The Toyota Phenomenon

How come the world's second largest automobile manufacturer grows continuously and makes large profits whilst its biggest competitors fight for survival?

Summary

After the Second World War, the distribution of World economic power was totally rearranged. Before the war, Europe and the USA ruled the world market. The management of Western companies was based on the "Scientific Management" by Frederick Winslow Taylor (1856-1915) and on "Modern Sociology" by Max Weber (1864-1920). This intellectual basis characterizes the begin of industrialization, led to mass production and to tremendous productivity increases.

Yet after the war, new players appeared on the playground, whose work was based on a philosophy, on methods and rules unknown before. Whilst Western managers turned to short-term thinking to satisfy shareholders and to endless restructuring, the new actors concentrated on continual improvement in the quality of products, uniformity of processes and qualification of employees.

Toyota is one of these new players, which despite the fierce competition due to excess production capacity in the automobile industry of around 25 % outperforms Western competition in every aspect, in technological innovation, in customer satisfaction, in continuous growth and in profit. In 2004 Toyota passed Ford to become the second largest automobile producer. Before long, Toyota will overtake General Motors becoming the biggest car company in the world probably having no less than 15% of the world market. Toyota will prevail. Most others will have the choice between shrinking or sinking.

This paper tries to shed light on the root causes of the Toyota Phenomenon, which for some reason or another Western companies find so hard to understand and much less on how to apply, despite their struggle for survival.

Introduction

Some of the headlines in recent editions of the influential news and business publication "The Economist" indicate that the European and American automobile industry finds itself in deep trouble. Here are just a few samples:

- General Motors pays FIAT to walk away
- Raw nerves in Motown: Making money remains tough for America's big three carmakers
- Divorce Italian-style: Is Fiat's marriage to General Motors coming to a bloody end?
- Stuck in the rough: America's car giants, General Motors and Ford, find Europe hard going
- Detroit's big three in the slow lane
- The three Fs: Ford, Fiat and Failure
- The also-rans: Mitsubishi and Mazda struggle, despite Western partners
- The End of Detroit: Shape up or ship out
- One hell of a birthday, Bill: Ford celebrates its 100th anniversary, fighting for survival
- Extinction of the car giants: Why America's car industry is an endangered species

In 2004, Volkswagen with its brands VW, Skoda and Bentley lost • 44 millions. During the same period, the Volkswagen group including also Audi, Seat and Lamborghini lost in North America alone • 907 millions. Bernd Pischetsrieder, CEO of Volkswagen, attributes theses problems to the economic slump in Europe resulting in a low demand for cars, the fierce price fights with huge discounts and incentives in the US and so on. Are these indeed the true reasons or is it deliberate self deception or a justification for blunt mismanagement?

Despite the fierce competition among the automobile producers due to excess production capacities of around 25 %, Toyota outperforms its competition in every aspect, in technological innovation, in customer satisfaction, in continuous growth and in profit. In 2004 Toyota passed Ford to become the second largest automobile producer. Before long, Toyota will overtake General Motors becoming the biggest car company in the world probably having no less than 15% of the world market. Toyota will prevail. Most others will have the choice between shrinking or sinking.

Toyota will continue to focus on patient execution of sensible, but ambitious plans to expand their sales. They will continue to develop a steady stream of new models and make them with remarkable efficiency: there are no takeovers, no dramas or miracle cures, just relentless, grinding professionalism with, increasingly, an enticing dash of design flair to boot. And when they hit one target, they immediately set another.

However, there is one extra ingredient that is somewhat mystical, if not exactly magical. There is such a strong corporate culture that every employee knows the "Toyota way" of doing things. Put it down on paper and it sounds as flaky as a typical mission statement. But Toyota preaches to the converted and it works.

Since the fifties, an uncountable number of Western automobile production specialists visited Toyota to find out the secret behind the success. Since they did not have a method, they did not know what questions to ask. They copied what they believed essential but were unable to advance to the core of Toyota's truly extraordinary company culture even after Toyota started to produce automobiles in the American backyard in December 1984 in a joint venture with General Motors (New United Motor Manufacturing NUMMI). Even though Western Automobile producers turned out better products, they are still far behind Toyota and the gap widens.

The intellectual foundation for Toyota's success was laid from 1950 onward by W. Edwards Deming. In June 1950, Deming presented to the very top managers of the Japanese industry his view on what must happen to make Japan successful in the world market. Kiichiro Toyoda, the founder of Toyota Motor Company, was among

the audience. The managers listened, understood and went straight to work. They did not have a choice.

In no more than five years, Japan flooded the world with products of unparalleled quality. Western economies did not and still do not posses the means to withstand.

Observing the complacency of the West, Deming formulated his First Theorem: "Nobody gives a hoot about profit." With profit, he meant long-term profit. The West talks about it, but does not do anything about it. Deming's Second Theorem was: „We are being ruined by best efforts, doing the wrong thing."

The following paper uses the automobile industry as an example to show that there is no substitute for leadership and quality to survive. Fortunately, survival is not compulsory.

Automobile Industry and its Problems

The industry as an Indicator for Welfare and Success

The industry produces nearly 60 million cars and trucks a year and employs millions of people around the world. Its products are responsible for almost half the world's oil consumption, and their manufacture uses up nearly half the world's annual output of rubber, 25% of its glass and 15% of its steel. No wonder the car industry accounts for about 10% of GDP in rich countries.

But the industry that has pioneered the forms and weathered the storms of 20th-century capitalism is now over 100 years old and struggling. Average profit margins have declined from 20% or more in its youth in the 1920s to around 10% in the 1960s and less than 5% now, and some volume carmakers have actually been losing money.

A century ago the car industry more or less invented modern industrial capitalism. The car started life in Germany, and early development of the industry began in France (hence automobile, originally a French word) in the 1900s, but it was in America that it came of age.

Henry Ford's adaptation for car making of the moving assembly line he had seen in Chicago slaughterhouses marked the birth of mass production. But Mr. Ford applied those techniques to a vehicle that resembled a horse-drawn carriage, with a body laid on to a separate chassis.

The World's Top Ten Car Manufacturers 2003

	Global vehicle units sold in millions	Sales in billion USD *Year ending March 2004	Latest Market Capitalisation in billion USD	Latest Market Capitalisation per units sold in USD
General Motors	8.59	185.5	23.3	2'712
Toyota	6.78	153.1*	136.4	20'118
Ford	6.54	164.2	24.8	3'792
Volkswagen	5.02	98.4	12.2	2'430
DaimlerChrysler	4.36	171.9	41.8	9'587
PSA/Peugeot Citroën	3.29	61.2	14.3	4'347
Hyundai Automotive	3.05	38.9	9.0	2'951
Nissan	2.97	65.8*	47.1	15'859
Honda	2.91	77.2*	46.4	15945
Renault	2.39	42.4	22.1	9'247

Sources: Automotive News, Company Reports, Thomson Datastream

Figure 1: The World's ten largest automobile manufactureres in terms of number of units sold, sales and market capitalisation

Modern cars have a monocoque steel body in which the strength is built into the pressed steel floor, sides and roof. It was invented by Edward Budd, taken up by Dodge and then by Citroën in Europe, and then by all volume carmakers.

Around the same time as modern car manufacturing was born in the mid-1920s, Alfred Sloan's ideas for running General Motors provided the model for the great corporations that grew up to dominate the second half of the 20th century. GM soon swept past Ford as Mr. Sloan revolutionized the young car industry and Ford has never regained the dominance it enjoyed in the infancy of mass production.

The car industry has been ahead of its time in many respects. Peter Drucker, a management writer who first made his name with a study of GM in 1945, coined the phrase "industry of industries". The company was also the leader in "planned obsolescence", the frequent changes in design that tempted customers to switch to a new model every year or so. It was the first to feel consumer anger with the publication in the 1960s of Ralph Nader's attack on the safety record of the Big Three Detroit manufacturers, "Unsafe at Any Speed".

In the 1970s, as the oil price quadrupled, the industry found itself under attack from environmentalists outraged by its products' gas-guzzling habits. It was also among the first to come under careful government scrutiny, from safety concerns to environmental issues to antitrust worries in the days when General Motors had 60% of its domestic market and could snuff out competitors with a few well-chosen price cuts. But it also received more welcome government attentions. When small, economical and reliable Japanese cars started to eat into Detroit's market share, the American government imposed restraints on those imports. Soon afterward, the industry in Europe came under similar pressures.

The car industry also found itself at the cutting edge of capitalism in another sense. As mass production techniques developed in the 1920s and 1930s, its workers increasingly pushed for unionization. At times, it seemed as though the car factories of the Detroit area, the British Midlands or the huge plants around Paris were the main battleground of the class war. Even today, the United Auto Workers union (UAW) still dominates Detroit, even though trade union membership in America's private sector as a whole is well below 10% of the workforce.

Today the motor car is the epitome of mass production, mass marketing and mass consumption, with some of the strongest

brands in the world. For most households in rich countries, it is the second-biggest purchase after a house or flat. Few other consumer-goods industries depend so heavily on a thriving second-hand market for their products. And yet there are powerful forces at work that could profoundly change the industry.

Limits to Growth

Right now, though, the biggest force for change is the fact that most of the volume-car industry is broke and needs fixing. The market in America, Europe and Japan, where over 80% of the world's cars and trucks are sold, has been running out of growth.

In America the arrival of European, Japanese and South Korean makers has created overcapacity. Moreover, as America's own carmakers constantly improve their productivity to catch up on these new rivals, their greater efficiency itself increases capacity by about 3% a year.

In Germany and France, rigid labor laws have inhibited the closure of redundant old factories, although Renault has set a good example, and Ford Europe and GM Europe have been trying to follow it.

In Japan, the close industrial partnerships known as keiretsu have proved too rigid for some manufacturers. Only Toyota and Honda remain in purely Japanese hands. The smaller Japanese producers make little or no profit at home and are struggling to get into the black in Europe. Even for the big companies America provides the best hopes for growing profits.

All the car companies think that if only they try harder, they can somehow regain growth at the expense of rivals. But in reality they are like Scott Fitzgerald's "boats against the current, borne back ceaselessly into the past". Add the growing pension and health-care bills of traditional producers such as America's Big Three and the Europeans, and it is easy to see why the industry is feeling under siege.

Today Toyota leads a select band of volume car manufacturers that make real profits; the others are Nissan and Honda. Even when GM, Ford, the Chrysler end of DaimlerChrysler and European firms such as Renault and Volkswagen are in the black, they usually do not earn more than the cost of their invested capital.

But the worldwide market is a cruel place. There is capacity in place to produce about 80 million cars and other light vehicles (pick-ups, SUVs and so on). Yet production is running at barely 60 million a year, so the factories are only three-quarters full in an industry where utilization rates need to top 80% to ensure decent profits. It is not much of a gap, but the effect on weaker carmakers is painfully evident.

Of course, much of this excess capacity is being installed in China and other parts of the Asia-Pacific region in anticipation of growth prospects that are awesome. According to a forecast by PriceWaterhouseCoopers, the region will account for almost half the increase in world car output (over 18%) that is forecast by 2011.

But too much of excess capacity lies in North America and Europe, where too many producers are producing too many cars and selling them at too little profit. Detroit keeps its factories at full tilt only by offering huge discounts and other sales incentives to "move the metal", as they say there. Hence the profitless prosperity offered by strong car sales in recent years. The same is increasingly true in Europe.

The End of Detroit

Micheline Maynard's crisply written book, "The End of Detroit: How the Big Three Lost Their Grip on the American Car Market" [1], coolly analyses the causes of the latest fall of Detroit.

Many in the American car industry have been slow to appreciate how serious the problem really is. The big three manufacturers were used to hard times; they just hoped to make more money in booms than they lost in busts. But their current problems are different.

Figure 2: Cover of Micheline Maynard's book, „The End of Detroit, how the big three lost their grip on the car market"

Car sales are still at historically high levels; it is just that Detroit's share of these sales has slumped. Japanese, South Korean and German models (whether imported or made in the 17 car factories that foreigners have opened in America in the past 20 years) account for half of car sales, and are advancing on Detroit's last redoubt—the gas-guzzling minivans, sport utility vehicles and pick-ups so beloved of suburban cowboys.

In 1960, GM alone had 60% of the American market; today it can count on barely half that and the foreigners' share of the light-vehicle market is already 40%.

Ms Maynard pinpoints the difference between the men who run the big three and the leaders of successful foreign car companies. She contrasts the financial background of those at the top of GM and Ford with the car knowledge of Toyota's boss, Fujio Cho, who cut his teeth running one of the company's first American factories.

But there is more to Detroit's weakness. The big three manufacturers have to deal with the powerful United Auto Workers Union, which has won its members great benefits while employers are saddled with pension and health-care costs that top $1,200 per vehicle.

Ms Maynard concedes that Detroit is fighting back, with a new emphasis on the quality and attractiveness of the products. But she still sees Toyota becoming the biggest car company in the world, overtaking GM, and probably having no less than 15% of the world market, its stated aim. She is right: Toyota will prevail. Detroit's choice is between shrinking or sinking.

Fiat's Struggle for Survival

The recent controversy between GM and Fiat Auto illustrates the desperate struggle the Western automobile industry finds itself in.

In 2000, GM had bought 20% of Fiat Auto for $2.4 billion. In return, Fiat took a 6% stake in the American car giant. At the time GM feared being left behind in the merger wave that was sweeping the car industry. Since the DaimlerChrysler merger in 1998, the industry had consolidated rapidly. To become a global force, GM felt it needed the expertise of foreign companies to satisfy the differing tastes of the world's car buyers and to share development costs.

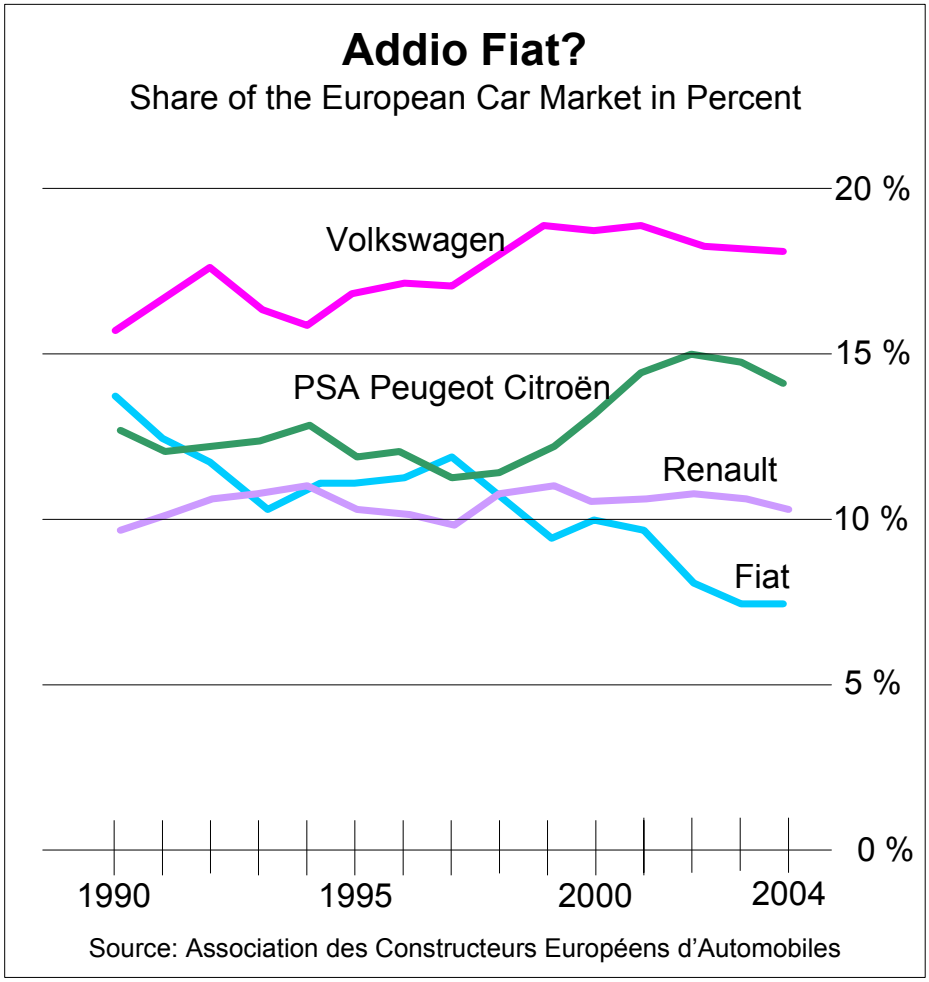


Figure 3: The contribution of Volkswagen, PSA Peugeot Citroën, Renault and Fiat to the European car market

GM's greatest rival, Ford, was building a global network. In Europe it eventually acquired Jaguar, Volvo and Land Rover. Renault had teamed up with Nissan. DaimlerChrysler would go on to forge alliances with Hyundai of South Korea and Mitsubishi of Japan.

Since GM took a stake the problems have mounted. Greater foreign competition in Italy, Fiat's biggest market, arrived as government schemes to help Fiat faded away. Fiat's high costs and the lack of success of the Palio (Fiat's "world car") and the Stilo, a bigger and supposedly more profitable model, proved a drag, sucking money from Fiat's successful truck and tractor business.

In 2002 Fiat was forced to seek refinancing in the form of •3 billion in convertible loans from banks. The souring relationship with its American partner was exemplified by GM's refusal to contribute. Fiat also sold its stake in GM and its financing arm to raise cash. This diluted GM's holding in Fiat to 10%, which according to GM invalidated the put option.

GM has also had its share of troubles since its link-up with Fiat. In January 2000 its shares were worth over $80 and it made a profit of $5 billion that year. Its shares now trade at around $37 and although it made $3.6 billion in 2004, $2.9 billion came from its finance arm. GM's bonds are at a record low, hovering just above junk status and it has been saddled with mounting "legacy" costs from its employee health-care and pension plans.

European and Asian producers dominate America's luxury-car market and the increasingly bold and innovative South Koreans are attacking the market for cheaper cars.

On Sunday, February 13th, 2005, it was decided that GM will pay Fiat •1.55 billion ($2 billion) to cancel a "put" option that the firms had agreed as part of a tie-up that was concluded in happier times for both GM and the Agnelli family, the founders of the Fiat industrial empire.

Management Compensation

This issue has stirred up much controversy during past years. Since this topic, besides being of general interest, is also linked to the performance of automobile manufacturers, it must be addressed here too.

Over the past few years, the salaries of managers in Europe and the US have gone out of control. They became so outrageous, insane and beyond common people's imagination, that the Swiss business magazine "CASH" of February 25th, 2005, simply called this development "The New Insanity".

It is especially shocking for the public to realize, that the salaries are not linked to the quality of leadership and company performance, which again are directly related to the capability of a company to meet customer expectations.

Daniel Vasella, both chairman of the board and CEO of a Swiss pharmaceutical company was able to multiply his salary tenfold up to a stratospheric level of $ 18 million per year, whilst on the other hand the return to the shareholders stalled.

The Hay Group, a consultancy, reckons that a European chief executive's basic salary is much the same as that of his counterpart across the Atlantic. According to a recent study by a human-resources consultancy, German executives are the best paid in Europe, but the component of their bonuses linked to short-term targets is higher even than that of their counterparts in America. This has put pay and performance out of line. In one case, while Daimler-Chrysler's market value fell by 60%, its top executives' pay rose by 40%.

In the US the differential between the pay of top executives and their workers has grown. In 1991 the pay of the average American large-company boss was about 140 times that of the average worker; by last year, it was over 500 times, and growing.

Executive compensation packages in Japan, where pay scales are also largely determined by tradition, are much more down to earth. In Japan, the CEOs, on average, get only 17 times what the workers earn. Even in companies employing up to 400'000 people, the salaries of CEOs are typically less than $ 1 million a year. Indeed the median in these huge companies lies somewhere between $300'000 and $ 600'000 a year. Even when receiving retirement allowances, these CEOs would be fortunate to take

much more than an extra $ 1.5 million home with them.

It is believed that this issue has tremendous implications on employee motivation, trust of potential customers and respect paid by the public. Who wants to work for or buy a product from a company whose top management demonstrates over and over again that its actions are diverted from the customer and the employees by selfish greed.

Management sets the standard with respect to every aspect of corporate behavior. Countless examples have shown in the past that managers, which do not live up to these standards as observed by both the employees and the public damage and even ruin a company. In any case, the damage will be a multiple of what a management claims in excessive compensation.

Toyota Motor Corporation

The Ultimate in Manufacturing Excellence

It will be an important moment in industrial history: in only a few years Toyota will topple General Motors from the number one slot among the world's carmakers, as it grows relentlessly towards 15% of the global market. It makes a net profit far bigger than the combined total for Detroit's Big three; its market capitalization towers above them; its productivity has grown sevenfold in the past 25 years, twice as much as Detroit's finest, despite their efforts to keep up.

The financial performance of Toyota is enormous (Figure 5).

There is the world car industry, and then there is Toyota, the outstanding phenomenon. Since 2000 the output of the global industry has risen by about 3 million vehicles to some 60 million. Of that increase, half came from Toyota alone. While most attention over the past four years has focused on a spectacular turnaround at Nissan, Toyota has undergone a dramatic growth spurt all round the world. Japan's industry leader will soon be making more cars abroad than at home. It has overtaken Ford in global production terms and is set to pass Chrysler in sales to become one of America's Big Three. In an industry strewn with basket cases, where hardly any volume producer makes a real return on its capital, Toyota is exceptional in that it consistently makes good returns.

Toyota's ebullient chairman Hiroshi Okuda has made little secret that he wants the company to win 15% of the global car market, snatching leadership from General Motors. Having reached Global Ten (10% of the world market) Mr Okuda has his eyes focused on his new goal. “It's just to motivate employees,” says Fujio Cho, Toyota's more downbeat president. “Somehow news of the banners in our factories leaked out,” he says disingenuously, as if you could keep such a secret after it has been blazoned to 264'000 workers around the world.

Market capitalization says it all (Figure 1). Toyota is worth more than the American Big Three put together, and more than the combination of its successful Japanese rivals, Nissan and Honda. Last year (2004) Nissan may have outperformed Toyota in terms of operating margin, but over the long haul it has been the provincial powerhouse from Aichi prefecture near Nagoya that has consistently shown the way.

Toyota Motor Corporation Annual Report 2004

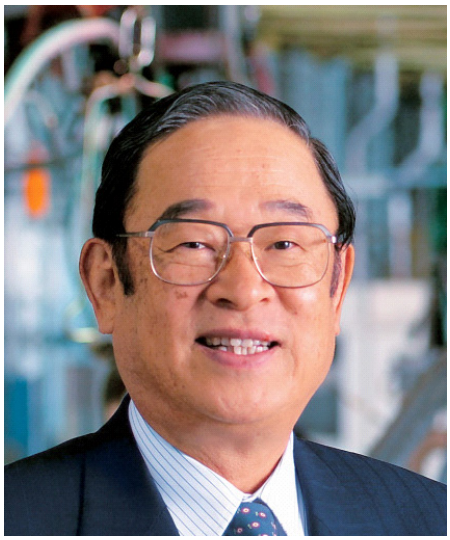
Fiscal Years ending March 31st

	in million USD except share data	2003 vs 2004 Change in Percent
For the Year 2004		
Net Revenues	163'637	+11.6 %
Operating Income	15'772	+31.1 %
Net Income	10'995	+54.7 %
Return on Investment	15.2 %	+11.6 %
Per Share Data		
Net Income (Basic)	3.24	+62.3 %
Cash Dividends	.43	+25 %
Shareholders' Equity	23.24	+19 %
At Year-End		
Total Assets	208'537	+9.4 %
Shareholders' Equity	77'383	+14.9 %
Share Performance (March 31		
Price per Share	36.71	+47.2 %
Market Capitalisation	132'527	+47.2 %

Figure 5: Key figures showing the performance of the Toyota Motor Corporation for the year beginning 1st April and ending March 31st

Hiroshi Okuda, Chairman

Toyota is turning challenges into business opportunities by accelerating the pace of its innovation to achieve new growth.



Fujio Cho, President

We intend to raise corporate value by pursuing even higher levels of growth and efficiency.

Figure 4: Hiroshi Okuda, chairman od the board and Fujio Cho, President of the Toyota Motor Corpration and their policies for the future development of the company

Toyota Production System TPS

First, of course, it taught the modern car industry how to make cars properly. Few had heard of the Toyota Production System (TPS) until three academics in the car industry study programme run by Massachusetts Institute of Technology (MIT) wrote a book in 1991 called "The Machine that Changed the World" [2].

It described the principles and practices behind the "just-in-time" manufacturing system developed at Toyota by Taiichi Ohno. He in turn had drawn inspiration from W. Edwards Deming, an influential statistician and quality-control expert who had played a big part in developing the rapid-manufacturing processes used by America during the second world war.

At the core of TPS is elimination of waste and absolute concentration on consistent high quality by a process of continuous improvement (kaizen). The catchy just-in-time aspect of bringing parts together just as they are needed on the line is only the clearest manifestation of the relentless drive to eliminate muda (waste) from the manufacturing process. The world's motor industry, and many other branches of manufacturing, rushed to embrace and adopt the principles of TPS.

Toyota's success starts with its brilliant production engineering, which puts quality control in the hands of the line workers who have the power to stop the line or summon help the moment something goes wrong. Walk into a Toyota factory in Japan or America, Derby in Britain or Valenciennes in France and you will see the same visual displays telling you everything that is going on. You will also hear the same jingles at the various work stations telling you a model is being changed, an operation has been completed or a brief halt called.

Everything is minutely synchronized; the work goes at the same steady cadence of one car a minute rolling off the final assembly line. Each operation along the way takes that time. No one rushes and there are cute slings and swiveling loaders to take the heavy lifting out of the work. But there is much more to the soul of the Toyota machine than a dour, relentless pursuit of perfection in its car factories.

Another triumph is the slick product-development process that can roll out new models in barely two years. As rival Carlos Ghosn, chief executive of Nissan, notes in his book "Shift" (about how he turned around the weakest of Japan's big three) [6], as soon as Toyota bosses spot a gap in the market or a smart new product from a rival, they swiftly move in with their own version.

The result is a bewildering array of over 60 models in Japan and loads of different versions in big overseas markets such as Europe and America. Of course, under the skin, these share many common parts. Toyota has long been the champion of putting old wine in new bottles: over two-thirds of a new vehicle will contain the unseen parts of a previous model. But TPS alone would not justify the extraordninary success of the company in the world market.

The "Toyota Way"

Many firms have tried to install the Toyota Production system TPS. They set up the Kanban system, which is a tool for managing the flow and production of materials in a Toyota-style "pull" production system. They plug in the andon, which is a visual control device in a production area that alerts workers to defects, equipment abnormalities or other problems using signals such as lights, audible alarms, etc. Finally, with all these devices the workplace looks like a Toyota plant. Yet over time the workplace reverts to operating like it did before.

And this is exactly what many Western organisations have experienced.With the set up of TPS, the real work of implementing TPS has just begun. In the Toyota Way, it's the people who bring the system to life by working, communicating, resolving issues and growing together. The Toyota Way encourages, supports and in fact demands employee involvement.

The Toyota Way is much more than a set of improvement and efficiency techniques. It's a culture depending on worker attitude to reduce inventory, identify hidden problems and to fix them with a sense of urgency, purpose and teamwork.The Toyota Production System can be copied, the Toyota Way cannot. It has to be built, maintained and refined over decades.

The roots of the Toyota Way go back to 1926, when Sakichi Toyoda (1867 – 1930), a brilliant engineer, later referred to as Japan's "King of Inventors", founded Toyoda Automatic Loom Works.

His work ethics was significantly influenced by the book of Samuel Smiles, "Self-Help"[5], first published in England in 1859. The book grew out of the devotion, to help young man in difficult economic circumstances by improving themselves. The book chronicles inventors whose natural drive and inquisitiveness led to great inventions that changed the course of humanity. When looking for instance at the success and impact of James Watt, Smiles concluded, that both were not the result of natural endowment but rather trough hard work, perseverance and discipline.

These few words summarize the spirit, which Sakichi Toyoda handed over to his son Kiichiro Toyoda (1894-1952), the founder of Toyoto Motor Company, his son Shoichiro Toyoda, Honorary Chairman and director of Toyota Motor Corp., and on to his nephew Eiji Toyoda (*1913), President of Toyota from 1967 to 1994.

Spend some time with Toyota people and after a time you realize there is something different about them. The rest of the car industry raves about engines, gearboxes, acceleration, fuel economy, handling, ride quality and sexy design. Toyota's people talk about "The Toyota Way" and about customers.

In truth, when it is written down the Toyota creed reads much like any corporate mission statement. But it seems to have been absorbed by Japanese, European and American employees alike.

Mr. Cho thinks that something of the unique Toyota culture comes from the fact that the company grew up in one place, Toyota City, 30 minutes drive from Nagoya in central Japan, where the company has four assembly plants surrounded by the factories of suppliers. In this provincial, originally rural setting, Toyota workers in the early days would often have small plots of land that they tended after their shift.

Mr. Cho, who made his career in the company by being a pupil of Mr. Ohno and becoming a master of production control, thinks that the fact that Toyota managers and their suppliers see each other every day makes for a sort of hothouse culture—rather like Silicon Valley in its early days.

Jim Press is boss of Toyota's sales in North America. He left Ford in frustration 35 years ago, because he did not think it handled customer relations properly and he suspected that the upstart Japanese company making its way in the American market might do better. He was right.

Toyota shares a production plant in California with GM. Identical cars come off the line, some badged as GM, the rest as Toyo-

tas: after five years, according to one study by Boston Consulting Group, the trade-in value of the Toyota was much higher than that of the American model, thanks to the greater confidence people had in the Toyota dealer and service network.

Mr. Press talks with a quiet, almost religious, fervor about Toyota, without mentioning cars as such. "The Toyota culture is inside all of us. Toyota is a customer's company," he says. "Mrs Jones is our customer; she is my boss. Everything is done to make Mrs. Jones's life better. We all work for Mrs. Jones."

But not even the combination of its world-leading manufacturing, rapid product development and obsessional devotion to customer satisfaction is enough to explain Toyota's enduring success. There is one more ingredient that adds zest to all these.

Tetsuo Agata doubles as general manager of Toyota's Honsha plant in Toyota City and as the company's overall manufacturing guru. The magic of Toyota's winning culture was summed up for him by an American friend who observed that Toyota people always put themselves "outside the comfort zone": whenever they hit one target, they set another, more demanding one. That relentless pursuit of excellence certainly explains much of what has been happening to the company in recent years, at home and abroad.

The strain of going global

Life started changing for Toyota when the economic bubble burst in Japan at the start of the 1990s. First it had to work hard to improve its competitiveness as the yen strengthened. Mr. Okuda, president in the mid-1990s, launched a program of cost-cutting to make the company's exports competitive even at a yen level of only 95 to the dollar. When costs fell and the yen subsequently weakened, Toyota reaped a double reward.

But the company also had to face up to a car market at home that slumped from nearly 6 million sales a year to just over 4 million. And Toyota has had to respond to renewed competition in its domestic market, after an aggressive push by Honda and the revival of Nissan. One reaction by Mr. Cho to tough competition at home has been a further round of cost cuts that have helped Toyota re-build market share in Japan from 38% in the mid-1990s to 44.6% last year, helped partly by windfall sales after the implosion of Mitsubishi Motors.

But European imports of Volkswagens, BMWs and Mercedes cars have mopped up 7% of the Japanese market, mostly for premium models, and forced Toyota to introduce its luxury Lexus brand into Japan.

Until now, cars that Americans and Europeans have known as Lexuses have been sold as plain old Toyotas in Japan. Now Mr. Cho has decided, as part of a wider reorganization of Toyota's distribution network, to sell these vehicles separately with the Lexus badge and support from their own up-market retail outlets.

One of Toyota's strengths has been its army of privately owned car dealers, long organized into five competing channels, each one more or less specializing in different parts of the range. The multiplicity of distribution channels arose simply because of the rapid growth of the Japanese market and Toyota sales from the 1970s onwards. But in February 2003 Toyota administered what was called the Valentine's Day shock. It streamlined the number of channels down to four, including a new one aimed at the young people turned off by mainstream Toyota's staid image. (It is having to go even further in America with a separate sub-brand called Scion to appeal to young consumers.)

Like all car companies Toyota in Japan has had to get used to a fragmentation of the market, which means there are no longer huge runs of a few bestselling models. The boss of the Tsutsumi plant, where the firm's trendy Prius hybrid cars are made, recalls the good old days when all they had to do was churn out half a million Camrys and Coronas. Today's lines have been adapted and made flexible so that no fewer than eight different models can be manufactured simultaneously. The Prius—despite its revolutionary engine—still has to share an assembly line in the Tsutsumi plant with several conventional models.

Seeds of success

Making all these changes at home is relatively easy compared with Toyota's biggest challenge, now that it has set itself the goal of making more cars outside Japan than at home. Apart from seeking to switch production to exports, Toyota also chased growth outside Japan by building three more plants in North America and two in Europe, starting with Derby in Britain, followed by Valenciennes in the north of France. Between 1993 and 2003, overseas production more than doubled to 2 million units, while in Japan it declined from 3.5 million to 3 million before recovering in the later years to its old level, boosted by exports; about half of domestic production is exported.

This globalization process has transformed the size and shape of Toyota. In 1980 Toyota had 11 factories in nine countries; in 1990 it had 20 in 14 countries; today it has 46 plants in 26 countries. In addition, it has design centres in California and in France on the Côte d'Azur, and engineering centers in the Detroit area and in Belgium and Thailand.

Although Japan remains its biggest single market, sales topped 2 million in North America for the first time last year, and in Europe Toyota is passing through the 1 million mark, with 5% of the market, after a long period of slow growth. The opening of plants in Turkey and France and the introduction of the European-designed Yaris small car have done much to make Toyotas more appealing to Europeans, while in America its entry (not without a few hitches) into the enormous market for pick-up trucks and sport-utility vehicles has been responsible for its steady march to beyond 10% of the market. It is now breathing right down the neck of Chrysler.

Mr. Cho acknowledges that such international growth and globalization is the biggest change happening to the company. He sees his greatest challenge as maintaining Toyota's high standards in such areas as quality while it grows so fast across the globe. For Toyota has only recently started to transform the way it is run to make itself a truly global company rather than a big exporter with a string of overseas plants. Its top-heavy all-Japanese board has been drastically slimmed and five non-Japanese executives, including Mr. Press, have been made managing officers, which means that they sit on the executive committee in Tokyo, but are also left free to run their overseas operations on a day-to-day basis without deferring to head office. For Toyota, that is a big step away from centralized rule by Toyota City.

Another leap has been the creation of a Toyota Institute, not just for training Japanese managers, but also for developing groups of executives from all over the world. The centre is expressly modeled on the Crotonville Centre that has played such a big part in the success of General Electric. By having squads of managers moving through development courses, head

office can keep tabs on the potential of its people, whilst ensuring that they are thoroughly steeped in Toyota's way of doing things, whether it be in manufacturing, retailing, purchasing and so on.

But globalization and the rapid growth of production now in places such as China is also straining the learning process further down the hierarchy.

Toyota has a flying squad of line workers who move around the world to train locals at new factories or move in to help out when there is a model change going on. These line supervisors train local workers.

Toyota has also made astute use of joint-ventures to ease the strain of manning overseas operations: apart from its original one with GM in California, Toyota now has another with a local company in Turkey, with PSA Peugeot Citroën in the Czech Republic and in China, which is the fastest-expanding part of Toyota, in line with the country's rapid motorization. Toyota reckons that it will learn much about purchasing more effectively in Europe from its French partner in the new joint-venture, which is preparing to unveil a budget car for the European market at the beginning of March 2005 at the Geneva Motor Show.

But the company is finding there are limits to the number of Japanese managers and foremen who are prepared to work as expatriates, either on a temporary or permanent basis. So it has opened a Global Production Centre in a former production area in Toyota City. Here, on a given day you can see Filipino and Chinese workers being taught how to assemble Toyota cars. To get round obvious language barriers the instruction makes heavy use of video recordings and inter-active DVDs, a sort of automated, virtual version of watching how Nelly does it.

The best gets better

Perhaps the best single example of Toyota managers' aversion to taking it easy in the comfort zone is back where it started—in the mysteries of the TPS. Mr. Agata, one of the firm's manufacturing experts, regards his job as inculcating the virtues of the TPS in a younger generation. But he has concluded that the company has to raise its game. "We have always proceeded by steady improvement," he says. "But now we need to make step changes as well to keep ahead." That means finding radically different ways of manufacturing things like bumpers or doors, reducing the number of parts, and developing new machines to form parts more economically.

Figure 6: Toyota Prius, a four door limousine with a 1.5 liter four cylinder internal-combustion engine with 58 hp and an electric motor with 41 hp and a nickel-metal-hybrid battery. The car was launched in December 1997 and replaced by a new model in Spring 2003

As GM's bonds sink towards junk status, and as Japanese carmakers steadily overhaul America's Big Three, it must be a chilling thought that Detroit's nemesis is working on ways to improve its performance. No wonder one GM planner mused privately that the only way to stop Toyota would be the business equivalent of germ warfare, finding a "poison pill" or "social virus" that could be infiltrated into the company to destroy its culture.

What else could stop Toyota? Soon it will have the scale to outgun GM. A technological revolution will not threaten it, since Toyota is leading the way with hybrid electrics en route to full-scale fuel-cell electric cars.

Toyota spends regularly around 4 % of its revenue on research and development R&D. In 2004, the expenditure on R&D amounted to $ 6.5 billionr, which is 3.94 % of this years total revenue of $ 165 billion. This effort was spent on R&D of anticipatory, advanced and environmental technologies with a central focus on the development of a fuel cell battery and the impact of expanding new models to promote Toyota's strength in a competitive global market for the future.

Consumer preference for exciting designs? Toyota has shown that it can play that game also: there is a stylish edginess in recent models such as the Prius, Yaris, the new Avensis and even its venerable LandCruiser SUV. At least the man from GM put his finger on the key to Toyota's success. Provided its culture can be sustained as it goes from being an international Japanese company to a global one, then Toyota's future seems secure.

Why the future is hybrid

Toyota began development of a new car for the 21st century, which eventually turned into the Prius, as early as in September 1993. The goal was to develop a small, but nevertheless spacious car with a fuel economy better than 47.5 miles per gallon (4.95 liter per 100 kilometer).

The design efforts led to the world's first mass-produced petrol-electric hybrid car, powered by both an internal-combustion engine and an electric motor. The second-generation Prius, launched in 2003, won some of the industry's most prestigious awards—it has just been named European Car of the Year 2005—and generated a buzz out of all proportion to the car's prevalence on the roads.

The success of the Prius has taken Toyota by surprise. The average wait at American dealerships is currently six months, even though the company increased its sales target for North America from its initial estimate of 36,000 units to 47,000 for 2004.

To meet demand, Toyota announced another increase in August, saying it would push monthly global production up next year by 50% to 15,000 cars, and double its allotment for America to 100,000 units.

While that number is still only one-quarter of last year's sales for America's most popular Toyota model, the Camry, it shows

that consumers are willing to pay a premium for clean, environmentally friendly cars—as long as there is no need to compromise on performance.

Japan experimented with the combination of a combustion engine and an electric motor since the sixties. The German car manufacturers did not think this to be a serious alternative and thus did not pay attention, even after the first edition of the Prius entered the market in 1997. Experts are now convinced that ignoring this development in automotive technology can be compared to the „Worst Possible Accident" in the nuclear field. GM Chairman and CEO Rick Wagoner now openly admits that at present hybrids are the best possible contribution of individual transportation to the protection of the environment. GM Vice Chairman Bob Lutz confesses at the Detroit Motor Show 2005 that Western manufacturers „missed the train" and everybody present agreed.

Other carmakers are scurrying to catch up. Besides this year's new Ford Escape and Honda Accord hybrids, Toyota will add two sport-utility vehicles (SUVs) to its hybrid line-up early next year.

DaimlerChrysler recently announced that it will introduce a Mercedes hybrid within the next five years, and Porsche is considering a hybrid version of its Cayenne SUV. Even General Motors, one of the strongest proponents of hydrogen fuel-cell cars, has jumped on the hybrid bandwagon with two pick-up trucks, a sedan and several SUVs to follow. The US industry announced that it will launch at least two dozen gasoline-electric hybrid cars within next five years or so. But until these cars are ready, Toyota and Honda will continue to make the deals in the showrooms.

Ingredients of Toyota's Success

There are many books that provide insight into the tools and methods of Toyota's Production System (TPS). One of the most recent and also the most extensive book was written by Jeffrey K. Liker, Professor of Industrial and Operations Engineering at the University of Michigan in Ann Arbor, USA [4]. Ann Arbor also hosts the Toyota Technical Center (TTC), where significant portions of the Camry and Avalon sedans and Sienna minivans for the U.S.-market are designed and engineered.

Gary Convis, Managing Officer of Toyota and President of Toyota Motor Manufacturing in Kentucky, USA, describes his personal experience in the foreword of this book as follows:

"When I joined Toyota after 18 years in the U.S. automobile business, I didn't know exactly what to expect. But I was hopeful. I knew that I wasn't comfortable with the direction that American automobile manufacturing was taking, and I felt Toyota might be different. In no time at all I noticed a fundamental difference between Toyota and my previous employers. At a Toyota/GM joint venture plant in Fremont, California, called NUMMI (New United Motor Manufacturing), I witnessed the transformation of a workforce from one of the worst in the General Motors system to one of the best manufacturing facility in the United States."

Through his research, Liker identifies fourteen principles of the Toyota Way, which he divided into the following four sections. He does not comment on whether the analogy to Deming's famous fourteen points of management is intentional or accidental.

Long-Term Philosophy

Toyota is about long-term thinking. The focus from the very top of the company is to add value to customers and society. This drives a long-term approach to building a learning organization, one that can adapt to changes in the environment and survive as a productive organization. Without this foundation, none of the investments Toyota makes in continuous improvement and learning would be possible.

The Right Process Will Produce the Right Results

Toyota is a process-oriented company. They have learned through experience what processes work, beginning with the ideal of one-piece flow. Flow is the key to achieving best quality at the lowest cost with high safety and morale. At Toyota this process focus is built into the company's DNA, and managers believe in their hearts that using the right process will lead to the results they desire.

Add Value to the Organization by Developing Your People and Partners

The Toyota Way includes a set of tools that are designed to support people continuously improving and continuously developing. For example, one-piece flow is a very demanding process that quickly surfaces problems that demand fast solutions, or else production will stop. This suits Toyota's employee development goals perfectly because it gives people the sense of urgency needed to confront business problems. The view of management at Toyota is that they build people, not just cars.

Continuously Solving Root Problems Drives Organizational Learning

The highest level of the Toyota Way is organizational learning. Identifying root causes of problems and preventing them from occurring is the focus of Toyota's continuous learning system. Tough analysis, reflection and communication of lessons learned are central to improvement as is the discipline to standardize the best-known practices.

Differences between the Japanese and Wester Business Practices

Toyota's business practices differ from those of Western automobile manufacturers in a number of aspects:

- Operations are strictly governed by a sustainable business policy, which is passed on from one generation to the other and not by short-term decision making or by the attitudes of changing management teams and variable customer tastes.
- Growth comes from the inside out and not through mergers and acquisitions, in other words, growth through continual improvement of products and services and not through continued restructuring.
- Production is controlled by customer demand ("pull" system) not by production capacity ("push" system).
- Qualified employees are attracted with the possibility to participate in the company's striving to meet and exceed customer expectations with products of unparalleled quality and not with compensation schemes. Toyota employees work for a winner. Who wants to work for an employer, whose products have to be forced onto the customers with discounts and incentives? Who wants to work for a looser?
- No unions are admitted which force both management and employees to defend their own interests and by so doing distract from the shared responsibility to satisfy customers.
- For more than 50 years, Toyota experienced an extraordinary history of continuous growth without major layoffs

despite the ups and downs of national and global economies.

- Compensation schemes in line with training, experience and responsibility across all the ranks from top to bottom instead of skyrocketing salaries unrelated to company performance for a few.

How much do Germans like the cars they are driving?

Since 1968, J.D. Power and Associates has been conducting quality and customer satisfaction research based on survey responses from millions of consumers worldwide. We do not rely on "expert opinion", says J.D. Power. Our product and service rankings in no way reflect the opinions or preferences of the firm, and we do not review, judge or test products and services ourselves.

We represent the voice of the customer by translating survey responses into information that companies worldwide use to improve quality and customer satisfaction, as well as to help consumers make better decisions. J.D. Power and Associates has developed and maintains one of the largest, most comprehensive historical customer satisfaction databases in existence, which includes feedback on virtually all aspects of the shopping, buying, and product and service ownership experience.

Up to now, J.D. Power and Associates has conducted three studies on the satisfaction of German car owners. Studies similar to those of J.D. Power are conducted all over the world by marketing and consumer organizations.

The results are always more or less the same. Year after year, Toyota ranks first in reliability and customer satisfaction with a significant lead over other Japanese manufacturers leaving all others far behind. Over decades of consistent performance Toyota accumulated an immense capital in terms of public trust motivating customers to return and to take their friends along. Toyota does not need to offer huge discounts and other sales incentives to "move the metal". The result immediately shows up under the bottom line. Even though Toyota is not yet the biggest producer of cars, its market capitalization stands high above all others as shown in Figure 10. Toyota ranks highest in every of the three studies conducted with German customers in 2002, 2003 and 2004. In the 2004-study

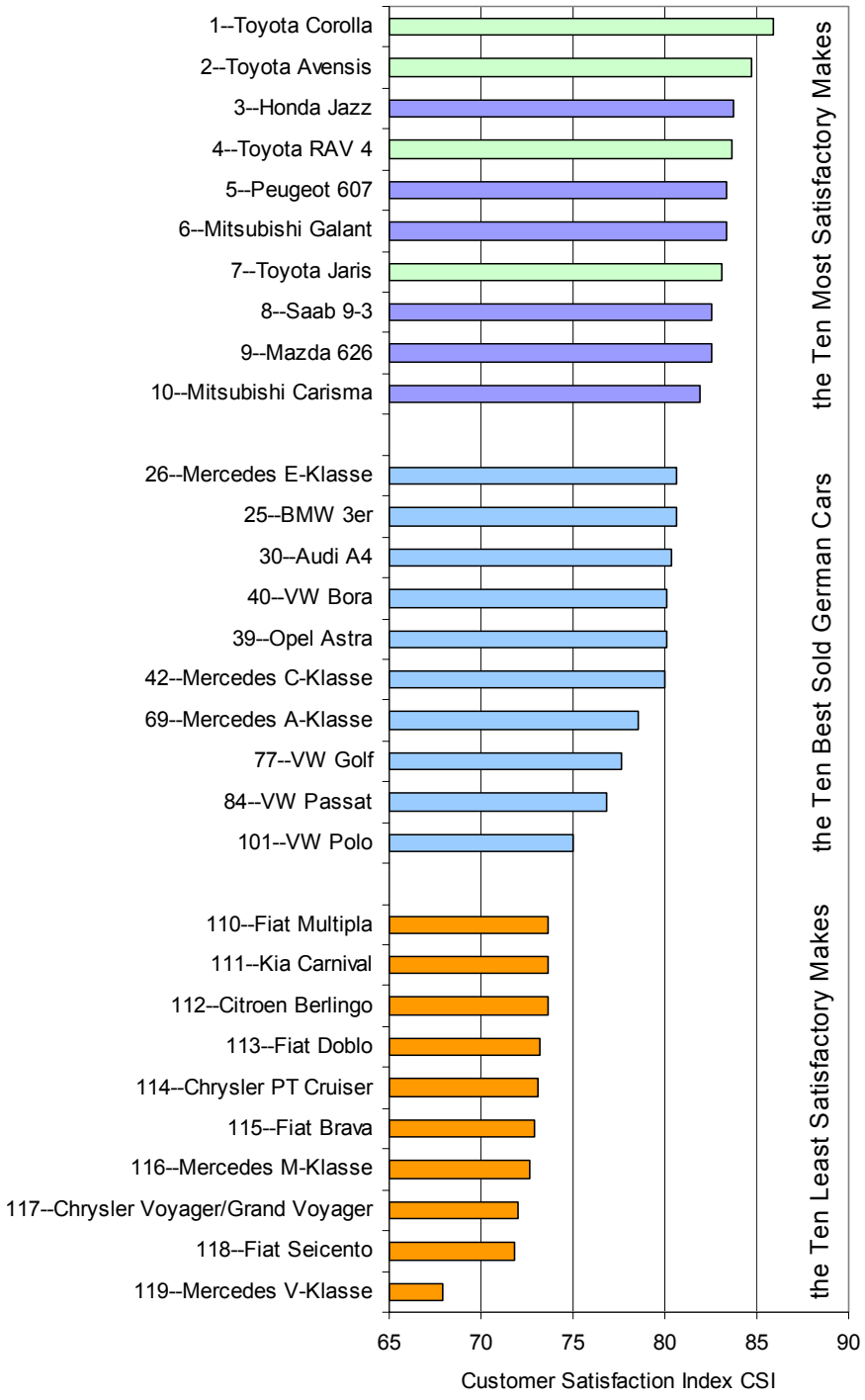


Figure 7: Extract from the JD Power Report 2004 on the satisfaction of the German car owners as expressed by the Customer Satisfaction Index CSI. Shown are the ten most satisfactory makes, the ten best sold German cars and the ten least satisfactory makes out of 119 classified models.

Toyota models are at the top in three out of seven new-vehicle segments. Two other Japanese manufacturers, Honda and Mazda, along with Porsche and Peugeot, each have top-ranking models in one segment.

The top-ranked models in each of the seven segments are:

Small Car: Honda Jazz

Lower Medium Car: Toyota Corolla

Upper Medium Car: Toyota Avensis

Executive/Luxury Car: Peugeot 607

Sports Car: Porsche 911

MPV: Mazda Premacy

SUV: Toyota RAV4

The study analyses customer satisfaction based on responses encompassing 77 attributes grouped into four key measures (the importance of each measure is shown as a percentage): quality and reliability (30%); vehicle appeal (25%), which inclu-

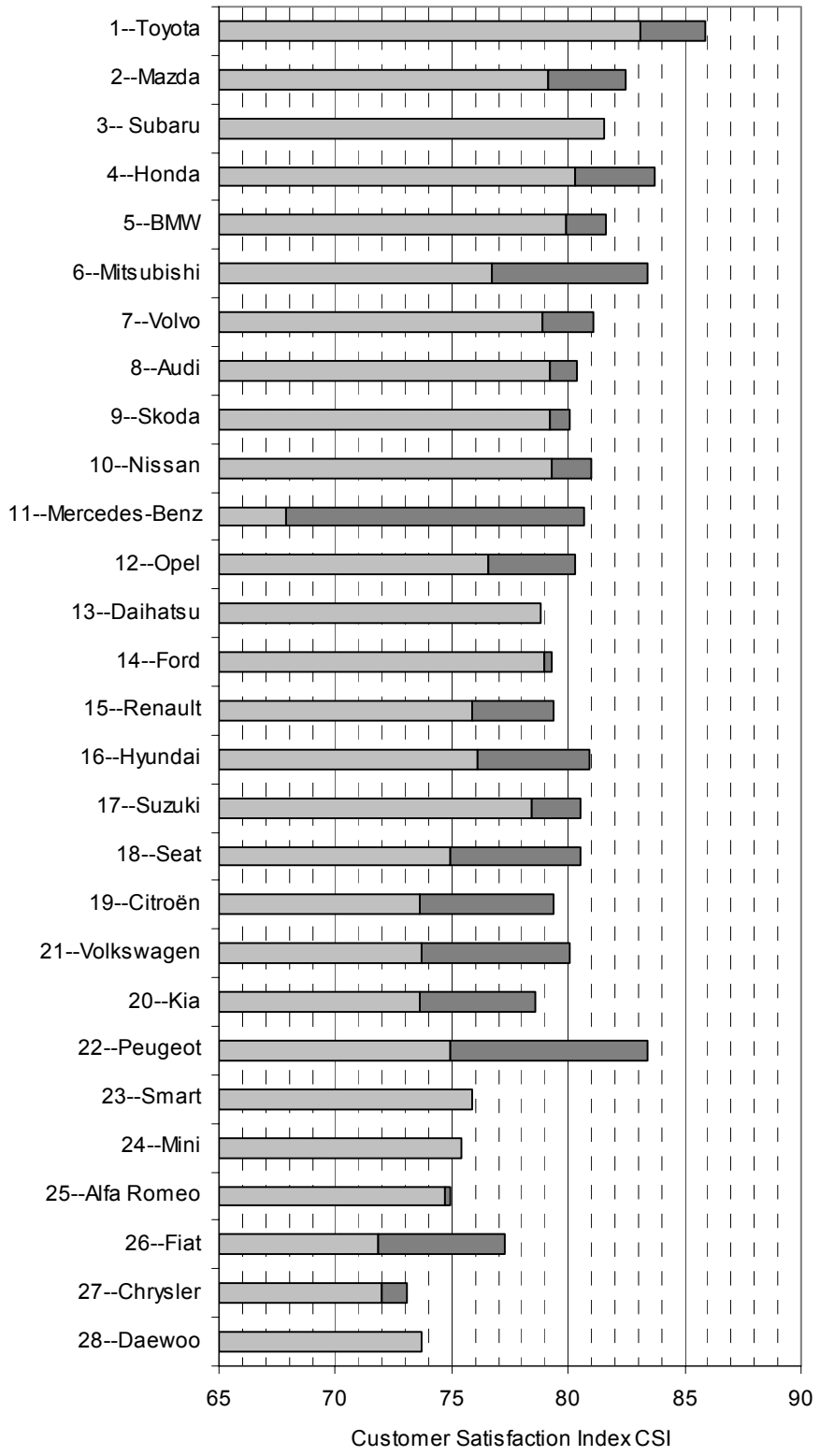


Figure 8: Extract from the JD Power Report 2004 on the satisfaction of the German car owners as expressed by the Customer Satisfaction Index CSI. Shown is the ranking of the 28 brands as considered by the study. Especially emphasized is the bandwidth of the CSI-values of each manufacturer's models.

des performance, design, comfort and features; service satisfaction (23%); and ownership costs (22%), which includes fuel consumption, insurance and costs of service/repairs. The top four brands in the overall ranking are Japanese. Toyota scores 84.4 points out of a possible 100, placing it significantly ahead of Mazda, Subaru and Honda, which score 81.6, 81.5, and 81.1, respectively. German manufacturers BMW, Audi, Mercedes-Benz and, for the first time Opel, perform above the industry average.

The 2004 Germany CSI study is based on the responses of 24,483 vehicle owners who rated their experiences with their vehicles, their dealers and the cost of ownership after two years. In total, 28 brands and 119 models are included in the study.

J.D. Power and Associates conducts CSI studies throughout the world. In some markets, like the United States, the study is primarily focused on dealer service satisfaction.

The results of the JD Power Report 2004 give raise to some comments:

Mirror for VW's economic problems

The VW Golf, Germany's by most popular car, stands on place 77 of 119 classified makes. In 2003 the car ranked 100th of 115 classified and in 2002 82nd of 132 classified. The introduction of the brand new Golf V turned out to be a disaster. Potential customers could only be enticed to by the car with discounts and incentives unknown before. The statistics of the reliability of automobiles as established by the Swiss Drivers Association TCS 2004 (Figure 9) shows, that the reliability of VW automobiles continuously deteriorated since about 1990. With popular cars as bad as the VW Golf it does not surprise that the market capitalisation of VW is but a small fraction (8.9 %) of Toyota's worth.

What happened with Mercedes Benz?

The products of this producer are ranked 24th (Mercedes S-Class), 26th (Mercedes E-Class), 33rd (Mercedes CLK), 42nd (Mercedes C-Class), 69th (Mercedes A-Class), 78th (Mercedes SLK), 108th (Mercedes Vaneo), 116th (Mercedes M-Class) and finally as the red light on the list 119th (Mercedes V-Class). No other automobile producer has products which vary so much in customer satisfaction, say quality. Uniformity is an important aspect of quality. From this viewpoint Mercedes is indeed the worst of all.

Since the foundation of Mercedes-Benz on June 28, 1926, the cars with the three-pointed star on their hoods became objects of pride for their well-to-do owners and all those that wanted to look alike. The megalomania of Mercedes-Benz gambles with the trust of a large clientele that was built up over decades.

Not long ago, Mercedes was top in prestige and a symbol for quality and reliability. The moment a customer of a Mercedes received a new car, he had to order the next one, when he wanted to have it delivered when when turning the old one in. Dis-

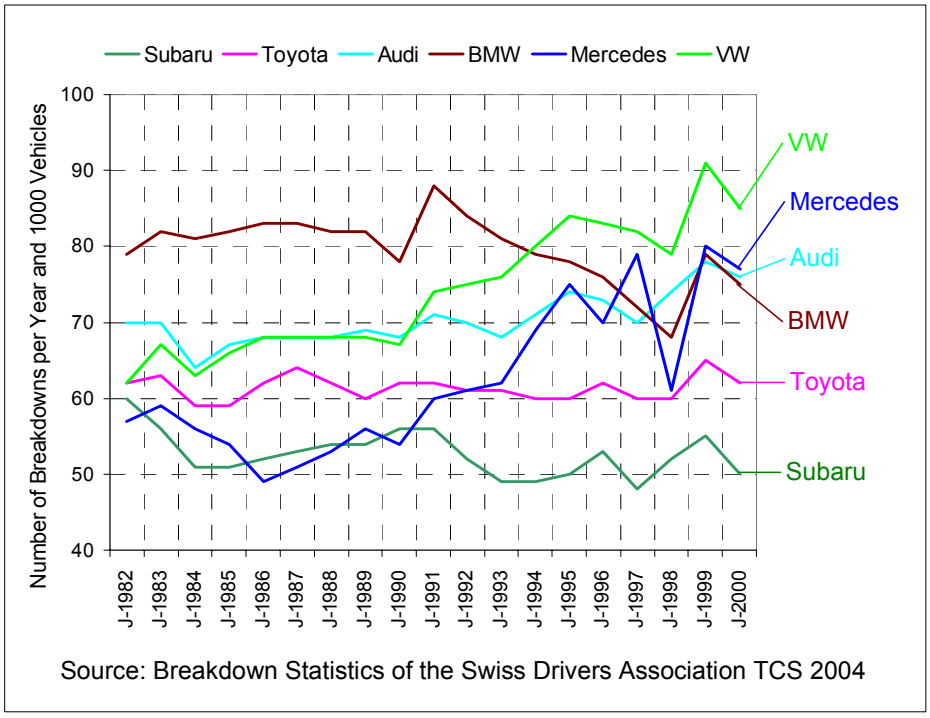


Figure 9: Extract from the breakdown statistics of the Swiss Drivers Association TCS 2004. The study only considers cars with more than four years of age. Shown are the results for Subaru, Toyota, BMW, Audi, Mercedes and VW over the period 1982-2000

counts and other sales incentives were out of discussion.

Since Jürgen E. Schrempp founded his „Welt AG“ in 1998 to satisfy his ambition to become one of the key players in the automobile industry, not one year passed without a fire somewhere in his diverse conglomerate (Mercedes-Benz, Chrysler, Maybach, smart, Mitsubishi Fuso and others). He had to act as a fire-fighter instead of looking after the quality of the products and the development and the launching of innovative, attractive and reliable cars.

The statistics of the reliability of automobiles as established by the Swiss Drivers Association 2004 TCS (Figure 9) shows that the reliability of the Mercedes cars deteriorated after the launching of the Mercedes C-Class in 1985 and worsened dramatically since then.

On Wednesday evening, 9th February, 2000, ARD (Association of the Broadcasting Corporation of Germany) screened a remarkable documentary film with the title “The Fairy-Tale of Made in Germany".

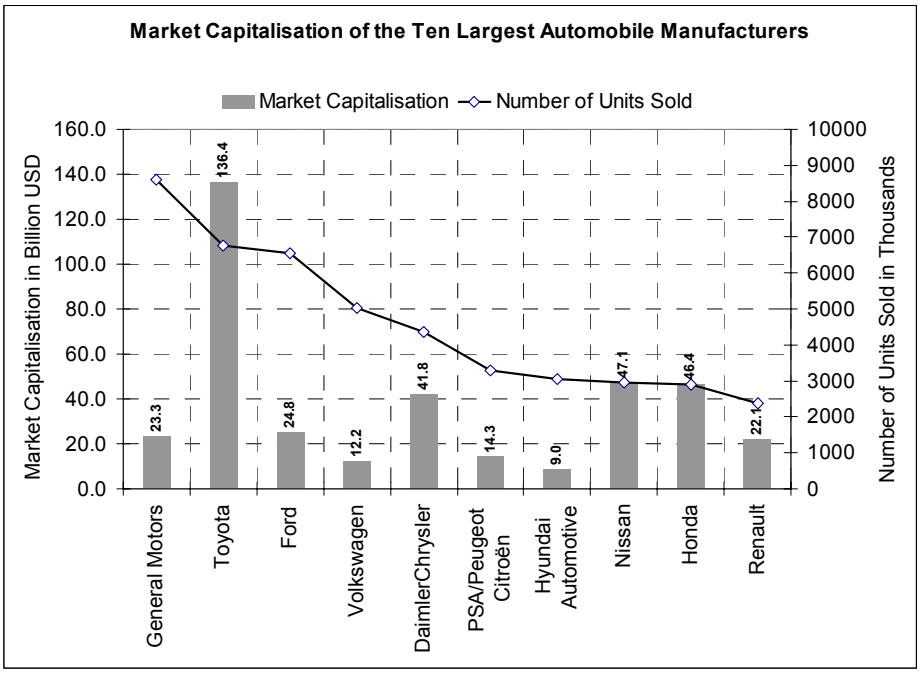


Figure 10: Market Capitalisation and number of cars sold of the world's ten largest automobile manufacturers as a mirror for the quality and reliability of their cars

The preview of this documentary had the following comment:

„At the beginning of the 1990's a study showed that Toyota made the Lexus with the same number of man-hours that Mercedes had to spend on warranty alone. The film showed how German companies are shunting the previous world champion exporter into a siding with sloppy work, expensive procedures and poor customer relations ".

The film closes with a little song that says a lot about the present situation in Europe in general and in Germany in particular.

> *„Good night Germany, only a single star is shining, Are you in the decadency too?*
>
> *Without you, how will our great industrial nation ever find salvation from the chaos that surrounds you.*
>
> *Good night Germany, when will you understand that industrial perfection requires a new direction."*

(liberally translated from the Lyric of Nick Benjamin.)

The song describes a gloomy vision of Germany's future. When this film was aired on ARD, nobody was yet willing to accept that this depressing scenario could ever become reality.

In the meantime, Germany's unemployed workforce rose to 5.2 million (March 2nd, 2005). All sorts of countermeasures are being discussed, most of them merely administrative in nature. Yet nobody is willing to openly admit that the film “The Fairy-Tale of Made in Germany" revealed the root of the problem.

Obviously, the situation has to aggravate even further for decision makers to overcome their complacency and become active.

W. Edwards Deming and Toyota

Deming in the eyes of his contemporaries

At the 1991 Deming Prize ceremony, key personalities of the Japanese industry used the following words to recognize the contribution of W. Edwards Deming to the recovery of Japan after World War II.

Shoichiro Toyoda, Honorary Chairman and director of Toyota Motor Corp.: "There is not a day I don't think about what Dr. Deming meant to us. Deming is the core of our management."

Koji Kobayashi, chairman emeritus of NEC: "Deming made a great contribution to the recovery of Japan's economy after the total war. We needed his authority. He fascinated the Japanese people."

Yoji Akao, engineering professor at Temagawa University: "He's the person who introduced quality control after the devastation of the war and who was the starting point of the whole development of quality control in Japan. Japan owes a great deal to him."

The Deming Management Philosophy

From 1950 onward, Deming explained to top management in quality and productivity seminars his quality philosophy.

The impact of these seminars on the course of worldwide economy cannot be overestimated. Their influence developed to one out of the 10 most significant turning points ("History's Hidden Turning Points") in human history during the past two millenniums. Apostle Paul, who carried Christianity to the Roman Empire, was the first, Deming the last.

This assessment was made by Daniel J. Boorstin, Historian, Pulitzer Prize-winning journalist, Director of the US Library of Congress from 1975 until 1987. The same opinion is expressed by John O. Whitney, Professor at the Columbia University Graduate School of Business and the Harvard Business School.Back to Contents

The Systems View

Deming taught the Japanese that production is a system and not a sequence of unrelated mechanical processes. The Japanese had knowledge, great knowledge, but it was in bits and pieces, uncoordinated. This flow diagram (Figure 11) directed their knowledge and efforts into a system of production, geared to the market - namely, prediction of needs of customers. The whole world knows about the results.

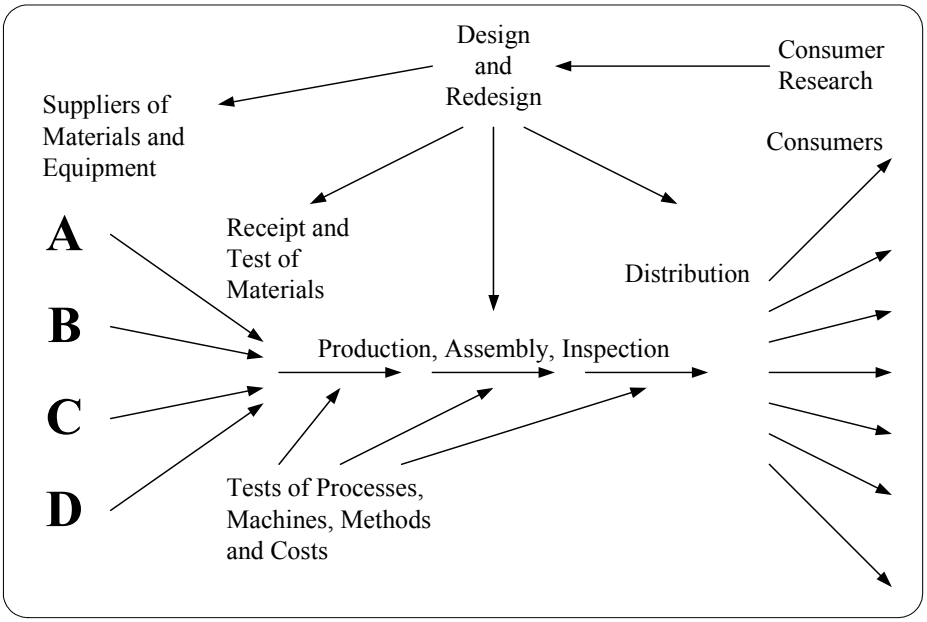


Figure 11: The revolutionary new view of looking at production as a system and not a sequence of unrelated mechanical processes was the basis for the success of Japanese products on the world market.

Supplies come in from various sources e.g. A, B, C and D. They go through various stages. They come out as a product, which might be semi-finished. The product is different from what went in. The product goes into distribution, it goes to one or more customers. Consumer research tries to discover what improvement or innovation in product or service might help the customer in the future and will entice him to buy. That may call for different inputs, design or redesign of product or service.

Everybody knows what a system is but nobody can define it.

1) A system is a whole consisting of two or more elements, each of which can determine the behavior of the whole.
2) How one element influences the behavior of the whole depends also on what other elements are doing.
3) No matter which way elements are grouped, every group influences the behavior of the whole.

These three definitions are included in the following statement:

The system is a whole, which cannot be split into different parts without losing its defining properties.

One of the best known systems and also the most complex is the human body.

Systems cannot be understood through analysis, e.g. by separating the parts and looking at the parts separately, a method which served man so well over centuries.

It can be rigorously proved that improvement of the parts will not improve the behavior of the whole, since the behavior of a system is not the sum of the behavior of its parts but the product of its interactions.

Systems can only be understood through synthesis, where synthesis is the exact opposite of analysis, e.g. by looking at a system as a part of a larger system not as something which can be divided into separate parts.

Systems scientists are convinced that the step from the analytic thinking to the systems thinking means a total change of imagery comparable to the change of the image from the world being plane to being globe.

Japan proved from 1950 onward that this totally new view, the systems view, can have tremendous implications.

Based on the systems view of production, late Dr. Shigeru Mizuno and Dr. Yoji Akao developed a method called Quality Function Deployment (QFD). QFD links the needs of the customer (end user) with design, development, engineering, manufacturing, and service functions. It helps organizations seek out both spoken and unspoken needs, translate these into actions and designs, and focus various business functions toward achieving this common goal.

The same systems view led Dr. Genichi Taguchi to the development of the "Tagu-

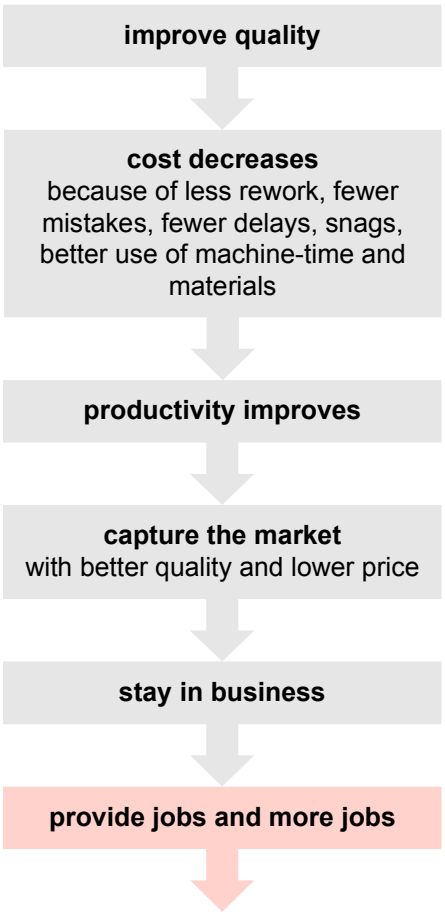


Figure 12: The „Deming Chain Reaction" shows the conclusive consequences of quality improvement measures for the lasting success of a company.

chi loss function" or "quality loss function". The loss function estimates the social loss produced by a deviation or variability of any design parameter from the ideal or target value. The greater the deviation from target, the greater is the loss.

Taguchi devised a special methodology, now called the "Taguchi methodology", to arrive at designs which produce minimum loss to the customer. In an automobile, every defect means a loss to the owner. The extraordinary dependability of Japanese products is attributed to the systematic application of this concept to all phases of design, production and maintenance.

Taiichi Ohno also had the systems view in mind, when he screened the entire production process at Toyota to eliminate as far as feasible all the activities which did not add to the value of the product as experienced by the customer. He identified 8 categories of such activities or waste:

1) Overproduction
2) Waiting
3) Unnecessary transport or conveyance
4) Overprocessing or incorrect processing
5) Excess inventory
6) Unnecessary movement
7) Defects and
8) Unused employee creativity.

Over 30 years of intensive planning and experimenting to improve production, the Toyota Production System TPS, evolved, which allowed the production of many different models in small quantities with unparalleled efficiency.

The inventor of TPS himself describes the system in his book, "Toyota Production System, Beyond Large-Scale Production [3].

TPS is the next major evolution in efficient business processes after the mass production system invented by Henry Ford and it has been documented, analyzed and exported to companies across industries throughout the world.

The Deming Chain Reaction

Deming explained to his audience the chain of actions and its consequences known today under the name of the "Deming Chain Reaction".

Quality improvement leads to cost decreases and improved productivity, it captures the market, keeps the company in business and provides jobs and more jobs.

It is interesting to note, that Deming stresses the social function of a company and not the interest of the shareholders. Jobs activate the creative potential of human beings, generate income and provide welfare not just for a few, but for everybody. Unemployment is a waste, a terrible waste, which no nation should tolerate. Think of what the 5.2 million unemployed Germans could do for the nation.

Quality can always be improved and improvement can only come through human ingenuity combined with action managed by competent and responsible managers, which focus on customer satisfaction and the welfare of the employees instead of their own bank account.

Deming promised his audience that whenever Japan will provide the world market with products of unparalleled quality, within five years manufacturers the world over would be trembling and would begin to scream for protection.

Deming later was told by top management that at the beginning he was the only man in Japan who believed it. Finally, after all, Deming was wrong. Japanese industry accomplished this goal within only four years.

Other Elements of the Deming Philosophy

Much more could be said about the Deming management philosophy and its influence on the success of Japanese products in the world market.

Known the world over are the Plan-Do-Study-Act (PDSA) Cycle for continual improvement, the 14 Points for management and the System of Profound Knowledge (SoPK).

The SoPK is comprised of the four major parts:

1) **Appreciation of a System**
2) **Theory of Variation** (right back to where it all started with Shewhart's breakthrough)
3) **Theory of Knowledge** (how do we know things, how do we learn things, how do we improve that learning and knowledge?) and
4) **Understanding of Psychology** (the understanding of people and the way that they interact with all that surrounds them).

This a very human philosophy.

First the Employee, then the Product

Deming advocates that man stands at the centre of every activity, be it as an individual, the team or the organization. His creativity, his vigor, his energy cannot be replaced by anything else.

The more an organization is capable of activating the complete mental an physical potential of its employees, the more successful it will be.

Deming expressed his view on the unique value of man in the form of the following quotes:

- *„If you destroy the people of a company, you do not have much left."*
- *„Monetary rewards are not a substitute for intrinsic motivation."*
- *„All anyone asks for is a chance to work with pride."*
- *„There will be quality of work life*

when people take pride in what they do.“

- *„People are entitled to joy in work.“*
- *„The transformation can only be accomplished by man. A company cannot buy its way to quality“*
- *„There is no substitute for knowledge.“*
- *„Whenever there is fear, you will get wrong figures.“*
- *„Innovation comes from people who take joy in their work.“*
- *„If someone can make a contribution to the company, he feels important.“*

Toyota demonstrates through actions, not only by words, that the convictions behind these quotes are implemented.

This short extract from the commemorative speech by Dr. Shoichiro Toyoda, Honorary Chairman of Toyota Motor Corp., on the occasion of being awarded the honorary doctorate by the Asian Institute of Technology in August 2003 summarizes the values and believes Toyota Motor Corp. is based upon.

“We at Toyota have long cherished the idea that "making things" requires "developing human capability." Since it takes human beings to make things, naturally you would have to build human capability before you'd start making products.

I believe that the same thing applies also to building services, building society, and building nations. I have long been convinced that the capability for making things is the motivating force for the development of industry, the economy, and technology, and constitutes the foundation for any nation's growth.

I can cite three reasons why it is important for us to focus on making things.

First, building of products is a great source of added value for the economy and society. The bulk of human endeavors in economic fields are revolving around useful added values, primarily in the form of making things.

Second, capability for making things induces and supports technological progress. Today, many Japanese argue for devoting ever more efforts to developing sophisticated kinds of fundamental technology. In many instances, however, this would tend to generate disregard and inattention toward the capability for making things, namely, development engineering and manufacturing technology. And I personally have grave concerns about this trend.

To begin with, technology cannot advance on a broad scale if you isolate basic technology from applied technology. These two aspects of technology must be present to work with each other, to stimulate each other, and to be fused into amalgam on occasions, while exchanging their respective needs and seeds between them, for ultimate advancement in both.

Third, making things is important because it brings excitement and joy to the people involved. Human beings are instinctively capable of perceiving beauty in products of high quality and high performance. You must not forget that the act of making things brings joy to your heart and such an act is enjoyable in itself. To exercise your mind, exert your limbs, and spend your time, all for the purpose of making new things, represent a process that you can find gratifying; and when finally the product is complete at the end of your mental and physical exercise, you will be naturally filled with a sense of joy and fulfillment.

Additionally, I would like to say that building products does build people, or help people grow. The issue we have to deal with is how to develop good people for making good products. We have to prepare people and help people develop themselves through the accumulation of experience by performing round and round of work day after day.

In other words, we are building human beings by going through the process of building products; and skilful people thus developed can then rise up to yet greater product-building challenges. This is a continuous process of building human capability through OJT, or on-the-job training.

What is important here is the fact that building human beings means more than just letting them acquire necessary skills, know-how, or techniques.

When we say we "build people" at Toyota, it doesn't just mean that we have people skilful enough to build high-quality products on a timely basis. It also means that our people will have a strong sense of responsibility so that they abide by rules for safety and honor agreements made among team members for joint work; and it also means that every member of the Toyota organization is strongly motivated to improve oneself to aspire for ever higher skill levels.

Let me cite an example: We at Toyota have always been very attentive to what we call "Four S's." The four S's here stand for sifting, sorting, and spick and span. Thorough attention to them helps us identify glitches on shop floors and visualize troubles caused by overburdening, non-value-adding activity and unevenness.

We have made a full use of ideas and experiences of our people directly engaged in production so that we can eliminate problems arising out of disregard of the 4-S's in every part of our manufacturing operations; and as a result, we have been able to build and refine the Toyota Production System, including the "just-in-time" system which many of you may be familiar with. This type of down-to-earth approaches in manufacturing have helped us constantly improve our sensitivity to such factors as safety, quality, efficiency, and costs, and are inherited from generation to generation as the DNA, as it were, of Toyota.

Global competition is growing increasingly fierce, and we are right in the middle of it. For Toyota to maintain and improve its competitive capability as a business entity, it is crucially important that we find suitable ways to pass on our "management philosophy" firmly rooted in the idea of making things, to later generations of Toyota workers and also to share our philosophy with Toyota's local members outside Japan.

As part of the source of Toyota's competitiveness, we have selected and arranged sets of fundamental beliefs and approaches. In other words, sets of values and codes of conduct that will have to be shared by all members of Global Toyota, in the form of the "Toyota Way" for worldwide application.”

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