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The confrontational management-labor negotiations that led to the failure of the United States motor vehicle companies and why the Japanese and Germans prevailed

ABSTRACT

The success of the US motor vehicle companies up to 1955 and their subsequent decline is directly related to the management-labor negotiations in the 1930s and the acceptance by both management and the mass union movement of the inherent nature of work in an assembly-line factory. Because the conditions of employment on the assembly line became less and less bearable over time, the negotiations became confrontational ones in which each side tried to get as much as possible from the other in a “win-lose” setting. This ongoing confrontation let to the continuously escalating labor costs within the US motor vehicle companies that ultimately led to their decline. Unlike the case of Japanese or European companies, the US companies never had a “win-win” proposal on the table. To understand how this happened, we will first describe how, on three occasions, the motor vehicle industry has changed the most fundamental ideas on how to manufacture things and, what is more important, how humans work together to create value.

Keywords: US motor vehicle companies decline, mass production system, lean production system, reflective production system, confrontational management-labor negotiations

Introduction

The success of the US motor vehicle companies up to 1955 and their subsequent decline is directly related to the management-labor negotiations in the 1930s and the acceptance by both management and the union movement of the inherent nature of work in a mass production assembly-line factory. Because the conditions of employment on the assembly line became less and less bearable the negotiations between the United Auto Workers Union (UAW) and the Big Three (General Motors, Ford and Chrysler) became confrontational ones. .Each side tried to get as much as possible from the other in a “win-lose” setting. Unlike the case in Japan or Europe, there was never a “win-win” proposal on the table. This confrontation led to the continuously escalating labor costs for the US motor vehicle companies that ultimately led to their decline.

To understand how this happened, we will first describe how, on three occasions, the motor vehicle industry has changed the most fundamental ideas on how to manufacture things and, what is more important, how humans work together to create value. The industry began at the end of the 19th century as a craft production system, with a workforce mainly comprised of skilled craftspeople that understood mechanical design principles and the materials they worked with. Many of the more experienced craftspeople became independent contractors working for or inside the factory. After World War I Henry Ford invented the mass production system in which each worker performed one particular task. Management came to consider the work force variable costs, and so was always trying to reduce these costs to improve the company’s bottom line. The mass production system was responsible for the extraordinary success of the US motor vehicle companies up to 1955.

The Japanese and the Europeans, faced with the realization that due to its dead-end monotony the mass production system was unbearable for the workers, developed different approaches to the mass production system. In Japan after World War II Eiji Toyoda and Taiichi Ohno developed the Toyota Production System (TPS) that later became known as the ‘lean production system’. Toyota considered workers as fixed costs and continuously enhanced workers’ skills so as to gain more ongoing benefits from their

seniority in the form of knowledge, experience and commitment. The Europeans, faced with the same dissatisfaction of their assembly line workers with the dull work, also adopted job enrichment and a technology-oriented productivity strategy. In the case of Germany workers had representation on the board of the companies. One of the most emblematic attempts to humanize work and promote team work was the reflective production system pioneered by Volvo in the 1980s. The system was called reflective because the workers had to reflect over their work during the work process.

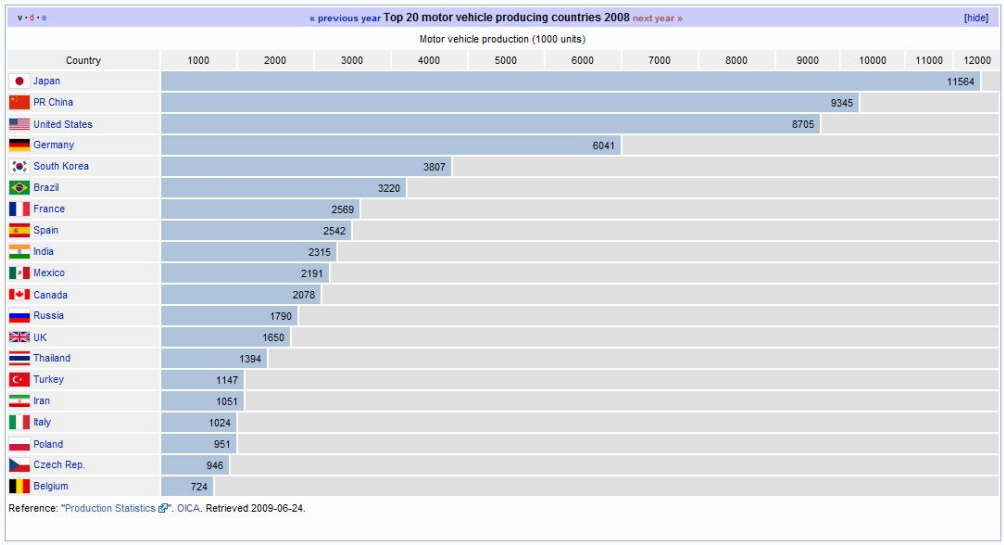
The World motor vehicle industry and the decline in US participation

The motor vehicle industry is the world's largest manufacturing activity with 70.5 million new vehicles produced in 2008. Due to the financial crisis however, this was slightly lower than the 2007 production of almost 71.9 million. Even with this slight reduction, 2008 production was 21 percent higher than the 2000 production of 58.3 million. The main reason for this was the extraordinary 465% growth in Chinese production, from 2.0 million in 2000 to 9.3 million in 2008; the significant 288% growth in Indian production, from 0.8 million in 2000 to 2.3 million in 2008; and a 58% growth in Brazilian production from 1.7 to 3.2 million in the same period. These growth rates widely compensated for the 47% decline in US production during these years, from 12.8 to 8.7 million vehicles (International Organization of Motor Vehicle Manufacturers).

The decline in US motor vehicle production, the shift of production from some countries to others within the EU, the growth of Japan and Germany, and the extraordinary growth of the BRIC (Brazil, Russia, India and China) countries can be seen when comparing the list of the top ten vehicle manufacturing countries of 2008 with those of 2000. In 2008 (Figure1) these were: (1) Japan with 11.5 million, (2) China with 9.3 million, (3) the US with 8.7 million, (4) Germany with 6 million, (5) South Korea with 3.8 million, (6) Brazil with 3.2 million, (7) France with 2.5 million, (8) Spain with 2.5 million, (9) India with 2.3 million, and (10) Mexico with 2.2 million produced (List of countries by motor vehicle production, Wikipedia). In 2000 the top ten were: (1) the US with 12.8

million, (2) Japan 10.1 million, (3) Germany with 5.5 million, (4) France with 3.3 million, (5) Spain with 3.0 million, (6) Canada with 2.9 million, (7) Mexico with 1.9 million, (8) the United Kingdom (UK) with 1.8 million, (9) Italy with 1.7 million, and (10) Brazil with 1.7 million (International Organization of Motor Vehicle Manufacturers). The 21% growth in world production between 2000 and 2008 occurred primarily in the BRIC countries to satisfy their internal demand - with few exports. The European Union (EU) countries together increased their production by 8 percent from 17.1 million in 2000 to 18.4 million in 2008.

Figure 1. Top 20 motor vehicles producing countries in 2008



Source: Automotive industry, Wikipedia

The largest motor vehicle manufacturers are multinationals with production facilities in many countries. The top multinationals, with production of over one million vehicles in 2008, were: (1) Toyota with 9.2 million, (2) General Motors (GM) with 8.3 million, (3) Volkswagen (VW) with 8.2 million (not including Scania), (4) Ford 6.4 million, (5) Honda with 3.9 million, (6) Nissan with 3.4 million, (7) PSA (Peugeot and Citroen) with 3.3 million, (8) Hyundai with 2.8 million (not including KIA with 1.4 million), (9) Suzuki with 2.6 million, and (10) Fiat with 2.5 million, (11) Renault with 2.4 million, (12) Daimler with 2.2 million, (13) Chrysler with 1.8 million, (14) B.M.W. with 1.4 million, (15) KIA with 1.4 million, (16) Mazda with 1.3 million, and (17) Mitsubishi with 1.3 million. The decline in US motor vehicle

production primarily affected GM's position. In 2004 GM was the number one world producer with 8.0 million vehicles, followed at a comfortable distance by second placed Toyota with 6.8 million, then Ford with 6.6 million, VW with 5.1 million, and Daimler Chrysler with 4.6 million (International Organization of Motor Vehicle Manufacturers).

By 1950, near their peak, the US companies, utilizing Ford's mass production and Alfred Sloan's marketing and management techniques, dominated world motor vehicle production, accounting for 79.4% of the 8.0 million vehicles produced (Grant, 2004). The US market also accounted for the largest percentage of the world's motor vehicle sales. The giant enterprises GM, Ford and Chrysler accounted for 95 percent of all sales in the US, with six models accounting for 80 percent of all cars sold. It was 1955, when the US and Canada were producing 70.9 percent of the world's 9.2 million motor vehicles, that the decline began; 1955 was also the year that Sloan retired after thirty-four years as either the president or chairman of GM (Womack et al., 2007, p. 41-42).

To understand the success of the US motor vehicle companies up to 1955 and then their subsequent decline, we will now describe the management-labor relations and conflicts and how these were solved in the three basic production systems - the craft production system, the mass production system and its European humanization into the reflective production system, and the lean production system.

The craft production system

The first motor vehicles were created in 1885 when both Benz and Gottlieb Daimler separately introduced the first petrol engine driven four wheel carriages, the "Velozipede" (Clarke, 2005, p. 71). Motor vehicle production flourished in the late 1880s and early 1890s when the Paris machine-tool company of Panhard et Levassor (P&L) became the world's leading motor vehicle company, building several hundred a year. P&L got its jump start on other competitors in 1887 when Emille Levassor negotiated a license to manufacture Daimler's new "high-speed" gasoline engine (Womack et al., 2007, p. 19). P&L's vehicles were designed according to the very modern in its time "Système Panhard" whereby the engine was in the

front with passengers seated in rows behind, and the engine drove the rear wheels with a crude sliding-gear transmission (Panhard, Wikipedia).

According to Womack et al. (2007, p.19-24) P&L was a classic craft production system that had originally manufactured metal-cutting saws, and later converted partially to manufacture motor vehicles. The workforce was mainly composed of skilled craftspeople who carefully hand-built motor vehicles in small numbers. These workers thoroughly understood mechanical design principles and the materials they worked with. Many of the more experienced workers were independent contractors inside the P&L plant, or independent machine-shop owners contracted to produce specific parts or components.

The founders of the company, Panhard and Levassor, and their associates took orders directly from customers, who would define their requirements and determine the vehicle's exact specifications. Based on these specifications P&L then ordered the necessary design, engineering and parts, and coordinated the assembly of the vehicle to exactly satisfy each client's needs. Much of the work, including design and engineering, was subcontracted out to individual engineers and machine-shop owners scattered all over Paris.

The P&L craft production system was a job process with low volume motor vehicles made to customer order and produced by skilled craftspeople with a flexible and unique sequence of tasks. This production process however, does not yield economies of scale. Even if P&L had tried to gain some economy of scale by building some identical cars or ordering a large quantity of parts and components they would still not have had any significant economy of scale because there was no real standard gauging system and the machine tools of the time could not cut hardened steel.

The P&L contractors used slightly different gauges when making the parts and components. After they machined the parts they had to put them through an oven to harden their surfaces enough to withstand heavy use. The parts would frequently warp in the oven and require further filing to regain the intended shape. When these parts - with approximate measures - arrived at P&L for the final assembly, skilled fitters were required to file

them down until they fitted together perfectly with the other parts. This process of filing and fitting each part to the next part had to be performed until the hundreds of parts of each motor vehicle were complete. This sequential fitting of each part had the consequence that when the fitters reached the last part, each completed motor vehicle would differ significantly in the dimension of its parts from others - even if they had been built with exactly the same specifications.

Due to these technical limitations of the time P&L could not produce identical motor vehicles, so it concentrated on tailoring each one to the precise desire of each individual buyer. The P&L emphasis was on vehicle performance and hand-fitted craftsmanship in which the gaps between individual parts were nearly invisible. At that time this made perfect sense. The wealthy customers that could afford the P&L motor vehicles employed chauffeurs and mechanics on their personal staff and cost, driving ease, and simple maintenance weren't their primary concerns: speed and customization were (Womack et al., 2007, p. 21).

The craft motor vehicle production system of the end of the 19th century had the following characteristics (Womack et al., 2007, p. 22):

1. A workforce that was highly skilled in design, machine operation, and fitting.
2. Decentralized organizations, with much of the design, engineering and machine-shop work done by contractors.
3. Owner/entrepreneurs who coordinated production in direct contact with everyone involved – customers, employees, and suppliers.
4. General-purpose machine tools to perform drilling, grinding, and other operations on metal and wood.
5. Very low production volume with none exactly alike because the craft techniques of the time inherently produced variations.

The success of P&L in the 1890s was soon copied and by 1905, less than twenty years after they had produced the first commercially successful motor vehicle, hundreds of companies in Western Europe

and North America were turning out motor vehicles in small volumes using the same craft techniques. The motor vehicle industry progressed to the mass production system after World War I, and P&L eventually floundered when trying to make the conversion (Womack et al., 2007, p. 23). Some companies using craft production systems have survived up to the present day, like Aston Martin and Morgan in the United Kingdom, and Ferrari in Italy.

The mass production system

The craft production system of motor vehicles reached its premature maturity in the 1910s. The general design of motor vehicles had converged to the P&L design of four-wheel, front-engine, and internal-combustion that still is the industry standard today. Because the high costs of producing motor vehicles did not drop with production volume, only the rich could afford to buy them. The many small independent craftsmen producing motor vehicles, parts and components were unable to produce any fundamental innovation to reduce costs and make them more affordable. This because any real technological advances to reduce production costs would have required expensive research that was much more than the technical tinkering these craftsmen were capable of doing.

It was during this time that Henry Ford was trying to overcome the problems inherent to the craft production system. In 1908 he introduced the Model T, his twentieth design over a five-year period that had begun with the production of the original Model A in 1903. With the Model T, Ford finally archived his objective of a motor vehicle that was both easy to produce and user friendly. By user friendly Ford meant a motor vehicle that almost anybody could drive and repair, with no need for a chauffeur or mechanic like most other motor vehicle models of the time. These two achievements laid the groundwork for the revolutionary change in direction for the entire motor vehicle industry (Womack et al., 2007, p. 24).

Ford's key innovation to what he called mass production was the complete and consistent interchangeability of parts and the simplicity of attaching them to each other. To achieve this he vertically integrated production of all parts and components for the Model T, developed

dedicated machines to produce these parts and components, and standardized the gauging system. He also benefited from the advances in machine tools which were now able to work on pre-hardened metals. This avoided the warping that had occurred when parts were hardened after being machined and that had previously made standardization impossible.

All these factors taken together - a single model that was simple to produce and easy to use, the vertical integration of production of parts and components, the standardization of parts that fitted perfectly together, the use of dedicated machines to produce these parts, and the elimination of the skilled fitters who had comprised the bulk of the craftsmen used to assemble motor vehicles - gave Ford a tremendous advantage over his competitors.

The assembly of Ford's motor vehicles, beginning in 1903 with the Model A, involved setting up assembly stands on which a whole vehicle was built, often by one fitter. In 1908, on the eve of the introduction of the Model T, a fitter's average task cycle (the amount of time he worked before repeating the same operation) totaled 8.56 hours. With the introduction of the Model T and its perfect interchangeability of parts, Ford decided that each assembler (there was no need for fitters because parts were perfect) would perform only a single task and move from vehicle to vehicle around the assembly hall. By August of 1913, just before the introduction of the moving assembly line, the average task for an assembler had been reduced from 8.56 hours to 2.3 minutes. The introduction of the moving assembly line further reduced the average cycle time, from 2.3 to 1.19 minutes (Womack et al., 2007, p. 25-26).

What Ford did was to take Adams Smith's (1864) idea first published in 1776 of the division of labor as being essentially positive in yielding increased productivity, and Charles Babbage's (1832) idea of the necessity to match skills and job tasks. Frederick Winslow Taylor (2008) in 1911 builds on these ideas to define the relationship between the worker and the work. The primary objectives of standardization for Taylor were first the fragmentation of skills into their smallest components (division of labor), and second, the separation of mental and physical work. As a consequence,

the complex set of skills a craftsman used to build a motor vehicle before the introduction of mass production were fragmented into individual units, with each worker then merely performing one particular task in a manner considered to be the most effective and efficient.

With this specialization, an assembler in Ford's plants required only a few minutes of training. The performance of the assembler's task was relentlessly disciplined by the pace of the assembly line, which sped up the slow and slowed down the fast. The foreman, who had previously had wide-ranging duties and been responsible for a whole area of the factory, was reduced to a semiskilled checker spotting any failures in the allocated tasks on the assembly line. As a result, the workers on the line were as replaceable as the parts in the motor vehicles, and so became variable costs in the mass production system.

Ford divided labor not only in the factory but also in the engineering shop. The knowledge workers who, according to Taylor, managed ideas and information but rarely touched an actual car or entered a factory, were also specialized into industrial engineers, manufacturing engineers, product engineers. This basic division was further specialized into industrial engineers for specific assembly operations or for special dedicated machine design. The same increasing specialization was also applied to the manufacturing and production engineers. As time went on the engineering profession branched into more and more subspecialties. These engineering professionals became more and more specialized and with time lost their overview of the other specialties. This minute division of engineering only grew, as to cope with the increasing complexity of new motor vehicles the US companies adopted ever more bureaucratic organizational structures with many procedures, protocols, and regulations to manage product development. These bureaucracies also became cumbersome and discouraged talented people from joining or staying in the companies. These two major factors explain why most technological innovations in the 1960s and 1970s came from Europe. Examples of European innovations during this period are front-wheel drive, disk brakes, fuel injection, unitized bodies, five-speed transmissions, and engines with high power-to-weight ratios (Womack et al., 2007, p. 44).

Ford's total vertical integration of the mass production system had introduced bureaucracy on such a vast scale that it brought its own problems, with no obvious solution. It was at this point that Alfred Sloan at GM complemented Ford's ideas with his own basic management ideas that solved the problem of how to manage the complexity of the mass production system that was now inhibiting its spread (Sloan, 1990). Sloan created the concept of decentralized divisions managed objectively "by the numbers" from a small corporate headquarters. He also created the new professions of financial manager and marketing specialist to complement the engineering profession specialized by Ford, so that every area of the company now had its dedicated experts. This completed the division of professional labor proposed by Taylor.

The consequence of Taylor's basic separation between mental and physical workers was that the shop-floor workers (also called blue collar workers) in the mass production system had no career path, except perhaps to foreman. On the other hand, while the mental workers or professional specialists (also known as white collar workers) had a direct climb up the career ladder, unlike the skilled craftsmen of the 19th century their career path didn't lead toward ownership of a business. These professionals could only aspire to a career in the company's bureaucracy, a factor which obviously turned many talented young entrepreneurs away from careers in the motor vehicle industry; entrepreneurs who then went to more promising industries such as electronics.

Sloan's organization created a revolution in management and marketing in the motor vehicle industry. However, it had not changed the fundamental idea, institutionalized by Ford, that workers on the shop floor were simply interchangeable parts and variable costs of the mass production system. On the shop floor then, matters went from bad to much worse. Ford himself had temporally calmed the situation in 1914 by doubling wages to the famous five dollars a day. Ford was able to take advantage of his company's much higher efficiency over its competitors to portray himself as a paternalistic employer and so avoid unions (Womack et al., 2007, p. 40).

The trouble with higher wages was that it worked and reduced turnover. This though created another problem: workers stopped dreaming about returning to the farm or to the old country from which they immigrated, and realized that a job at the assembly line was likely to be their life's work. When that realization dawned, their conditions of employment rapidly came to seem less and less bearable. Additionally, since the US motor vehicle companies considered their workforce a variable cost, they would dismiss workers at the first sign of a downturn in sales.

All this meant that by the time of the Great Depression the conditions for a successful union movement in the US motor vehicle industry were fully in place. This was a mass production union movement whose leadership fully accepted both the role of management and the role inherent nature of work in an assembly-line factory. Based on this, in the late 1930s the United Auto Workers (UAW) signed with what had become the "Big Three" (GM, Ford and Chrysler) an agreement in which the main issues were seniority and job rights. This union movement was called at the time 'job-control unionism' (Womack et al., 2007, p. 40-41).

These and subsequent negotiations between the union and management of the Big Three concentrated on confrontational negotiations with each side trying to get as much as possible from the other in a "win-lose" setting. There was never a "win-win" proposal on the table because of Taylor's segregation of the work force into blue collar workers and white collar workers. Because the blue collar work force had no career prospects the union's negotiations were always motivated by getting more financial concessions, reducing working time, and job security. Management on the other hand considered the work force a variable cost, and so were always trying to reduce this cost to improve their company's bottom line.

During the 1950s and 1960s, as a consequence of the UAW negotiations its members had become one of the best paid groups of industrial workers in the country, placing them solidly in the middle class of American society. Additionally, besides their high wages the union workers also got generous benefits compared to those working at non-union Japanese auto plants in the US. Sorkin (2008) pointed out that, counting

benefits, each UAW worker received 70 US dollars per hour while Toyota US workers received about 10 to 20 dollars less per hour for the same jobs. He also mentions that because of the union contracts GM at the time employed about 8 thousand people who actually did not work. These employees benefited from a supplemental unemployment benefit that gave laid-off workers most of their take-home wages.

The predicament of the US motor vehicle companies was the consequence of the confrontational management-labor negotiations that are one of the primary reasons for the poor competitiveness of the Big Three. The other reason is that the large bureaucracies of the US car companies discouraged young ambitious and talented people from joining them, which meant that they were not able to keep up the fast pace of innovations in small and efficient vehicles characteristic of the Japanese and European manufacturers.

The reflective production system

The European motor vehicle companies that had copied Ford's mass production system experienced in the 1950s what the Big Three US companies had experienced in the 1930s. After World War II the European plants employed large number of immigrants in the assembly lines. There was a mass influx of Turks and Yugoslavs to work in Germany, Moroccans and Algerians in France, and Sicilians and other southern Italians to work in the motor vehicle plants of Turin and Milan in Northern Italy. Some of these workers returned home after the postwar boom eased, but many assimilated and were joined by native workers. As in the US, these workers too realized that they would not progress to become independent craftsmen as their fathers and grandfathers had, and that dead-end monotony of mass production was going to be their life's work. This realization made working in the mass production system unbearable and waves of unrest followed in Turin, Milan, Paris, and Wolfsburg.

The negotiations between management and workers in Europe at first took the same confrontational tone as in the US. The largest difference was that European countries had much better social systems like medical care and pension plans, and there was not such a wide a gap in salaries between

shop floor workers and top managers as in the US. For this reason the medical care and pension plans that were part of the packages negotiated by the US unions were not on the negotiation agenda in Europe. The negotiations about salaries were reasonable because the differences between workers and engineers were relatively modest in Europe. The income inequality between the richest 10 percent and the poorest 10 percent in the US is 15.9 times, in Germany is only 6.9 times, in France 9.1 times, and in Italy 11.6 times (Human Development Report 2007/2008, 2007, p. 281). The modest salary differences in Europe in contrast to the US focused the management-labor negotiations upon the reducing hours spent in the plant doing dull work. In some cases workers were even willing to take salary reductions for fewer hours spent in the plants.

The European motor vehicle manufacturers, realizing the problem of dull work, tried some experiments in job enrichment. The most radical at the time was undertaken in the early 1970s by Volvo's new CEO, P. G. Gyllenhammar (Ellegärd, 1996, p. 124) who had strong appreciation of the social dimension of work. He had to deal with workers' low commitment to the work and the low degree of work satisfaction in the Volvo plants. To mitigate these problems the decision was taken to open a new plant in Kalmar with the goal of humanizing the work and promoting teamwork on the shop floor. In the Kalmar plant the assembly line was literally broken into sections. All work was organized in teams, each of which had its own section in which team members performed their extended assembly work tasks. The physical and social environment was greatly improved in comparison to other traditional Volvo plants applying Ford's mass production system.

Volvo in the mid 1980s innovated again with a new plant in Uddevalla (Ellegärd, 1996, p. 126). The company had realized that the number of young people in the European labor force would decline by the mid 1990s, so they decided to build a factory that could attract not only young male workers but also females and older people. In this new plant the assembly line was completely abandoned and small teams, working parallel to each other, were responsible for the assembly of complete motor vehicles. The central issue for this approach was how to teach to the workers the

extended work content required for only a handful of workers to be able to assemble a complete vehicle. To do this Volvo adopted a holistic learning strategy where skilled workers taught newly employed workers how to assemble the vehicles. Employees not only learned how to build motor vehicles, they also learned how to perform several supporting tasks, economic tasks and so on. The teams planned their own production and were able to make plans in pursuit of their educational needs.

The production system developed for the Uddevalla plant is called the "reflective production system" because workers have to reflect over their work during the work process in such a way that the product reflects the workers performance back to him/her, which makes it possible for workers to improve upon working methods. The developments at the Kalmar and later at the Uddevalla plants inspired managers and trade unionists in Europe to begin thinking in new directions with respect to the organization and content of work. Furthermore, the reflective production system was later applied by Saab at its Trollhättan plant, and it influenced the Rastatt I plant of Mercedes-Benz, and the introduction of the modular units at GM and VW.

Unfortunately Volvo suffered severely from the fall in worldwide demand for cars in the early 1990s; the Volvo Car Company was sold to Ford in 1999, and the two innovative plants in Kalmar and Uddevalla were closed. Since then, the Volvo Car Company under Ford has had no unique alternative to assembly line production. Nevertheless, the Uddevalla plant was reopened by Autonova AB and Volvo maintained a 49 percent share in the plant. The principles of the reflective production system continue to be developed by Autonova AB at the Uddevalla plant (Ellegärd, 1996, p. 133).

The lean production system

The Toyota Motor Company was founded in 1937 by the Toyoda family. During World War II Toyota built trucks largely using the craft production system. In the thirteen years to 1950, Toyota had produced 2,685 motor vehicles. This was also the year that the young engineer Eiji Toyoda made a three month visit to the Ford Rouge plant that produced 7,000 motor vehicles in a single day. This plant was the largest and most

efficient in the world. After his return to his native Nagoya, Eiji Toyoda and the production genius Taiichi Ohno concluded that Ford's mass production system could never work in Japan for the following four reasons (Womack et al., 2007, p. 48-49):

1. The Japanese domestic market was very small and demanded a wide range of vehicles.
2. The Japanese worker was not willing to be treated as variable cost or interchangeable cost.
3. Management's right to lay off people was severely restricted, and the bargaining position of company unions representing all employees (including managers) was greatly reinforced (this was based on labor laws introduced by the US occupation authorities that had strengthened the position of workers in negotiations).
4. The war-ravaged Japanese economy was starved for capital and foreign exchange, which made it difficult to purchase the latest Western technology.

These factors forced Toyota to develop techniques to produce small batches efficiently with fewer flexible machines instead of the enormous runs on dedicated machines that was the norm in mass production. By doing this they discovered two fundamental things: the first was that producing small batches cost less because it eliminated the need for large inventories; and the second that assembling them immediately caused mistakes to show up almost instantly. The consequence of this second discovery was enormous. The workers making the parts got immediate feedback on their quality and began to pay more attention, and so avoided the waste of large numbers of defective parts.

The drawback of the system was that if workers failed to anticipate a problem before it occurred and did not take the initiative to correct it immediately the work of the plant could easily come to a halt. Holding back knowledge and effort, as was common among the workers who had a low commitment to work and low degree of work satisfaction in Ford's mass

production system, would lead to constant problems at the Toyota plants. Fortunately this did not happen, because Toyota had negotiated a compromise formula with the company's union in the crisis of 1949 that allowed them to terminate a quarter of the workforce. The formula, which is still applied in the Japanese motor vehicle industry, gave the remaining employees two guarantees. One was life-time employment, and the other was for pay to be steeply graded by seniority rather than by specific job function, and total remuneration tied to company profitability through bonus payments (Womack et al., 2007, p. 53).

The implication of this historic agreement was that the workers were from then on a fixed cost, and the longer they stayed in the company the higher this cost got. To get the most from its workers Toyota continuously enhances the workers' skills to gain continuously more benefit from their seniority in form of more knowledge, experience and commitment. These are the similar ideas to those developed for the Volvo Uddevalla plant that evolved into the reflective production system.

The result of Toyota's approach to human resources made it possible to group workers into teams to perform a set of assembly steps under a team leader. The team leader would do assembly tasks, as well as coordinate the team, and, in particular, would fill in for any absent worker. Additionally the team had the job of housekeeping, minor tool repair and quality-checking. Besides this, the teams periodically take some time to collectively suggest ways to improve the process (this collective work to improve the process, *kaizen* in Japanese, became known in the West as "quality circles").

The team effort was easier to implement in Japan than in the US because there the work force was never as extensively divided into blue collar and white collar workers. Another factor was that the difference in salaries between engineers and workers was very modest. Japan has one of the lowest income inequalities in the world, with the income of the richest 10 percent of the population being only 4.5 times higher than the income of the lowest 10 percent (Human Development Report 2007/2008, 2007, p.

281). To further stress the teamwork aspects the Toyota engineers wore the same work clothes as the common workers.

In sharp contrast to the situation in Japan and Europe, management-labor negotiations in the United States have been an obstacle to implementing teams in manufacturing. The UAW in the U.S. has not supported self-managed teams, loose job classifications, or the combination of direct and indirect labor tasks. This is because these organizational innovations have been perceived as ways of getting employees to do more work for the same pay. Job classifications, in particular, are considered to have been an important contributor to the decline of U.S. manufacturing productivity. At one time some assembly plants listed as many as 50 to 100 different work classifications. These limit flexibility because workers are not required to perform tasks outside of their classification and corresponding pay scale. In contrast, plants modeled after the Japanese team concepts have only about four or five job classifications (Fuxman, 1999, July).

Taiichi Ohno, the production genius at Toyota, had fully developed the Toyota production system (TPS) by the end of 1960s. He had introduced "the five why's" for production workers to trace systematically every error back to its ultimate cause (by asking "why" as each layer of the problem was uncovered), then to devise a fix so that it would never occur again. He had also developed a new way to coordinate the flow of parts within the supply system on a day-to-day basis, the now famous just-in-time system, called *kanban* at Toyota. This last idea simply converted the suppliers and parts plants into one large system. In this system, each part was only produced at each previous step to supply the immediate demand of the next step (Liker, 2004).

Toyota also did not adopt Ford's organization model of dividing engineering into specialties. Eiji Toyoda and Taiichi Ohno decided early on that product engineering encompassed both process and industrial engineering. They formed teams with strong leaders that contained all relevant engineering expertise. Career paths were structured to reward strong team players rather than individual specialists. As a consequence Toyota's engineering excelled in productivity, product quality, and

responsiveness to changing consumer demand (Womack et al., 2007, p. 63).

The TPS was developed to achieve maximum economic efficiency with a minimum of available resources. Thus the key focus is to reduce any kind of wasteful, non product-value adding activity. For this reason the TPS became known as the lean production system.

The current trend in production systems

The MIT study *The machine that changed the world* (by Womack et al.), published in 1990, propagated the TPS as the basis of the universal principles of the lean production system that later was termed 'lean thinking'. This motivated the Western motor vehicle manufacturers to examine the claims of the MIT study, and so called benchmark trips to the Toyota plants in Japan were organized for these companies' senior production managers by McKinsey and Andersen Consulting. As a result the lean production system became the model for most companies in developing their own production system (Clarke, 2005, p.119).

During the 1980s and 1990s all the world's car manufacturers redesigned their production system to incorporate variants of Toyota's lean production system. Some of the key elements that were copied were statistical process control, just-in time scheduling, quality circles, teamwork, and flexible production (more than one model manufactured on a single production line). One of the important practices that were introduced was the transition from static concepts of efficiency optimization towards continuous improvement to which every employee contributed.

The transition to new manufacturing methods required heavy investment by the companies in both capital equipment and training. The 1980s were a period of unprecedentedly high investment expenditure. However, according to Grant (2004), the critical elements of Toyota's lean production system were not new production "hardware" in the form of robotics and computer-integrated manufacturing systems - as GM learned after spending 10 billion dollars in upgrading its plants. The critical elements were the "software" that operated the plants, particularly the management-labor relations, the teamwork required, the workers' skills, the shop-floor

organization, and the relationship with suppliers. Unfortunately, because of the confrontational management-labor negotiations with the UAW and the lack of vision of both the union leadership and the bureaucrat-managers of the Big Three, these critical elements were never completely understood and implemented. This deficiency was probably the most important factor that precipitated the decline of the US motor vehicle industry. The Europeans, in contrast, because of their strong appreciation of the social dimension of work had a much easier task in adopting the new concepts.

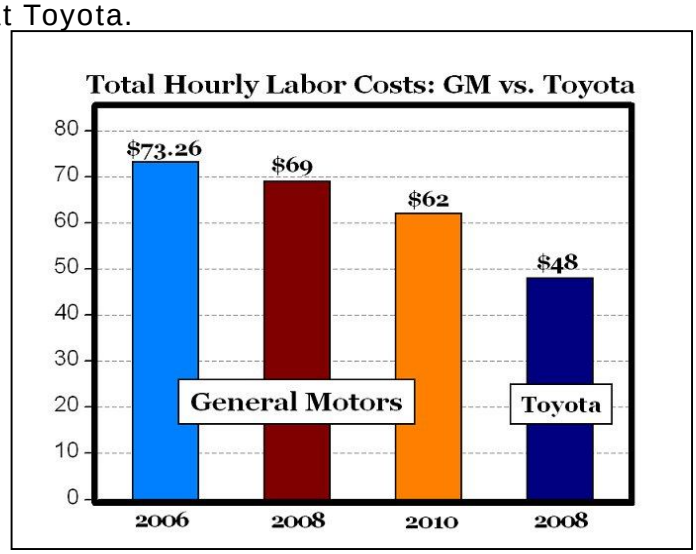
Conclusion and consequences

The US motor vehicle companies were never able to change from Ford's mass production system to the Japanese lean production system because of the confrontational management-labor negotiations. Neither the management-bureaucrats nor the UAW leadership could overcome Taylor's fragmentation of skills into their smallest components (division of labor) or the separation of mental and physical work. This fragmentation was responsible for the excessive specialization of engineering and management in the US motor vehicle industry that transformed it into a cumbersome bureaucracy that scared away more entrepreneurial talents and slowed down innovation. The separation of mental and physical work created an apparently insurmountable barrier between the college-educated white collar workers and the poorly schooled blue collar workers. Furthermore, the white collar workers considered the blue collar workers to be variable costs that could be hired and fired according to the production needs, while the blue collar workers wanted more and more pay and benefits to compensate for the hours spent doing dull work in the mass production assembly line.

The consequence of the bureaucracy was that management was not creative enough to overcome the confrontational negotiation mode with the UAW, and change it from the "win-lose" mode to a "win-win" mode like the Japanese and the Europeans had. The large income inequality between management and workers, and the exclusion of the workers from any career possibility in the US motor vehicle industry led inevitably to a form of class war between the white and the blue collar workers. Managers made their careers by cutting costs and the expenses of the workers, and union

leaders made their careers by confronting management and so squeezing more and more concessions in the form of salaries and benefits. The consequence was a constant escalation over the years of the costs of the US motor vehicle companies. Toyota and other non US-owned motor vehicle producers were careful to not get into the confrontational management-labor negotiations of the Big Three US producers and so avoided the labor cost escalation. As a consequence Toyota in 2008 had a 21 dollar an hour lower total labor cost advantage over GM (Figure 2).

Figure 2. In November 2008 GM and the UAW were negotiating a new contract. But even with the new contract, there will still be about a $14 an hour pay gap in total labor costs between GM and Toyota, and more than a 29% wage premium for UAW workers compared to their non-union counterparts at Toyota.



Source: Perry (2008, November 24).

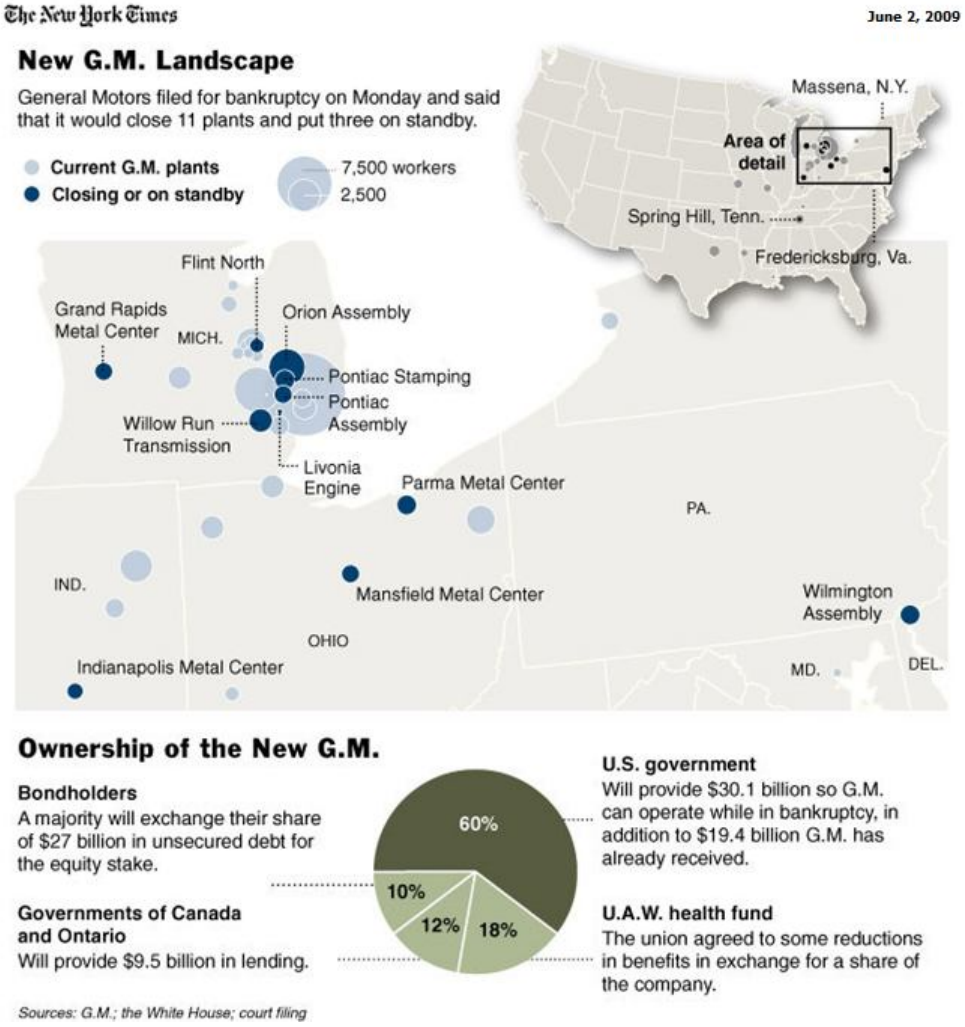
The slowness of the GM bureaucracy to respond changing customer preferences was also a factor that led to a constant decrease in market share in the US and contributed to the company's decline. An example of this inefficiency of the GM bureaucracy was the case of sport utility vehicles (SUVs). In 1990 GM was caught napping when customers started preferring SUVs like the Explorer model Ford had launched that year. GM overreacted by pouring time and money into SUVs at expense of car development. When the market changed GM was stuck with its SUVs in a market awash in new models and needed to give substantial discounts to keep up sales. A symbol of the lack of product foresight was the launch of the high-end Hummer in

2003 and the compact H3 in 2005, especially given that some of the larger Hummers barely managed 10 miles per gallon.

Another example of bad management by GM is the case of the EV1 electrical car. GM started working on the EV1 at about the same time that Toyota started working on the Prius (a full hybrid electrical mid-sized car) in the 1990s. Toyota started selling the Prius in Japan in 1997, around the same time as GM was fleet testing its EV1. Because of the public relations debacle when the test cards had to recalled, GM abandoned the EV1 program and its lead in electrical car technology, thus handing the lead to Toyota with its Prius (Carty, 2009, June 2; and Toyota Prius, Wikipedia). To make things worse, in the same year as Toyota was launching the environmental conscious Prius worldwide, GM launched the Hummer with its absurd gasoline consumption.

The cost disadvantages compared to its foreign competitors like Toyota, along with the incapability of its management-bureaucracy to respond to changing customer preferences, ultimately led to GM's bankruptcy on June 1 2009 and GM is now 72 percent government owned (Figure 3).

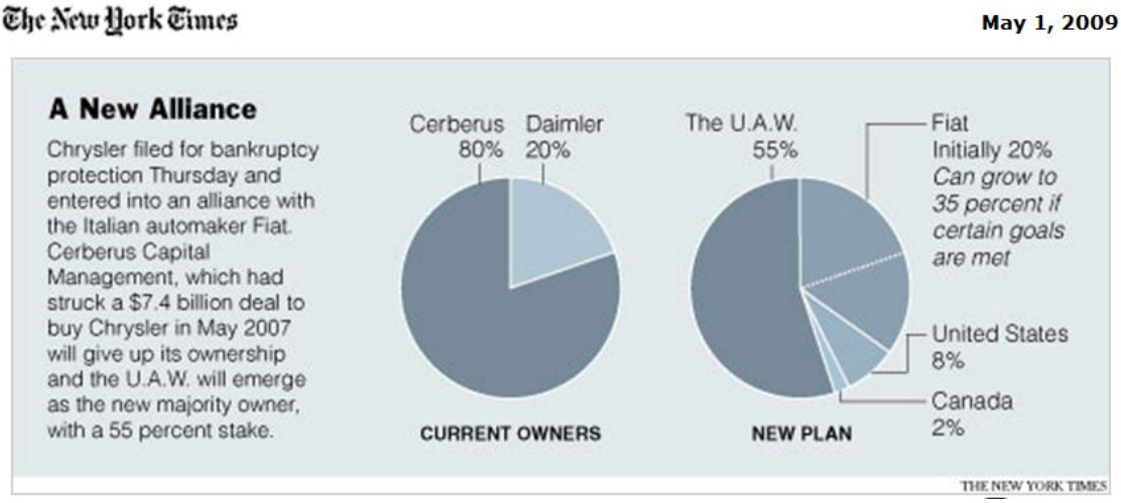
Figure 3. The GM bankruptcy June 1, 2009 and the 72 percent state ownership by the US and Canadian governments



Source: Vlasic (2009, June 1)

Another of the US Big Three, Chrysler, filed for bankruptcy in April 30 of 2009, before GM, for the same reasons (management-bureaucracy and confrontational management-labor negotiations) that were responsible for its lack of innovation and high labor costs. The irony in the Chrysler case is that the UAW with 55 percent participation is now the majority owner of company (Figure 4).

Figure 4. The Chrysler bankruptcy April 1, 2009 and the 55 percent UAW ownership



Source: Rutenberg & Vlasic, 2009, April 30.

Chrysler has always been the weaker of the Big Three and became the first major American automaker to seek bankruptcy protection since Studebaker did so in 1933. GM followed Chrysler into bankruptcy June 1st, 2009. These two bankruptcies were humbling moments for a US motor vehicle industry that had dominated the world markets in 1950 with almost 80 percent of the total world production of 8 million and 95 percent of all sales of motor vehicles in the US (Grant, 2004). Chrysler had recovered strongly after a near bankruptcy in 1979 with the help of US government before entering again in decline under the ownership of Daimler-Benz and as of 2007 under Cerberus Capital Management.

Ford, the last of the Big Three, was able to survive the financial crisis of 2008 without US government help and seems to be slowly recuperating. But it has the same problems as GM and Chrysler. Unfortunately for Ford, because it has not filed for bankruptcy the UAW is unwilling to give it the same concessions that it gave the other two of the Big Three (Bunkley, 2009, October 31). This means that not only will Ford's labor costs be higher than those of GM and of Chrysler, Ford will also have the financial costs of its substantial debt that the other two don't have because their debts were written off by their bankruptcies. With these two substantial competitive disadvantages (higher labor and financial costs) in relation to its direct competitors (GM and Chrysler) Ford's future is far from certain.

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