught us several decades ago there is no social coalition, no "block" as he called it, that acts as its proponent.

1. ASSESSING UDDEVALLA'S PRODUCTIVITY PERFORMANCE

Every discussion of the plant's performance starts from largely the same assumption, namely that productivity is very low in Uddevalla. Those who sympathize with the attempts at socio-technical design and anthropocentric production then immediately add on that it may get better in the future, or that relatively low productivity is -nothing can be done about that- the trade-off for good jobs. This probably explains why productivity is also remarkably absent from the debate in Swedish circles over the closure of Uddevalla during the winter and Spring of 1993.

This is remarkable because productivity is not low at all in Uddevalla. In what follows, I will first give the facts over which there is little disagreement; in the next part I will elaborate some of these points and suggest -hypothesize, in fact- that the Uddevalla production process involves a paradigm shift in production processes comparable to Henry Ford's early years. Yet even if one does not buy into the radical

version of the potential of the Uddevalla plant that I advocate -as many of my otherwise like-minded friends and colleagues with whom I discussed this do- this first section of the paper should make abundantly clear that economics is an incorrect and misleading answer to the question why Uddevalla closed.

The facts first ...

In November 1992, when the closure decision was made public, the average assembly time of a car in Uddevalla was 32 hrs (hrs are the same as personhours, and are derived by adding up all the hours worked by all people in the factory, divided by the total number of cars produced during the same reference period). This is somewhere around the European average for all car assembly plants, and considerably lower than for European luxury vehicles. The overall European average is 36 hrs (all figures that follow are for 1989, the best European plant does the job in 23 hrs. The luxury car plant European average is 57 hrs, the best there is 37 hrs. According to the only source that presents more or less comparable[3] figures, "The Machine that Changed the World" (Womack et al. 1990:84-91), this places the Uddevalla plant somewhere among the top 5 luxury car plants in Europe, not a "dead horse," as the first author of "The Machine" claimed in a newspaper interview in the summer of 1991, and definitely "in the ballpark." Moreover, the 32 hrs make Uddevalla the second most productive Swedish car plant, better than the main Volvo plant in Torslanda (near Gothenburg) and only slightly behind the older innovative Kalmar plant on the Swedish east coast. It also brings the target of 25 hrs, the time it takes the Ghent plant, the most productive Volvo plant in the world (and among Europe's best in its category), to finish a car, within reach. Finally, even in comparison with North-American and

Japanese plants, Uddevalla's performance is in fact rather good. Again, data from "The Machine": the Japanese do it in 17 hrs (there was only one plant in the sample); the North-American average is 36 hrs, the best result 38 hrs (Womack et al. 1990:89).

The figures as presented above are not entirely comparable, as every expert will immediately point out, because the Uddevalla plant lacks both a body and a paint shop. In the initial plan both were incorporated, but local protests and Swedish environmental regulations made the wait for the decision too long at first, and then made the paint shop an economically illogical solution, since the plant's paint emissions were so seriously restricted that even with a paint shop on site, painted bodies still had to be delivered from the main Volvo plant in Gothenburg anyway (Ellegard et al. 1992a; Maccoby 1992). The decision was therefore made to drop the paint shop and the body shop, and have the painted bodies delivered from the Torslanda plant, some 50 miles south.

However, both these parts of the production process can most easily be automated. In fact, in most very recent car plants in Europe, the paint shop is fully automated, in part because of the. health risks. The net effect of adding these parts to the total time needed for a car is therefore highly unclear. John-Paul MacDuffie, one of the staff researchers of the IMVP project was so kind to share some of his more detailed figures for final assembly. Unfortunately, those figures are only available for volume producers, and the Volvo 900 series is, in fact, a luxury vehicle. Nonetheless, the figures help to put the comparisons in proper perspective (see figure 1).

Figure 1

The 35.6 hrs a European car plant needs to build a car breaks down into 3.3 hrs of salaried work, 8.4 hrs of indirect work (primarily maintenance), and 23.9 hrs of direct labor. This latter category, in turn, consists of 5.1 hrs. for welding, 4.1 for painting, and 14.8 for assembly work. If we add one third of the salaried and indirect working time to each of these categories, the initial 36 hrs of total final assembly time then is the sum total of 9 hrs for welding, 8 hours for painting, and 19 hrs for assembly. For, volume producers, a little over the total time needed for final assembly is taken up by assembly work in the strict sense.

Given the current level of automation in car plants, and the size and, complexity of luxury vehicles, it safe to assume that bigger, more luxurious cars need proportionately more hours for final assembly ,than for the two other activities. The figures are therefore, if anything, biased against the type of car produced in Uddevalla. Even with this consideration in mind -using, in other words, the most conservative estimate for the plant performance of Uddevalla productivity in Uddevalla is far better than the European average. Compared with the (unrealistically) best possible interpretation of regional European averages for luxury car producers -assuming, in other words, that assembly activities account for 53% of all final assembly work- the regional average for Europe is somewhere around 40 hrs, or 8 hrs more than needed in Uddevalla. Taking into account the inherent bias of these figures, my estimate is that Uddevalla was located in the upper third of the European rankings of car plant productivity.

The second remarkable aspect of the Uddevalla productivity performance is that the learning curve is extremely steep. In 1990, it took about 120 hrs to assemble a car, in 1991 it took 50 hrs, in 1992, 32

hrs, and the productivity target was set on 25 hrs in 1993, a figure that would easily be attained, according to most people I interviewed. Translated into percentages, this curve means a productivity improvement of around 50% for the first three years (Berggren 1993)!! It is indeed not since Ford's early years that such a steep learning curve is found in the automobile industry.

The third point on productivity is more anecdotal, but serves to underscore the argument about the learning curve. In this production system, physical limits on car assembly are of an entirely different nature than our conceptual apparatus appears to be able to fathom. Regularly, individual workers break all kinds of records for assembly. For instance, a woman assembled a Volvo 740 in 15 hours on her own (Wrange 1993), and a few months ago, an Uddevalla worker built a Volvo 940 on his own in 10 hours time (Sandberg 1993). Both were able to do this as a result of, on the one hand, their training, which emphasized not just knowledge of parts, but of entire functional units ("systems") in the car and, on the other hand, the materials handling system, that was entirely geared toward this "holistic" learning process (Ellegård et al. 1992a).

... Interpretations follow

The plant has been in existence only some 4 years, and a lot of the material therefore needs to be interpreted with great care. However, even though accurate measures are lacking as of yet, the above listing of the productivity achievements suggests that the productivity potential is, as the proponents of the system suggest, indeed extremely high. Under normal

production circumstances, the 25 hrs target would easily have been reached by mid-1993.

The interpretation of these data that I subscribe to, is that, contrary to assembly line logic, this technology has not at all reached its limits. The sad fact about the assembly line -but never considered because a world without assembly lines seems impossible to envisage- is that it has basically exhausted its growth potential. Even under the best of circumstances, the marginal productivity growth expectations of the best Japanese plants are slim: we would be happy if over the next five years or so, we can shave another hour off the total time needed to assemble a car. That is also exactly the situation that the major Japanese car manufacturers find themselves in today: a detailed analysis of the productivity performance of the Japanese car industry suggests that significant improvements predate the 1980s, and that since then, productivity increases have been very small (Williams et al. 1992). The curve that represents the productivity increases of the assembly line is, by and large as good as flat today. The Uddevalla model, or reflective production as its authors call it (Ellegard et al. 1992b), is, in contrast, in its early childhood years of rapid learning.

This implies that assessing the performance of the Uddevalla plant using the same logic as conventional plants is simply misleading. In fact, judging by the learning curve, the better way to think of the Uddevalla numbers is not as a series of data points along the same line as the productivity increases in assembly plants, but as a curve that intersects with the assembly line curve in one place -let's say the 32 hrs mark- and then takes off on its own track, qualitatively different from the assembly line track (as figure 2 shows).

Figure 2 about here

This view of technology raises the question where the potential for productivity growth might reside. There are at least four obvious areas where changes would have enormous impacts on the productivity potential of the reflective production system as it can be found in Uddevalla.

The first one deals with the organizational remnants of mass production; line assembly and Fordism and Taylorism that are still present, even in the Uddevalla plant. In surprisingly many instances, one can find small organizational bottlenecks that predate the post-Taylorist organization developed in Uddevalla. For a good understanding it is necessary to look at figure 3, which presents the physical lay-out of the plant.

Figure 3 about here

The materials handling department is located in the big block in the middle of the complex. In this building, all parts are gathered, according to the functional "holistic" logic that the workers use to assemble the car afterwards. The preparation of these "assembly kits" (this is the word the people in Uddevalla use) is done by teams in the materials handling department, and when a kit is ready, it passes on an automatic guided vehicle to the place of assembly in one of the six assembly shops. When I visited the plant in the Spring of 1993, representatives of both management and unions pointed out that this island of centralization had survived the first phase of Uddevalla, but that plans existed to decentralize the materials handling, so that the production teams would be directly responsible for stock management. This not

only reduces the amount of indirect work, it also eliminates a lot of unnecessary movement of parts and workers -a vast source, as every engineer who was educated in Taylorism knows, of wasted time. A similar example of unconscious centralization with less than optimal consequences is found in the test shops. Currently testing is done in one test shop between the three assembly shops. After the car has been finished, it is filled up with all the fluids, started and all its vital functions are checked. If a test shop worker finds something wrong with the car, they have to write that up and inform the assembly worker who worked on that part. Apparently, however, it happened that test shop workers did not report a systematic error they found; this way, they could point out to the rest of the plant how critical their function was: for they found mistakes in practically every car.

A "Volvoist" version of kaizen -continuous, small-scale improvement- has found its way into Uddevalla as well. This is probably the second major source of improvements. Since a few months, one team has "hired" a researcher to track their every move and analyze with them where they lose valuable time. Sometimes the causes of the lost time are as trivial, such as parts that were forgotten in the materials handling department and which the assembly worker then has to go and get him or herself. On other occasions, there are really more serious issues at stake, and more profound answers are required. One example of this are the movements that workers and cars make during the assembly process within one team. During the two hour cycle, the workers move a lot from one end or one side of the car to the other Again the remark about the Taylorist engineer applies: moving workers or moving bodies is wasted time. After one group- of. workers (one or two) within a team has finished their part, the body

is usually transported to another side of the assembly bay, where another group takes over. Again, the bodies move and time is lost. Given that bodies move at least four times per day (8 hrs divided by 2 hr cycles), and that moving the body easily takes as much as 5 to 10 minutes, reducing those movements could, in fact, generate a time gain of 30 minutes or more per shift (see Ellegård 1989: 238 for an early illustration of this "careography" -I borrow this term from Michael Maccoby, who was a consultant to the project). Important to retain here is that this is not really the same as kaizen in Japanese car plants, since the problems and the solutions are purely the team's own idiosyncratic issues, and there is no pressure to apply the "solution" to other teams. In a pure kaizen situation, the solution that was eventually found would be sanctioned by an engineer and, with-his or her stamp of approval, become the single best way of doing things.

This is not to imply that workers do not learn from each other. Within this second large rubric of continuous improvement, mutual and social learning processes play an important role. Rather than have an engineer "solve" a particular problem for the workers, workers are encouraged to try out different solutions themselves, if necessary work and think in the team about a particular assembly problem, and finally tell others about the way they dealt with a problem. This happens in every work situation of course -even though it is not as common a practice in the car industry as elsewhere because of the need for a carefully balanced line and, hence, rigorously defined jobs- but in Uddevalla this type of informal learning was actually encouraged, presumably on the grounds that it allows the worker to have even a better understanding of the

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work process, something that, in the long term, can only pay off in productivity increases.

The third large field can, according to "The Machine," account for as much as 40% of the productivity differential between plants: product design. As of yet, the cars that Uddevalla workers assemble are generic Volvo cars. Nothing has been altered to take advantage of the special assembly method: the cars, are all sold and made according to the customer's wishes, but beyond that, the cars are still the ones designed for line assembly. It is not hard to envision what a simple re-thinking of the car in terms of number of parts and ease for assembly might do to productivity in the plant.

Design for manufacturing is, especially in Volvo’s case, a crucial variable. An intersubjective ranking test of the IMVP research team resulted in Volvo being judged among the cars that were, from an assembly point of view, among the worst designed cars in the world. Volvo ranked 15th in the field of 19; only Peugeot, SAAB, Daimler-Benz and Jaguar came out worse (Krafcik 1990;Womack et al. 1990:95-98). An example of how radical this redesign can be is the new Volkswagen Golf(Rabbit), where the number of parts in assembly was reduced from some 2000 to somewhere between 600 and 700.

The redesign of the car would also benefit from the knowledge the assembly workers have accumulated over time. As one of my interlocutors remarked somewhat sarcastically: "Even the best Japanese assembly worker cannot tell an engineer who is struggling with a design problem what some of our guys can." Design for manufacturing thus becomes a truly important and creative process in this work setting for all parties involved.

Finally, there are, in a manner not unlike the first of the improvements, a number of areas where both management and the workers do not take full advantage of the technical and management expertise the workers acquired. As I mentioned before, it still happens that larger teams automatically "re-install an assembly line" in their bay, by moving the car up through different sequences and shorter cycles. Smaller teams would make such a relapse into "sequentialism" impossible.

Taking all these improvements together, the final assembly time of a totally customized Volvo 940, a so-called luxury car, is suddenly plausibly far below 20 hrs, and presumably even below 10 hrs, which constitutes a productivity gain over the best Japanese plants of some 50 to 70% !! For those to whom this sounds like unsubstantiated wishful thinking,--there is of course always the case of the one worker who assembled a car on his own in 10 hrs, the example that makes this calculus and, thus, the hypothesis of tremendous productivity improvements, plausible.

Beside the productivity gains, there are the obvious benefits because building and operating plants such as Uddevalla is immensely cheaper than any comparable conventional assembly plant. The basic investment is the first area where this is obvious. Volvo Uddevalla cost, everything included, 1 billion Swedish Kronor (somewhere around $ 250 mill.). For matters of comparison, the new line (and only the line!) that Citroen added in its plant in Rennes during the same time period (and that I was lucky enough to visit at the same time), was more than twice as expensive. The reason is self-evident: in Uddevalla, there are almost no robots, and especially compared to a recently installed car plant (as Citroën, hence the

comparison), the level of automation appears almost pre-industrial.

A second serious source of gains is the tremendous reduction of management. In Uddevalla, the control span is of the order of 50-70:1. In Saturn, by far the best conventional plant in the world, the span is 50:1, in most conventional GM plants there is one supervisor for roughly every 25 workers, and in "lean" NUMMI it is 18:1 (Rubinstein et al. 1993). Uddevalla thus needs only about one sixth to one-seventh of the supervisory personnel other car plants need.

The same holds for management. In Uddevalla, there are only two management levels: central plant management, and one shop manager for each of the six production shops. All included, this gives a head count of 16 managers for a plant that employs between 900 and 1000 workers.

Only two costs are remarkably higher in Uddevalla than elsewhere. The first is training costs. Currently the workers go through a sixteen month training period, comparable to an apprenticeship system that leads to an entry into the craft (oddly enough, the workers who organize the training are called Master, as in the old crafts). Even if we take seriously that this could be reduced to somewhere between 4 and 8 months, as both the union and management seem to believe, the costs are still relatively large, because of the time spent in paid training and the cost of the trainers. The point of training is, however, that some of these costs could be externalized, through industrial development funds, labor exchanges or simply in regional community colleges. And it is undoubtedly possible, as learning technologies become more readily available on computer, to standardize some of the training and pass it on via computer.

The only other cost is typical of these plants. If specialized tools need to be made, they immediately have to be available to all teams -because assembly is parallel- and this could, in some instances, raise the cost of tooling quite seriously. However, an extensive analysis by Volvo, comparing the conventional Torslanda plant and Uddevalla, demonstrated that the tooling and retooling costs were, in fact, less than half in Uddevalla.

What I hope to have made clear with this short review of the actual productivity performance and the potential of reflective production, is that economics can hardly be called upon to explain the demise of the plant. In fact, when taken over the medium term, the potential for both cost reduction and productivity increases is so big that abandoning the concept of reflective production right now seems like bad business sense. It is useful to remember here that most of this happened in a context where most of the cards were stacked against Uddevalla's productivity potential: the paint shop was missing because of environmental policy constraints, many of the workers were, as a result of the regional economic aid program the car plant was a part of, older workers and women, and the new assembly technique was introduced in its entirety, but without re-designing the product. Despite all these obstacles, the plant began to perform very well after a relatively short take-off period.

No, in order to understand why the plant closed, politics must be invoked: first, during the project, then during the existence of the plant, and finally during the closing, several visions of what the new plant should look like and what the roles of management, workers and union were in this new plant, constantly collided and, in the end, became fatal for the plant.

The trail I have chosen to venture into this complicated story, is the role of the Metall locals in the Uddevalla project between 1984 and 1992-3. I will first discuss the participation of the union people in the early years of the project, and then move on to the corporate and union politics surrounding the closure decision in 1992 and 1993.

2. THE ROLE OF THE UNIONS IN THE DEVELOPMENT OF UDDEVALLA

Work organization is about power. That was one thing Metall understood very well when they started to work in the Uddevalla project group in the mid-1980s. This does not mean that they had a very clear view about which concrete way to go. The initial union demands in the project were very conventional, to say the least: one was that task cycles should be at least 10, the second that the worker decides when his or her work is ready, and, third, that there would be parallel assembly instead of serial line assembly.[4] Even though each one of these points was satisfied in the end result, it is hard to see the direct relationship between the end result and these demands (see Ellegard 1989, the only report that details the role of the Metalworkers Union during the development phase).

Management or inside and outside experts - engineers and scientists- did not have a clear idea at the start either. The pedagogic principles of holistic learning were of course available, but that does not guarantee their implementation in a highly volatile, experimental situation. The same is true about the principles of material flow: they could be introduced, but that does not necessarily imply that they will be followed. And unions and management had some experience with stationary dock assembly, but that was in the truck division, in other words in a highly specialized

market niche. It was far from obvious that techniques developed there could be transferred without much ado into car production (Berggren 1990:201 ff.; 224-249 goes in to a lot of detail on the trajectory toward Uddevalla; the book has recently been revised and published in English: Berggren 1992; see also Forslin 1991 and Auer & Riegler 1990for the antecedents of Uddevalla in other Volvo divisions).

What the unions did ...

In order to understand the relationship between these inputs and the final outcome, the most appropriate way to look at the development process is to see it as a series of unforeseeable "accidents," whereby each of the accidents opened up a new world to contemplate. The end result was something nobody could possibly have planned, because it lay far beyond the mental horizons of the project group when they started their work in 1985 (see the diagram in Figure 4).[5]

Figure 4 about here

The development process of the Uddevalla plant is shown here as a series of discrete steps in time. The ordinate (X-axis) gives the moment in time when the step was made. The abscise (Y-axis) represents the continuum between automated assembly on a large scale (the "unstaffed" factory), and the logical alternative, craftsman-like assembly on a large scale. Finally, the V-like angles associated with each of the steps (the differently dotted lines and the full line that is located in January 1988), represent the mental horizons. The way to read this -admittedly rather complicated- figure is as follows. Assuming that the degrees of "mental freedom" (in other words the imagination) of the group are more or less constant,

the mental horizons are always more or less the same. However, with each step in one or the other direction, the project group was able to envision other, more radical alternatives, while it closed off some possibilities on the other side of the abscise (i.c. automated assembly). After two or three of such steps, the mental landscape that the project group used to imagine the new plant had changed beyond recognition. In other words, all the small, incremental steps combined to create a different view of the possible outcomes and, eventually, also the outcome itself. Furthermore, this already rather contingent model was made even more unpredictable by a few other discontinuous events. Every development phase was characterized by a qualitative break with the previous one. One incident that appears to have brought the final result within reach, perhaps illustrates this best. As said above, the early plans were, by and large, still very conventional: even the union people involved in the project were at that moment unable to envision a plant with cycle times over 20 minutes, the cycle times at Volvo's other innovative plant in Kalmar. The reason was that nobody in the group questioned even for one moment that assembling a car is such a complex job that one could not demand from a worker, not even from the best-trained worker, to be remember a sequence of actions in assembly beyond 20 min. As long as this ceiling was kept, the project group was stuck in two opposite logics. There was, on the one hand, the wish to parallelize assembly as much as possible; the twenty-minute ceiling, however, forced the car to move through different stations. Even under the most radical proposal envisioned within this logic, the plant would still look a lot like the Kalmar plant, and some 100 workers would be involved in the assembly of one car.(Ellegård et al. 1992a:16-17).

It took the audacity of one group member, an engineer, to move the project group out of this deadlocked situation. The engineer knew how the car worked, was increasingly uneasy about the artificial time limit, and decided to take a car apart and re-arrange the pieces in order to show the rest of the project group what he had known all along (this event became known as the Red Shed experiment). They all agreed: a car was not that complex -it was, in fact rather easily surveyable. Suddenly the possibility of having entire cars built by small teams (of less than 20 people) became a real possibility, and not any longer a pipe dream of some lost utopians. There was, of course, still a long way to go, but the group's mental landscape had changed dramatically because of the Red Shed, and the project was taken on entirely new roads. The development of the Uddevalla plant was, as this example illustrates, a stop-and-go process rather than the careful implementation of principles dreamt up in the design room of a large corporation.

... And what they did not discuss

Yet, all this innovative thinking notwithstanding, a number of issues, in adjacent fields and therefore of marginal interest to the immediate preoccupations of the project group, were left largely untouched throughout the development process. Some of these would, in the "end game" surrounding the closure decision, play a rather important role. It is useful, therefore, to stand still for a moment and try to reconstruct what these other issues were and why they did not appear on the agenda of the project group. In other words, why did the unions, who would be the "natural" first parties for a discussion of these issues, not raise them in the early days of the project? I will first list the points that were left

outside the group's agenda, and I shall then discuss the role of the unions in this discussion.

Financial affairs were never considered in the project group. The project had to remain within the budgetary limits set forth, but beyond that none of the participants in the project raised financial issues. Many of my interlocutors were remarkably candid about this: in Volvo, the unions did not need anything special. Management had given the unions organized access to the books long before the Swedish Codetermination law of 1976 (MBL, for Medebestämmandelaget) made it mandatory, and unions were involved in all strategic decisions the Volvo board made. Yet the MBL did one thing, as one of the former local unionists pointed out: it forced the unions to consider long-term as well as the traditional short-term issues, and build an organizational structure around it. Work organization and strategic issues became, in this new perspective, just as important as wages and working time.

A second large field that was never discussed, pertained to the influence on corporate decisions. Throughout, there was no discussion of what cars to build in Uddevalla -originally the lower-end 240 as well as the high-end 940 were to be built there; then that changed and, eventually only the most expensive model was built in Uddevalla. Similarly, there were no contacts with project groups that were working on a new Volvo car, the currently marketed 850, and existing models were never re-engineered to match the learning and production process at the Uddevalla plant. Also, from what I was able to reconstruct, strategic linkages between the Uddevalla union reps and the Volvo corporate board union reps (but this seems to be true to some extent for management as well), were virtually non-existent. All of this suggests that the Uddevalla

project group -and the unionists in it- acted in a relative vacuum, somewhat detached from their parent organizations.

This impression is corroborated by an observation about the actual current operations of the union in the plant. One cannot help but be struck by the separation between the union role in the project and the union role in the plant. Whereas the union played a critical role in the project by constantly pushing the limits of the imagination, once the plant had become an operating reality, they resorted to very conventional union tasks, and became a kontaktombud again (the word is originally Swedish and requires no further translation), who dealt with health care administration, grievances, wage negotiations, etc. and negotiated the closure settlement. By and large, the union never came close to any type of actual co-management of day-to-day affairs. They played an important "unconventional" role only once, during the spring and summer of 1992, when the plant was reorganized in such a way that management was reduced from four to two layers.

Why did the union leave these strategic issues untouched? From my interviews, two sets of answers emerge, and both help us understand at least in part what happened. The first one is the "official Metall story." According to this view of things, any involvement with other issues was simply not deemed necessary at that time. The group concentrated on how to make a car, because, once in operation, production would be intrinsically so flexible that any changes in demand would be easy to meet. The other issues were, in this view, not a problem and if strategic issues became important, the co-determination law framework would provide the union with the resources it needed. The

issues were never discussed, in other words, because they were no issues.

The second argument digs somewhat deeper, puts the first plausible but limited point in larger perspective, and complements it: internal union politics blocked the active participation of the local Uddevalla people into these other, non-traditional areas. In order to understand this, a short excursus into the structure of Swedish unions is necessary (see Kjellberg 1992 for more details). Swedish unions operate at three levels of the economy simultaneously: the national economy, the industrial branch and the individual firm/plant. (In the case of large corporations such as Volvo, there is a fourth level, the corporate, inter-plant level.) Territorially, the unions have so-called "groups," regional union bodies (districts), that consist of the plant/firm-level unions within one region, the so-called "workplace clubs" (see figure 5).

Figure 5 about here

Inside the Gothenburg Metall union district -the regional union body that organizes both the workers in the main Torslanda plant (ca. 10,000 workers) and the small Uddevalla plant (ca.1,000 workers)- there have always been two large camps with regards to the Uddevalla project. One side supported the project, because they were younger and convinced about the necessity for the union to play an active role in shaping companies and work in Sweden. The other group, mainly consisting of older, traditional unionists, were very good at the conventional type of union work, and therefore did not appreciate nor like the Uddevalla-type ventures into new fields, or understood what the union role would be in this new production and

management system. This latter group was embodied in the Torslanda local president, who attempted to restrain the local union people involved in the Uddevalla project group several times, attempted to impose the 20 minute ceiling on the task cycle as the official union line, was unable to envision a car factory without lines, and denied the union people the authority to discuss other, wider-ranging strategic issues. [6]

The reasons why the local union people were, in the end, able to push through their program, is another illustration of the role of surprises and contingencies in the development of Uddevalla. Whereas the Torslanda Metall president was easily among the most important and powerful people in the union -in Gothenburg, but in all of Sweden- one of the Metall people in the project group was the chair of the SAP clubs in the Volvo concern (the Social-Democratic Party). He could and diduse this position as an independent power basis in the struggle over the direction of Uddevalla and managed to prevail at least in terms of setting the signposts for the union's participation in the project.

As long as Volvo's company results were good -and they were very good in the mid-1980s- this "defeat" over Uddevalla was acceptable to even the hardest-nosed opponents of the project, in union as well as management circles. When the situation began to sour, as I will discuss in a minute, the old animosities surfaced.

What this story of the initial phases of the Uddevalla project suggests, is that there was indeed a "disastrous mismatch" between the extremely innovative visions of the organization of production and the extremely traditional "Fordist" product development in Volvo (Berggren 1993). However, because of the delirious growth that Volvo experienced in the 1980s,

as a result of the low Krone and the ever expanding US market, nobody thought any further. And those who might have, had to fight a large number of turf battles with more powerful people who held very different views of the need for Uddevalla.

3. THE UNION ROLE IN THE CLOSURE

In the final act, the closure of the plant in Uddevalla, the two stories that preceded it, finally meet. As long as Volvo's capacity was largely in tune with demand, Uddevalla was regarded by both unions and management as an "interesting" plant, and both officially supported it. Especially the management story sounded persuasive -so persuasive, in fact, that even Marxists bought into it (see Pontusson 1990): humanizing work was management's way to cope with chronic labor shortages, full employment and rigid wages, so that workers would find pride in their work.[7] Volvo being one of the quintessential niche producers secured the company's position in the car industry landscape.

Volvo corporate politics in times of crisis

As soon as the general overcapacity crisis in the European automobile industry hit Volvo, however, the initial coziness was over and the real problems emerged. In 1988 already, a rift between different management factions had become clear. Ake Sandberg of the Swedish Center for Working Life reported that back then, some managers said they would abandon Uddevalla the moment the labor market situation changed.[8] That time, for those who doubt it, has definitely come now: according to newspaper reports in March of 1993, the government is factoring in a 16% unemployment rate by the end of the year -a little below the unemployment in

Spain and a disaster in a country that has known unemployment rates of 2-3 % for most of the last thirty years.

Yet the trouble runs deeper than a cyclical management offensive. It basically starts with the Renault-Volvo alliance in the mid-1980s. About a year ago, a French consultant wrote, in a report to his government that the deal with Volvo was really a bad thing for Renault and that Uddevalla was an especially troubling cost factor in the alliance (see Financial Times). Volvo also posted, in the same period that this report was made public, its second year of big losses, and the company's situation kept on getting worse: Volvo is currently losing something of the order of SEK 10,000 (around $ 2,500) on every car it sells. Renault, in the alliance with Volvo, foots the bill.

Renault's recent successes are worth a story in themselves, but that would be way beyond the scope of this paper. However, a few things are important for the unfolding of the Uddevalla story. Renault managed to turn itself around so dramatically that it is currently being discussed as a model for other mass producers in Europe, by adopting just about any Japanese production element they could import. For Renault, there is only one way out of this crisis, and it is "lean production."[9] Renault thus not only finds itself in the position of footing Volvo's bill, its management is also ideologically opposed to the Uddevalla concept. Furthermore, one of the reasons Renault has entered the alliance with Volvo is because it needs an entry into the upper market segment. Mercedes, Audi, Lexus and Infiniti drivers will never buy a Renault (presumably not even the big, luxurious Safrane), but would much more easily consider buying a Volvo. What would be better for Renault than packaging its cars as a Volvo? Renault is therefore only marginally interested in the

long-term survival of Volvo as an independent company (for this point, see Williams et al. 1993).

Here the stories begin to slide into one another. The French car maker forces Volvo to make serious cuts to bring its capacity in line with demand for its products. Within the Volvo group, the two European plants outside Sweden are -for several reasons: productivity, market proximity, joint ventures, ..immune to all calls for capacity reduction. The plants in Ghent (B) and Born (NL) have, in fact, seen their capacity increase sharply over the past 15 years, up to the point where they each produce almost as many cars as the main Swedish assembly plant in Torslanda (Alvstam & Ellegard 1990:187). And Ghent is, up until today, still the only plant where the new Volvo 850 is being produced, while the medium size 400 series is predominantly produced in Born. Both plants are, as these data suggest, as least as vital, if not much more so, for Volvo's corporate strategy as the Swedish plants. Capacity reduction therefore had to take place within Sweden, a "logical" business decision, underscored by high unit labor costs in Sweden.

The crisis and the unions

This is the place where the tension within the Gothenburg union district between the Uddevalla and the Torslanda local reappears. Neither of the two wants to lose workers in their backyard; the Torslanda union is by far the biggest local in Volvo, and this position gives it the power to prevail over the smaller locals in the Volvo concern, especially over Uddevalla, which is technically in the same union district as Torslanda.

Innovators were always a minority in the labor union, but they became so only recently in management. Most of the top management that was closely

associated with the Uddevalla project, left Volvo in recent years, and even the visionary CEO, P.G. Gyllenhammar, has apparently accepted to play second fiddle in the actual operations of the group. Union and management suddenly find themselves: the "traditionalists" in the Torslanda local enter into an alliance with the "traditionalists" in management, who did not see the need for Uddevalla either, in order to safeguard jobs in the conventional assembly plant in Gothenburg.[10]

Renault management, operating in the background, forces a modernization strategy on Volvo and make Japanese-style production control the official method to turn the company around. Volvo management is all too aware of the squeeze from both sides, from the Renault alliance and from the domestic workers and gives in without too much difficulties. Even--a series of provocative editorials in Sweden's leading newspaper Daqens Nyheter in March and April of 1993 on the plant closing was unable to change Volvo's mind. In fact, management simply refuses to discuss the issue in public.[11]

The decision to close being made, a rationale is needed for closing Uddevalla -and that was not hard to find. Investment in the plant was extremely small for Volvo. The plant cost, as I mentioned earlier, about SEK 1 billion and most of this was, in one way or another, public money. Financial commitment to the plant was therefore very small. Uddevalla did not produce anything new either. In the plant, exactly the same cars were assembled as in Torslanda and Ghent (be it that they were entirely customized and consistently better, if we are to believe J.D. Powers). Third, the union also steered clear from strategic issues, because of their unproblematic nature and because the union hierarchy prohibited trespassing into this terrain. In

the fall of 1992 it was too late to change that. All Uddevalla had going for itself was the innovative work design and the promise of productivity increases. Yet even that was still too far off in the-future: the plant had only just reached average productivity in European car plants. The chance (or likelihood, in my reading of the story) that Uddevalla was still on the very steep end of the curve, while conventional assembly is on the flat end of the curve, and that Uddevalla therefore presents, at least in theory, a qualitative jump in productivity comparable to Ford's early years, was never considered. Tying all the loose ends together leads to the inevitable outcome: Uddevalla's closure.

4. CONCLUSION: On the political sociology of process innovations

This leaves us in an awkward place. We've seen the future, it seems to work, and yet it is aborted. Why? What are the underlying social constellations that combined to create this tragic story? What is the big picture behind the immediate corporate and union politics? There are, I think, two points that warrant further elaboration. The first one deals with the ultimately contingent nature of the whole planning process. The second takes off from these contingencies and uses them as the building blocks for a political sociology of organizational innovations.

The development of the Uddevalla plant was, as I hope the account in this paper has demonstrated, not the result of some ingenious plan, elaborated in union research centers, corporate headquarters or technology institutes, but has to be understood as the contingent outcome of a series of (what I call for lack of a better term) quasi-accidents. What was and what was not

part of the project was therefore itself ultimately contingent. Had Volvo management, for example, been even bolder in its original plans, it may have linked the development of the Uddevalla plant and the development of the new car, the 850. From what I have been able to reconstruct, the 850 project group and the Uddevalla project group never even talked to each other! Similarly, had the union been slightly bolder, they could have pushed some of the long-term strategic issues on the table. Given the relative openness of Volvo management over the ideas on work organization, chances are that the fate of the Uddevalla plant could have been sealed by the exclusive nature of the car that was produced there - a car designed to be assembled manually in docks, and that could simply not be manufactured in conventional plants. We now know why it never got that far,, but there was, in the logic of the Uddevalla project, no argument that precluded these possibilities.

This heralds the second point in this conclusion. In the past, assembly lines were not just more efficient ways of making a car. They were also, as we all are well aware, efficient ways of moving control over work contents, work pacing etc. into engineers and manager's offices. Productivity was, in other words, not the only reason why the assembly line prevailed over other modes of workplace organization. Beside economics, as David Noble (1978) has shown so admirably in his studies of the introduction of CNC machines, politics mattered too.

Some production techniques thus make it because they have a "constituency," a group or class that is able to see how its future is linked to the technology, and willing to use its power to assure its implementation. Managers, but even more engineers fulfill this role in conventional organizations. They

conceptualize products, production processes, plants, tasks, and jobs. Engineers and assembly lines need each other as Siamese twins. Assembly lines create a tremendous need for coordination, that, by virtue of their education, only engineers appear able to provide. Many organizational changes are, to paraphrase Bendix's famous study on managerial ideologies (Bendix 1956), mainly ex post facto rationalizations of the engineer's and the manager's position in the world. That is really, as Marglin suggested almost two decades ago, what bosses do (Marglin 1974).

Why this detour? Because it makes painfully clear what the "big" reason behind Uddevalla's failure is: the plant did not -and, I am afraid, never will- have a constituency, a social actor that "carried" it the way engineers are the "natural" proponents of automation in assembly lines. In the reflective production model, management and engineers see their tasks sharply reduced. In Uddevalla, the control span is between 70:1 and 100:1, and from my interviews I deduced that any number was ultimately arbitrary, because management in Uddevalla appeared almost only as a point where information was aggregated, not a level of control. Put bluntly, in a self-managed team situation (to avoid any confusion: this is the opposite of what teams are in lean production systems) where pacing, coordination, sequencing and quality control are the team's responsibility, engineers are, for other than pure support reasons, obsolete. In the limit one could even envision product design to shift, at least in large part, to the assembly worker. For who can provide the design engineer with more valuable comments the new product than the Uddevalla worker who assembled the entire, car? Managers and engineers are thus both "out" as proponents of reflective production.

Labor unions are not necessarily better candidates. Admittedly, the Swedish unions went a long way in the Uddevalla case -and before any criticism is leveled at them they ought to be applauded for this. But, leaving aside for a minute the internal struggles -I will come back to these momentarily- it cannot be mere chance that the unions stopped far short of strategic management issues, both during the design stage and in current day-to-day practice. In retrospect, it is clear that a large set of issues outside the conventional union realm was simply never a part of the landscape the unions were looking at. That is not by chance: even in Sweden, the jewel on the North-West European social-democratic crown, trade unions have traditionally left "production" issues to management and their recent ventures into these new fields are still burdened by the reflexes and' organizational constraints that result from many decades of active disinterest (see, however, Metall 1985; Sandberg 1992 for different views). The fights within the union over the future of Uddevalla, then, compounded this dramatic picture even more. To the inattentive observer, they appear as the "normal" fights of one union over its members' job security. But underneath this rational veil reside issues of union identity, of competing visions about labor unionism at the end of the twentieth century. According to the old -and, witness the victory, still prevailing- logic, management manages and the union grieves. According to the new one, labor unions are, more than ever before, actors shaping their political economies. With the demise of Uddevalla, the old logic seems to have won round one. As long as the old logic has the advantage, labor unions do not qualify as social "blocks" (in Gramscian terms) either.

That leaves us with the workers. I think, even though I am aware that it is very hard to substantiate this, that workers only appreciate changes a la Uddevalla after they worked in them, and it is only then that their support can be mustered for these new forms of work organization. Highly indicative was, for instance, that Uddevalla management did not once use the quality of work life aspects of the new plant in their recruitment campaign (a fact that also seriously questions any academic argument that sees Uddevalla as an answer to the particularly Swedish labor market problems of high turnover and high absenteeism). And the Metall shop steward who guided me around the plant said that, after having worked there, he would never go and work in a conventional plant. The implicit point is, of course, that he did not know this before he entered Uddevalla. Perhaps this did not matter one hundred years ago, when workers could be mobilized around some quasi-utopian ideal; today, however, that seems totally out of the question. Mobilization works best, as every union militant knows, if you can demonstrate that people will or may lose something important that they have acquired. It is defiantly difficult, presumably impossible, to organize around the promise of reflective work and organization as in Uddevalla.

No, nobody seems predisposed and ready to fight for Uddevalla-like forms of production. Uddevalla and similar other attempts to build a better world -even though there aren't many- thus resemble the wonderful prototypes of houses that architects used to build to make living in the city a nicer experience, and that created neighborhoods where self-help and mutual reliance would foster security, but that were never really put into practice. Just as these architects' pipe dreams (even with their sometimes impeccable

logic) did not give us better cities, because the model never spread, so it seems Uddevalla too is a branch on a tree that is growing another way.

There is of course us, the generation that grew up believing in socio-technical work design, and their illegitimate sons and daughters, who deep down are convinced that democracy is the way to competitiveness (Heckscher 1991), and that good jobs are, in a train of thought not unlike Proudhon's, both a necessity and something to strive for. But we have to remain honest to ourselves: we cannot claim deeper knowledge of the world and simultaneously reject technocratic methods of decision-making. And beside, to make a real difference in the long run, there are simply not enough of us.

Does this mean the end of the Uddevalla model of work organization? Is this a world of possibility that closed in front of our eyes? My answer to that question does not come easily to me, but, on balance, yes, I think this is the end. Not because of intrinsic failures, logical mistakes or even raw power politics. But because new forms of work organization only emerge and persist when they combine economic gain with a political-social constituency. And if one thing is clear from this paper, it must be that in the case of the Uddevalla plant, none of these two conditions were actually met. The plant was indeed a swan among ducks.[12]

NOTES

1. See Womack et al 1990 (hereafter "The Machine"): pp. 101-02; Interview in "Edges Fray on Volvo's Brave New Humanistic World," NYT, 7 July 1991.

2. The relevant comparative figures can be found in "The Machine," pp.84-91. This may also be the moment to point out that in the fall of 1992 the 940 was produced in Uddevalla (not the 740, as "The Machine" says). The 940 is a little bit more luxurious and more complex than the 740.

3. The figures are, however, not entirely comparable, because the comparisons in The Machine.." are based on a standard sub-sample of assembly activities, not the entire job (Christian Berggren was the first to point this out to me). One cannot help but wonder why the authors were not any more straightforward about this not entirely untrivial matter. See John F.Krafcik, "A Methodology for Assembly Plant Performance Determination" IMVP-Working Paper, October 1988, the methodology paper on which "The Machine.." is based, which distinguishes between standard and non-standard assembly tasks and preambles this distinction by explicitly pointing out that this implies that productivity differentials are therefore relative, not absolute. Yet, whatever one may think about this not-so-careful presentation, it makes the argument I make in this paper even stronger, since the only comparable figures are biased against Uddevalla.

4. For some strange reason, Pontusson (1990) attributes a lot more to the union's red book: he claims that Metall initially advanced four basic demands with regards to production: (1) stationary assembly; (2) no machine pacing; (3) job cycles of over 20 minutes; and, (4) all workers perform direct assembly and indirect maintenance and administrative work. This is simply not true, and I have no idea where Pontusson got this material: when I interviewed the Metall people who were involved in the Uddevalla project, they were remarkably modest about their ideas in the fall of 1984 and the spring of 1985 (the conception phase of the project). The three points I mention in the paper I got from one of them, and when he presented them, he exclaimed, as if to underscore the relative triviality, "and that was all!."

5. Before I continue with these landscape metaphors, I must point out that I have been very influenced by the writings of and discussions with Kajsa Ellegard of the Department of Social Geography at the University of Gothenburg for this section on the development process one of the few privileged academic observers of the development of the Volvo plant in Uddevalla (see Ellegard 1989a; Ellegard 1989b; Ellegard et al. 1992a; Ellegard et al. 1992b). Being a geographer, she uses these metaphors the whole time and out of deference, I do so too. However, I had begun to develop similar ideas of my own by then that, influenced by Michael Piore's recent work on cognitive structures (Piore 1992),

I was framing in terms of changing "mindsets," and normative paradigms.

6. I was informed that many people who were involved in the Uddevalla project have since left the Metalworkers' union and were recruited by Volvo into its management group. This may seem strange to some of us but in Sweden, and especially in Volvo, this is standard practice. Not so standard practice is, however, that most of these people have cited serious problems with the traditional authoritarian leadership style of the union president as a major reason for leaving Metall.

7. It is, as always, hard to decide who's right and who's wrong here, but there are serious indications that the high turn-over, high absenteeism argument is really only half of the story of work innovation in Volvo. One indication, which I found after a few days of interviewing, is that Volvo wages were always above the national average. In the 1960s, Volvo paid higher wages in order to attract workers, but even under the relatively disciplined solidaristic wage policy, Volvo wages were relatively high. What happens is that Volvo, the largest industrial employer in Sweden, was always the first one to bargain over wages, and the result in the company provided the pattern for other firms. When the rest of the economy had settled their wage agreements, a second round started in Volvo, and the unions were usually able to increase the wages a little bit.

8. At the seminar "Vid Vägens Slut?" (The End of the Road?), Royal Institute of Technology, Stockholm, 26 March 1993.

9. There is as of yet still little documentation about all this. One source is Williams et al. 1993, a paper presented at the seminar "Vid Vägens Slut?", Stockholm 26 March 1993. Another is a book published by Renault management: Lucas & Jacobs, Au Coeur du Changement (Paris 1992). Yet another are discussions with Åke Sandberg, who had just visited Renault factories in France in March 1993, and a final source are my own interviews with French union people in January 1993. More research into Renault's recent ventures is desperately needed, so much is obvious from this list.

10. In March of 1993, a debate was opened by researchers from the Swedish Center for Working Life in Stockholm, who asked "Why is it' so silent over Uddevalla?" and suggested, in the columns of LO-Tidningen, the central labor union magazine, that the Metalworkers Union had betrayed its own goals of rewarding jobs (LO-Tidningen 12 March 1993). The next week, a Metall official responded, and said that a research group within Metall had analysed the situation and had come up with the same conclusion as a Volvo management (interesting footnote: Christian Berggren, the most important automobile researcher in Sweden, conveyed to me in a private communication that he volunteered his services to the Metall people in this analysis, but was refused to

participate. Moreover, in the article, the Metall official repeated something one of the people I interviewed said: it was not up to the Stockholm Metall leadership to tell its locals which plant to close, implicitly acknowledging, of course, that it was impossible to break the coalition between Volvo unions and management, and thus sealing the fate of Uddevalla (LO-Tidiningen 19 March 1993).

11. This might, to some extent at least, explain why I have been particularly unsuccessful in my attempts to talk to Volvo management. I could not discern any deliberate attempt to put me off, but it is a remarkable point that all the union people I asked for an interview were easily able to free themselves (sometimes on very short notice), while only one manager -in Uddevalla- could do so. It appears as if Volvo management has decided to not discuss any of these issues with outsiders.

12. The words are Kajsa Ellegard's (at the March 1993 seminar in Stockholm).

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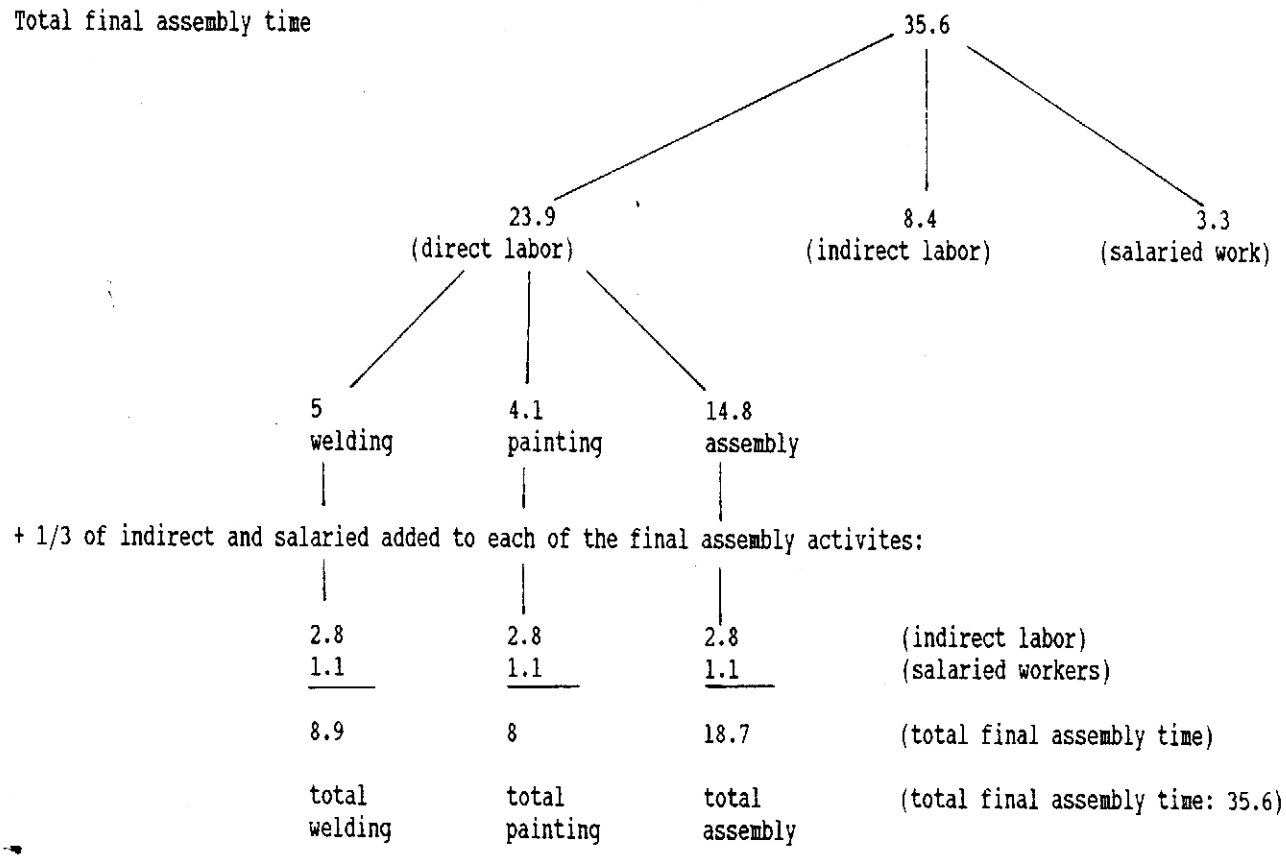
Figure 1: **Breakdown of Assembly Time** (in person hours)
Volume producers only; regional average Europe



Data provided by John-Paul MacDuffie,
Wharton School of Management, University of Pennsylvania, and IMVP, MIT

Figure 2 : Productivity curves in automated line and stationary manual assembly

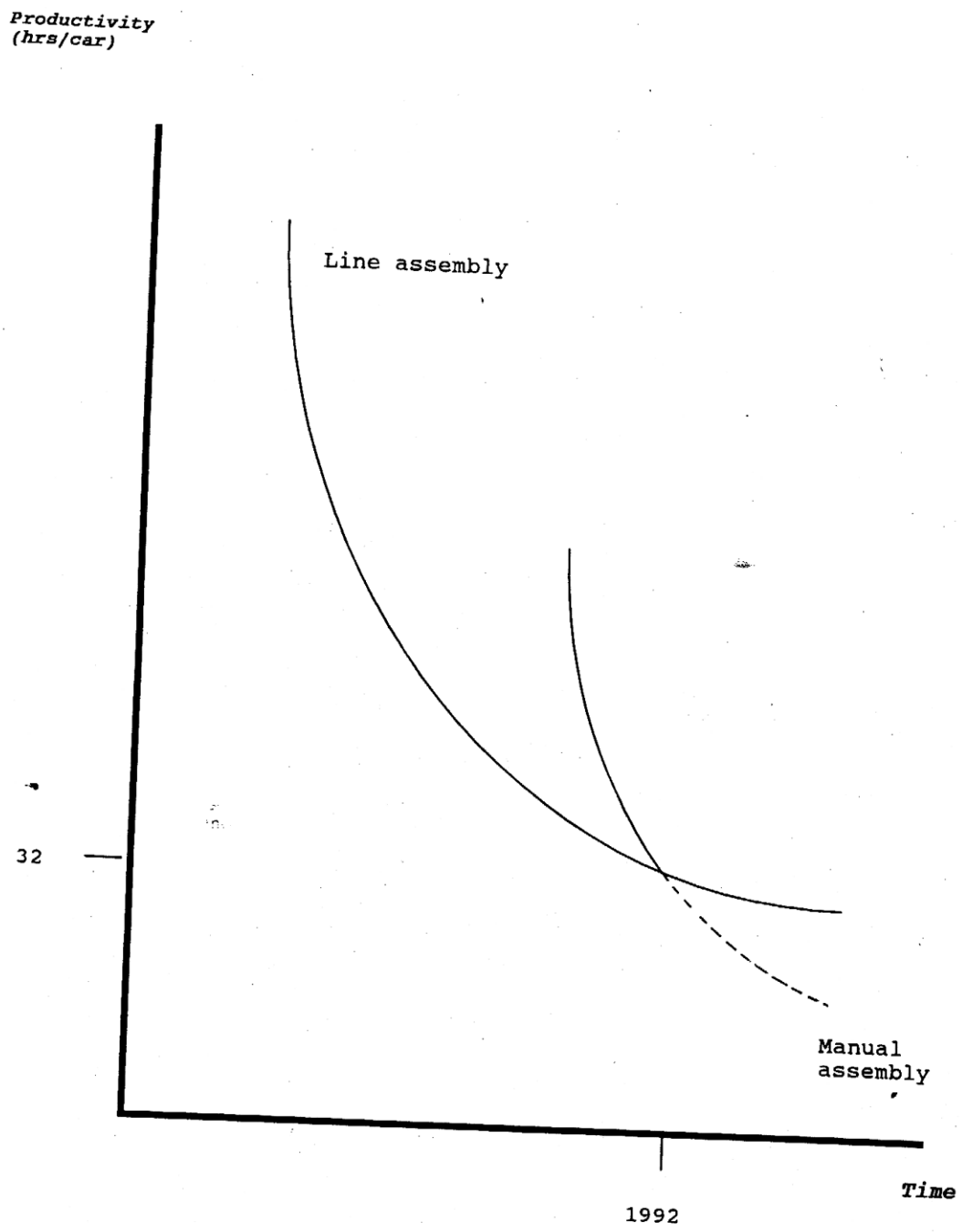


Figure 3 : Sketch of the Volvo plant in Uddevalla
(Source New York Times 7/7//1991)

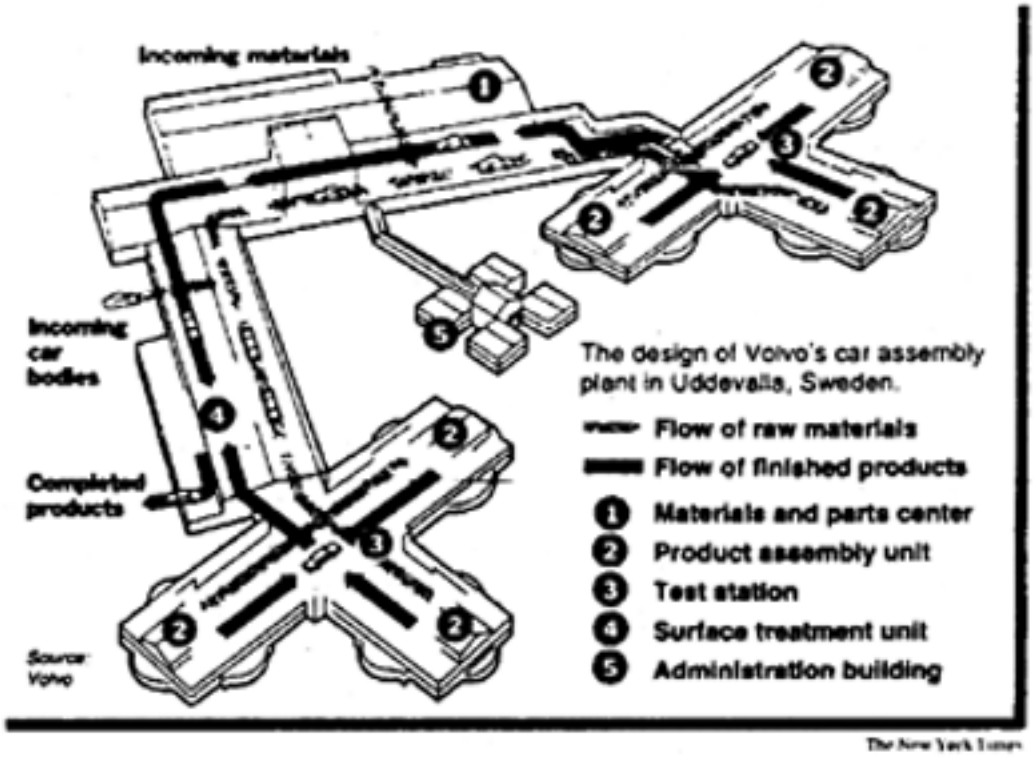


Figure 4 : The development process
(Source Ellegård et al.1992)

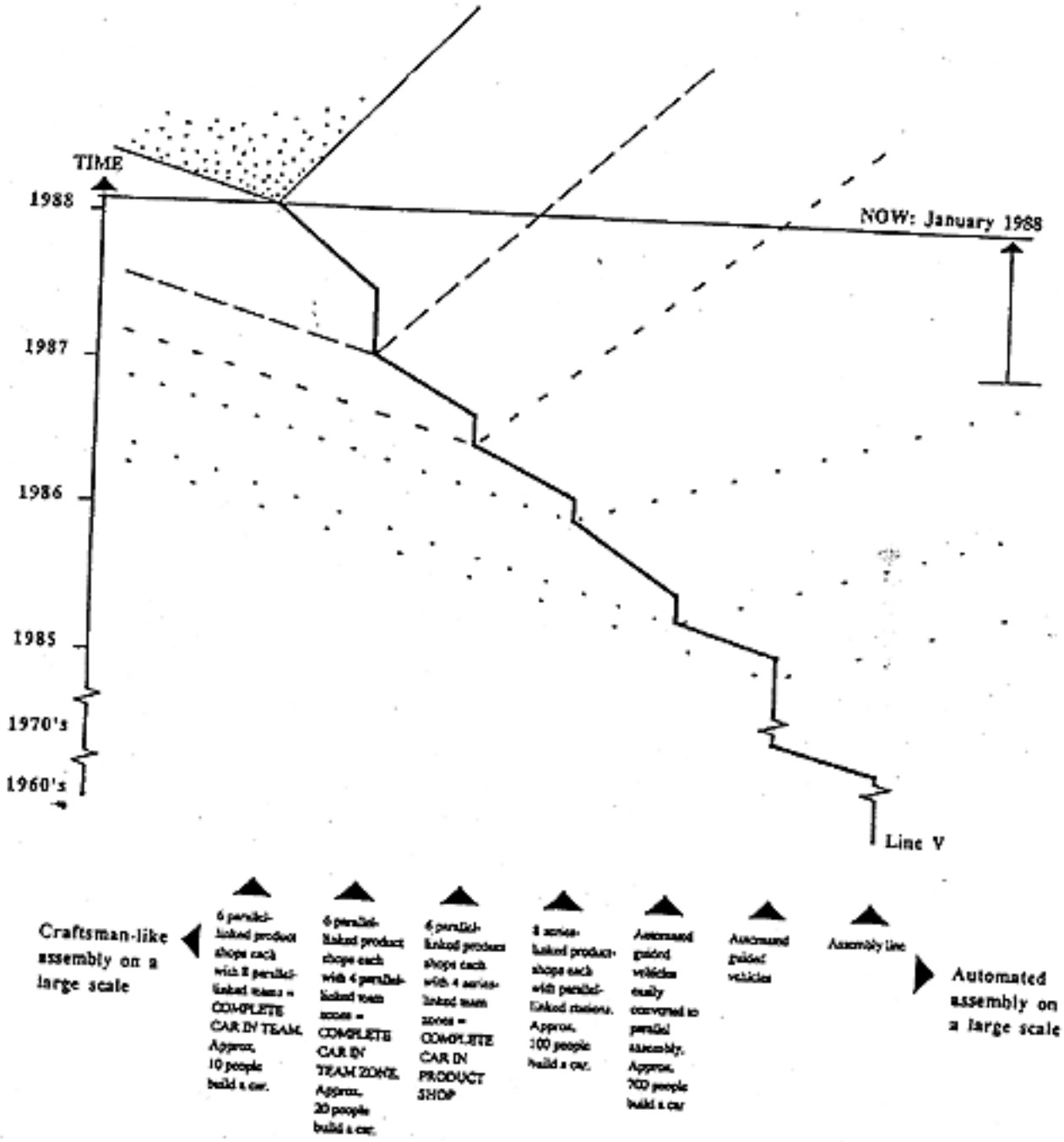
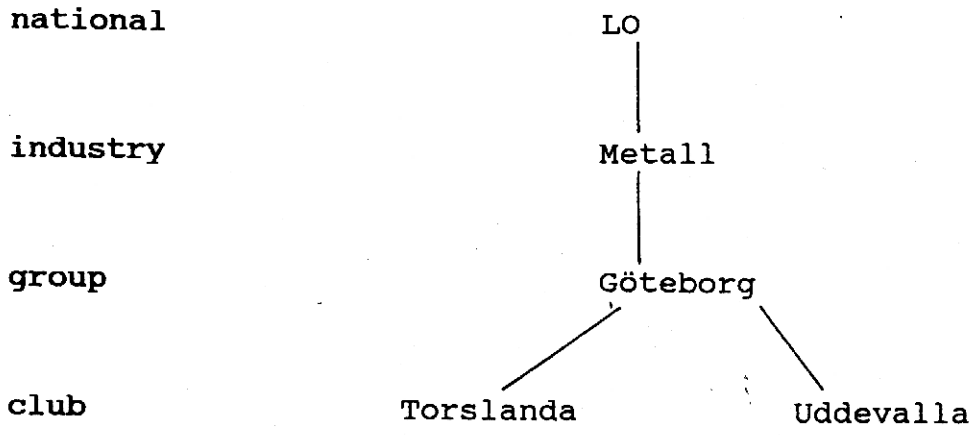



Figure 5: The Union Structure around Uddevalla