

Chapter 2

A Historical Path of the Systems

In the first years of the 20th century the famous entrepreneur Henry Ford used to say, half serious, half joking, that “Any customer can have a car painted any colour that he wants so long as it is black” and “What doesn’t exist cannot break” (referring to a car’s optional features). Considering the interruption of the markets development due to the two world wars, in 1960s and 1970s companies all over the world found themselves doing business in a sort of calm sea where the route wasn’t difficult to choose. The consumers requested products they did not have which could significantly improve their daily lives and for marketing managers it was relatively simple to satisfy their needs. The post-war generation, for example, used the moped as means of transport, but for obvious reasons desired a car. As soon as they managed to buy one, it became a Sunday morning ritual to tinker away in ones garage, trying to repair and maintain the product, as it was replacing the broken vacuum valve of the black and white television. The washing machine, the television, the fridge, the dishwasher and other objects that we now take for granted, often remained dreams for years for families in the post-war era. As soon as the financial status allowed it the purchase was automatic, without many demands regarding the quality of the product, from those few companies whose main goal was satisfying a rather large local request. In fact, only very few companies tried expanding to foreign markets due to trade protection and communication barriers. Today every company uses the Internet to complete transactions, but to those times even fax did not yet exist. So the consumer bought a product/service that he had never had before, having to choose between a few competing companies; and this product will have definitely changed his lifestyle. In this context it was quite difficult to obtain personalised products, long-term guarantee, immediate delivery and other services that nowadays are ever-present. The production for this market was concentrated on products that scarcely varied,

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produced by few companies that relied on little competition and relatively low-priced raw materials.

So was it really necessary to strive for excellence through quality and by reducing internal waste?

2.1 The Organisational and Productive Model of Mass Production

Between the 19th and the 20th century F.W. Taylor introduced the so-called Scientific Management, reaching the conclusion that the best establishments had to rigidly and scientifically specialize their organizational roles. If the market demanded an increasing quantity of relatively simple products with a constant rhythm, an “organisational clock”, which was synchronised with this market, was needed. Rather than having a work forces organized in teams to improve products and processes, it was favoured having work forces concentrating on producing at the right speed and with the correct equipment, leaving the task of finding and removing products not up to standard at the end of the chain to quality inspectors. Scientific Management is the organizational model used by Ford to produce the famous model “T”, introducing the assembly line. Compared to taylorism, Ford even believed that the worker had to be completely subdued by the mechanism of the chain: the assembly line set the rhythm of production, or, as we nowadays call it, takt time (cycle time) and the worker had to comply without questioning. A perfect model, with an uninterrupted lead-time would certainly not lead to warehouses with a low inventory turnover. And what about employee management? Concepts like Team Building, Job Enrichment & Rotation and self-accountability were not applied; in fact, workers often felt alienated in this system, an aspect discussed in Charlie Chaplin’s famous film “Modern Times”; even the quality of products was not exactly up to Six Sigma standards, since these were checked by production line inspectors.

To be fair, this organisation allowed a considerable reduction of the car’s unit price, and Ford started selling the cars to the workers, who in the meantime saw their purchasing power rise thanks to the parallel increase of the gross domestic product.

2.2 The Birth of the Japanese Management Systems

Some authors describe the dawn of the Japanese industrial system almost like a philosophical myth; a concoction of elements connected to the rigid social system, the comparison between Shinto and the western philosophy of Cartesian origin, lead to the success we now know. Historical anecdotes aside, analysing the situation with the eye of a macro-economist, it’s certain that Japan, in the mass production glory years, emerged defeated from the second-world war and had to fight obstacles that western, especially American, industries did not have. It’s common knowledge that post world war Japan had:

- higher raw material costs: since Japan has few natural resources, these have to be imported;
- rigid salary ranges due to a stifling union system imposed by the victorious Americans;
- a smaller internal demand compared to western countries, considering the difficulties induced by economic crisis after the defeat in the Second World War.

Attracted by mass production, which kept the western industries at high speed, the inventors of TQC and Lean Manufacturing attempted to compete with similar products obtaining poor results. Mass production followed the very simple equation of “quality equal to costs”, and since the Japanese had the initial disadvantage of elevated costs, there was high risk of producing products of poorer quality than the western competitors. Someone may still remembers the Japanese products of the 1960s, like cameras of very poor quality quite similar to the Chinese products of the late 80s. There are many myths regarding the famous journey in 1950 of the Toyota heir, Eiji Toyoda, and his production manager, Taiichi Ohno, to Ford to understand how they could apply mass production methods to Toyota. Ohno understood immediately that it would not have been a success due to the aforementioned problems; instead, they would have to thoroughly modify the cost structure to obtain a necessary cost reduction. Meanwhile, the situation on the international markets was rapidly changing, moving away from the organisational structures of mass production.

2.3 The Relentless Decline of Mass Production in the Western Nations

In the first years of the 1970s, the GDP of the industrialised western nations was still increasing steadily, and with them, the purchasing power of the consumers.

It has been sociologically proven that an increase of purchasing power is accompanied by an inevitable tendency of the consumer to demand higher quality, seen as reliability, personalized products and other bonuses. Thus, the consumer starts to complicate the lives of marketing managers and their companies by demanding diverse products and thus causing an explosion of production codes.

American and European reached mass product saturation at the end of the 1960s, which reached its peak in 1971 with the American economic crisis and Nixon stepping back on the 1944 Bretton Woods system that determined the convertibility of dollars to gold.

Parallel to this important historical event, the Arab–Israeli Yom Kippur war in 1973 caused increase of petroleum and natural gas prices of 70%. These political and economical events clawed at the heart of Ford concept: the concept of unlimited development based on the limited and unstable resource that is petroleum.

Thus the Japanese industry and especially Toyota in the 70s and 80s had a head start in competing in this new big economic scene, since they had already developed

strategies and methods of eliminating internal waste (the famous Muda), improving the quality of products and, especially, reacting to new clients that demanded personalised products at competitive prices. By the end of the 1970s Japan was the nation to follow for its industrial and economic structure, and many economists were certain that the American decline was inevitable in the next decades.

The western answer to this new situation, it must be said, was not particularly speedy. European countries, for example, tended towards protectionism, leading to a general delay in development, and some organisations were still trailing behind in the new millennium. Differently, the USA initially responded with a reorganisation policy based on cutting back directly on production costs, especially labour and, at the same time, increasing automation.

In the 80s, aided by the explosion of computer science in companies, the concept of Computer Integrated Manufacturing (CIM) is introduced in the USA, making it clear that mainframe, server, robotised cells and AGV would have replaced workmen bit by bit and led to a workman-free factory controlled by few, specialised technicians. Thanks the best universities in the world such as MIT, Harvard, Stanford and others, the USA tried to respond to this new situations with the most advanced systems of planning and control. Software such as MRP I (Material Requirements Planning) and MRP II (Manufacturing Resources Planning), still much used today, are developed together with the first mainframes and servers for companies, making it possible, by using predictive models, to partially keep up with the increase of codes and the reduction of lots the market clamoured for.

2.4 The Recovery of the USA in the 1980s–1990s and the Proclamation of the Japanese Production Systems

It is important to realise that the USA responded to the crisis with a revolution of their economical and industrial philosophy. Obviously a system that leads to excellence like Lean Manufacturing, Six Sigma or for instance TQM (Total Quality Management) has to start with significant commitment by the leadership. The USA started off with a liberal breeze brought by president Ronald Reagan from 1981 to 1989, who personally handed over the Malcom Baldrige prize to companies of excellence; this was the sign of a new era. Even Hollywood declared that the era of finance and of those that considered companies mere short-term profit centres had come to an end, and that now it was time for engineers concentrated on processes; Oliver Stone, the American film director, in the film *Wall Street* denounced greed (greed is good) and the absence of rules in a world of bankers that would have soon been surpassed by technicians and managers that believed in production. In many ways a similar scenario to the last economic crisis that was set off by large banks going bankrupt as well as the US and European public debts is underpinned on the not long-view of short term profits.

Still in the 1980s, Deming wrote one of the best books on management of the last two decades, “Out of the Crisis”: a symbolic title that warned and advised the whole industrial world what really needed to be done to survive in the competitive struggle. A shame, really, that the last crisis didn’t produce similar masterpieces.

The American economy took off and the global competition became more intense. In the 1980s the strategies necessary to compete increased in number:

- understanding the customers demand (Voice of the customer);
- understanding when to introduce new products/services (Time to market);
- the safety and reliability of a product;
- the mix of codes and subsequent reduction of lots in sale and supply;
- on-time delivery;
- reduction of production costs;
- the total cost of a product or service.

As well as the stress on automation and on computerised systems, the USA also started importing TQC-TQM and Lean Manufacturing principles. Womack and Jones of MIT published a book in 1989 called *The Machine That Changed the World*, introducing the concept of Lean Thinking in contrast with Mass production. This book, together with the sequel *Lean Thinking*, finally proclaimed the success of Lean in the whole world. Lean Manufacturing or Toyota Production System, of pure Japanese origin, became a necessity to compete with another important system that was developed in the early 1990s branching from TQM as many authors suggested: Six Sigma.

2.5 The American Model of Six Sigma

From 1985 to the early 1990s Motorola experimented with the famous Six Sigma pattern first on productive processes, subsequently on all company processes, saving 1.5 billion dollars in 5 years and winning the Malcom Balbridge award. Six Sigma spread to most of the western world in the early years of the new millennium, thanks to Motorola and especially General Electrics (GE) and its famous CEO Jack Welch. GE gave Six Sigma that strategic dimension that made it to system of excellence; removing the image it had of being a set of tools to improve quality.

In the year 2000 Harry and Schroeder published a famous book on Six Sigma, giving to this management system a precise route that starts with strategies, uses teams with certified specialization and improvement programs organized in 5 steps (Define-Measure-Analyse-Improve-Control or DMAIC) and, especially, delivers results in the form of saving.

The main principle of Six Sigma is reducing the variability of processes. Every process, be it productive or of service, ideally has a target. A polished steel pole must have a certain diameter, like taking care of a financial case must not take more than a certain amount of days. Unfortunately, processes are by nature subject

to variability and so results drift away from target. Within the process there are certain traits critical to reaching the target that need to remain within a certain programmed toleration zone. For example, to avoid hospital-induced infections a certain bacterial load has to be present. These critical characteristics to the quality of the product/service in Six Sigma are called Critical To Quality, or CTQ. The deviation from the CTQs is statistically measured through the “sigma”, better known as standard deviation. In general the bigger the number of sigma inside the range around the target, the smaller the possibility of producing non-conformities. Which easily translates into satisfied customers and saving in terms of Cost Of Poor Quality (COPQ). If a process reaches a six sigma quality, this means that this process will produce 3.4 defect products or service per million; an unexceptional quality when talking about clothes, but an unacceptable one when discussing airplane landings or surgery success.

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