LUISS

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Organizational Design

Lean Thinking made in Italy and ZBR approach

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INTRODUCTION

Attraverso il pensiero snello: … si ottiene sempre di più
utilizzando sempre meno risorse:
meno sforzo umano, meno tempo, meno spazio,
meno attrezzature e materiali.[1]

The **research question** is to understand the grade of the implementation of Lean Production in the Italian context:
What Lean practices have been adopted by company companies?
In what business areas have Lean practices applied?
To answer this question, the thesis project is supported by insights spread over the four chapters.

The first chapter introduces the concept of Lean Thinking and his differences with the mass production system. The history of the mass production system, starting from Taylor's scientific division of labour, to then analyse the first assembly line developed at Ford's Highland Park plant, until the 1970s. which will mark the end of the era of "Fordism" and the beginning of "Post Fordism". When the mass system was spreading around the world after the war, Toyota decided to take an alternative route, assuming that there were no conditions in Japan for the implementation of a mass production system. Thanks to the engineer Taiichi Ohno at the start of 1950s. Toyota created a new production system “TPS” based on the absolutely elimination of the waste inside the firm through the introduction in his plant of two important innovation: JIT and autonomation. When the oil crises generated changes that shocked the world and made mass production and its principles obsolete, many people began to wonder why Toyota continued to have success.
The reasons were clear to everyone when, in the late 1980s, John Krafcik published the results of one of the largest sector studies ever conducted: "World assembly plant study (IMVP)". The study showed a clear superiority

[1] Mario Deaglio, *La macchina che ha cambiato il mondo*, 1993, p. XVI.

in terms of productivity, product quality, inventory management and space used for the assembly of the Toyota Taokaka factory compared to the assembly of other factories. The authors of the research had concluded that Lean Production could be exported to the West with excellent results.
In the 1988 J. Krafick in the article "Triumph of the Lean production system" coined the term Lean Thinking, the western translation of the TPS. This concept was later taken up by J. Womack and D. Jones in the books "The machine that changed the world" and "Lean Thinking, how to create value and banish waste ” were they defined the 5 fundamental principles of Lean Thinking: the definition of the value, identification of the value flow, continuous production flow, pull and perfection.
Although studies conducted at the end of the 80's have highlighted the superiority of Lean Thinking compared to mass production in the automotive sector, and subsequently also in other sectors, the dominant model has remained the second and Lean production still remains the exception and not the rule.

The second chapter introduces the topic of the application of Lean Thinking in Italy. Already since the 1970s there has been an interest on the part of Italian companies for quality management systems, created in Japan after the war. The first quality circles were introduced in the factories of SNIA Viscosa and Ire Ignis, the results of which however were well below expectations. In 1989, Fiat launched the Total Quality project, the first project in Italy for quality management on a corporate scale, and in 2005 it introduced World class manufacturing into the Melfi and Tychy plants, a production system that integrates the concepts expressed by the Lean thinking with those expressed by the Total Quality Management and which focuses on cost deployment. In the wake of Fiat, other Italian companies have started a process of corporate restructuring, this process begin with large companies in the 1990s and subsequently, in the last decade, in the Italian SMEs, driven by the increase in international competitiveness and the difficulties generated by the crisis. financial year 2008.

The Third chapter illustrates the concept of Lean Production: the practical application of Lean Thinking. Lean Production is a holistic management system consisting of two orientations: philosophical orientation (principles and philosophy) and technical orientation (Lean practices). The focus in this chapter is on the technical orientation, more specifically on Lean practices. In the literature there are a lot of different techniques for grouping Lean practices, one of the most famous is the use of "Lean Bundles" groups. The two authors who were deeply interested in the definition of bundles with reference to the Lean Production system are Shah and Ward. They contributed to the creation of a solid methodological and conceptual basis regarding, on the one hand, the definition of Lean bundle and, on the other hand, the study of the relationship between multiple clusters of techniques and various performance indicators, without stopping at a technical analysis by technique .There also other important study that contributed to the creation and evolution of the Lean Bundles. The chapter will conclude with the analysis of some of the most important studies in the field.

The fourth chapter illustrates the methodology chosen for the in-depth study of the topic. The choice has been oriented towards the qualitative analysis of various companies have adopted the Lean production. Through the data collection and the interviews, it was possible to address the issues of the implementation of Lean Production in the Italian SME of the research question. It shows all the empirical results derived from the study, interviews and data collection.

Also, from the perspective of management systems based on good management, Chapter V will show the ZB approach. Unlike Lean Production, which is applied as part of improving business production processes, ZB approach is used in administrative cost analysis. Both models are based on the principle of the centrality of measurement and have as their common goal the elimination of corporate waste. Through the ZB, companies redesign the organization and promote structured interventions called "evolution initiatives" that generate cost savings. The history of the ZB originates in 1970 when Peter Pyhrr published an article

in the Harvard Business Review in which he introduced the concept of Zero-based-budgeting (ZBB). Pyhrr's idea is simple: starting from scratch, gradually adding only the costs deemed necessary and functional. The ZBB approach is used in Budgeting operations and represents a completely new methodology compared to those used previously. In the first years of life, the ZBB is applied only for the analysis of administrative costs but it was not very successful. At the end of the years 80' the ZBB began to acquire a certain notoriety, finding more and more space within companies. The modern application of the ZB approach are the ZBx and ZBR. The ZBx consist in use of ZB methodology into 4 micro-categories: ZBS (zero-based spend), ZBO (zero-based organization), ZBC (zero-based commercial) and ZBSC (zero-based supply chain).

The second evolution approach is the Zero-Based Review. During this chapter I describe the adoption of ZBR inside the banking institution where I did my internship. I define his methodology and its application in three organizational function: Marketing, Digital Innovation and Back Office. After I make the conclusion with the highlights of the results obtained.

CHAPTER I

1.1 MASS PRODUCTION

In 1911 Frederick Taylor, an American engineer, published a series of studies conducted on the work of American workers in factories. He realized that the organization of the work was completely random and that the companies obtained mediocre results in the face of considerable efforts.

He then hypothesized a division of labour based on the execution of simple operations always entrusted to the same worker, then measured the time necessary to perform each operation (one best way, there is a better way to carry out an operation). Each worker had to perform his task within the

standard times indicated by the manager, the managers had the task of ensuring that the worker was properly trained to carry out his task in the manner and time required.

Frederick Taylor gave birth to what we commonly call today the "scientific method of work". However, Taylor's work was criticized and found no application in the industrial field, until Henry Ford first used scientific work in automobile manufacturing.

H. Ford founded, together with 12 other shareholders, the Ford motor company in 1903. Despite the early years of the company's life, they were characterized by the success achieved with the market launch of the Ford T in 1908 (Ford was the first car manufacturer to reach 10,000 cars sold[2]) Ford plants was unable to produce more than 25 cars per day. The revolution occurred in 1913 with the introduction of the assembly line, within a year the time needed to produce a Ford T dropped from 12 hours to 93 minutes, increased efficiency within the factories and the price of the car fell by many hundreds of dollars. Between 1908 and 1927, 15 million Ford T were produced (from 1914 to 1926 only in black version), the new revolutionary production system took the name: "Fordism".

Fordism did not mean only the application of the scientific method and the use of the assembly line, in fact, other important innovations were introduced in the Ford plant:

- **High wage policy**, Ford workers were the highest paid in the world, introduction of piecework and guaranteed jobs for life. Automation, i.e. the introduction of large machinery with specific functions.
- **Creation of "large production plants"**.
- The River Rouge plant, considered at the time to be the "largest integrated factory in the world", construction began in 1917 and ended in 1928, hosted over 100,000 workers in the 1930s.
- **Reduction of car components**.

[2] https://web.archive.org/web/20150315112906/http://www.modelt.ca/background.html

1.2 FORDISM CRISIS

In 1927, after 20 years, the Ford T is no longer produced. An emblematic case that describes the rigidity of Ford's production system is provided by the book "the car that changed the world":

In 1927 Ford needed a larger part following the decision to re-design the "A" model. In addition to changing the old part, Ford also changed the same machinery. Ford's only goal for years has been to produce the T model, no one inside the factory was ready for a change, the conversion of production from the T model to the A model involved closing the Highland Park plant for months.

However, the market was changing, Chevrolet and Gm launched new machines on the market, more modern and less expensive than the T model, produced using the same methods invented by Ford. In a few years, in fact, the innovations introduced in the Highland Park factory travelled around America and the other major automotive companies created an assembly line within their factories. On the other hand, reproducing Ford's assembly line required companies to invest around $ 3,500, despite a considerable increase in productivity.

So, for the first time in history, American consumers had the opportunity to choose from multiple different car models all with a similar price range.

Ford could no longer replicate the successes achieved in the 1920s thanks to the T model, alternating difficult moments such as the crisis of 1931 where many workers were laid off and wages were reduced, to positive moments as in 1932 with the launch of the Model V8.

Although Fordism was exported all over the world in the post-war period and remained the dominant model until the end of the 70s, the first failures made by Ford highlighted its fragility. The limitations of the mass production system became evident only in the 1970s, thus marking the end of the era of Fordism and the beginning of Post-Fordism.

1.3 THE BIRTH OF THE TOYOTA PRODUCTION SYSTEM (TPS)

Nessuna nuova idea nasce già del tutto formata dal nulla. Le nuove teorie emergono da una serie di condizioni in cui le vecchie non sembrano più funzionare. Questo si applica in particolare alla produzione snella, che sorse in un paese in un momento in cui le idee convenzionali per lo sviluppo industriale del paese sembrano inattuabili.[3]

When the mass system was spreading around the world after the war, Toyota decided to take an alternative route, assuming that there were no conditions in Japan for the implementation of a mass production system:

- **Limited and highly diversified domestic demand:** The demand for vehicles by Japanese citizens varied from luxury cars for government officials, large trucks for transportation, trucks for peasants and small cars that took into account the conformation of Japanese cities (the machine that changed the world ...)
- **Absence of cheap labour:** In the absence of a migratory phenomenon in the Japanese peninsula, Japanese companies, unlike American and European ones, did not have the opportunity to hire immigrant workers on favourable terms.
- **Unions:** During the American occupation, new union laws were imposed on Japan that limit layoffs and imposed minimum wages and profit sharing with employees. In Japan, the first cases of "company syndicates" were occurring, unions were beginning to become part of the business system, attending company meetings and being involved in decision-making processes. Corporate unionism has developed in the West since the 1980s.
- **Low capital availability**: Japanese companies did not have enough resources to be able to purchase the machines that were used in Europe and America.

[3] J.P. Womack, T.D. Jones e D. Roos, *La macchina che ha cambiato il mondo*, Rizzoli, Milano, 1991, p. 21.

1.3.1 History of Toyota: "the origins"

The Toyoda family officially entered the automotive sector in 1933, that is when the Toyoda Automatic Loom company created in 1890 and dedicated to the production of weaving looms opens a branch dedicated to cars. At the head of this section is placed Kiichiro Toyoda, son of Sakichi the founder of Toyoda. Both Sakichi and his son Kiichiro were convinced that although the family business was going well, the future was represented by cars, so they decided to separate the textile business from the automobile business and to create Toyota in 1937 (which in Japanese means fertile paddy field) motor company as an independent company. The first years of Toyota's life were characterized by many difficulties, at the end of the 30s the production of cars for private use was thwarted by the government, so the company decided to engage in the production of trucks, by order of the Japanese army. The production methods used by Toyota in the 1930s and 1940s were handcrafted.

After the war, the Japanese economy was revitalized by the American occupation, but despite this, Toyota fell into a deep crisis:

“Toyota had little difficulty getting orders for automobiles, but rampant inflation made money worthless and getting paid by customers was very difficult. Cash flow became so horrendous that at one point in 1948 Toyota s debt was eight times its total capital value (Reingold, 1999)**.**

To avoid bankruptcy, Toyota adopted strict cost-cutting policies, including voluntary pay cuts by managers and a 10 percent cut in pay for all employees. Finally, even the pay cuts were not enough, this forced Toyota to ask for 1,600 workers to retire voluntarily**.** In total there were more than 2,100 layoffs, almost ¼ of the company. To resign was also the president of Toyota Kiichiro Toyoda.

1.3.2 The Company Crisis and the first historical changes

Despite the crisis deeply affected Toyota, it marked a turning point for the company. Employees who stayed in Toyota received two guarantees:

- Lifetime job.
- Progressive increase in salary according to a logic of seniority and profit sharing of the company (this same model was later adopted in almost all Japanese companies). Thanks to this system, the workers had no incentive to leave, Toyota created a real community including housing for employees and their families. Employees in this way accepted to be flexible in assigning tasks and were active in promotion of business interests.

  The new president Eiji Toyoda set the corporate goal of bringing Toyota's production process to the same productivity levels as Ford within 3 years. The task was assigned to the Plant manager Taiichi Ohno, Ohno seemed to have an impossible task ahead of him, just think that in 1937 the productivity of an American worker was roughly equal to that of 9 Japanese workers By the end of the 1940s, Toyota had produced a total of half the number of cars that the Ford plant in Rouge had produced in a single day, 2685 against 7000.[4]

  The mass system developed by Ford, capable of producing in very large quantities was justified by the American and European market demand, which was constantly growing, in 1955 only 7 million cars were sold in America alone. Japanese domestic production was much more modest than in 1949 it was 25,622 trucks and only 1,008 passenger cars. Toyota's growth was therefore severely limited by domestic market demand.[5]

1.3.3 The Taiichi Ohno revolution

Taiichi Ohno (1912-1990) held many positions within Toyota: from that of engineer to that of vice-president (the highest position at the time reached by a person not belonging to the Toyoda family), Ohno is considered the founder of the TPS system.

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[4] Taiichi Ohno, N. Bodek *Toyota production system, beyond large-scale production, 1988*
[5] https://www.aisastoryauto.it/wp-content/uploads/2015/02/AISA-Monografia58-Boscarelli.pdf

Ohno started working at Toyota in 1943, before then he had worked in Toyoda Spinning and weaving: “My job until 1943 was in textiles, not automobiles; this was an advantage. In fact, the idea of automation with a human touch was obtained from the auto-activated looms of Toyoda Sakichi's textile plant "(Taiichi Ohno)[6].

In 1950 Ohno together with some Toyota managers and President Eiji Toyoda visited Ford's River Rouge plant, the purpose of their travels was to bring American manufacturing innovations inside Toyota. The visit to the River Rogue plant did not meet expectations at all, however it was nevertheless useful to Ohno and his collaborators who saw with their own eyes all the defects of the mass production system:

- Overproduction problems.
- Inventories full of stocks.
- Work force employed in performing unnecessary tasks.

Back in Japan Taiichi Ohno defined the concept of value which we will discuss in more detail later and the concept of garbage, wrote down all the defects he had observed in the River Rogue plant and in the Toyota plant and gave it the name "garbage". Then divided the garbage into seven distinct types:

- Waste of overproduction.
- Waste of time on hand (waiting).
- Waste in transportation.
- Waste of processing itself.
- Waste of stock on hand (inventory).
- Waste of movement.
- Waste of making defective products.[7]

[6] Taiichi Ohno, N. Bodek, *Toyota production system, beyond large-scale production, 1988*

[7] Taiichi Ohno, N. Bodek, *Toyota production system, beyond large-scale production, 1988*

He then studied a solution that would include the elimination of garbage (Muda[8] in Japanese) produced inside Toyota's factories and then introduced two important innovations for the company: the Just in time delivery system and the Jidoka or the autonomation of machinery.

1.3.4 The Just In Time system (JIT)

The first innovation introduced by Ohno was to base the production volume on customer demand and not on the capacity of the plants. He then started from the end of the production chain to get to the beginning, in this way Ohno realized that the processes were closely connected with each other, which could not be said for those who adopted a mass production system. The advantages of adopting the JIT system were:

- The elimination of bottlenecks: obtained thanks to the collaboration of workers and the revolutionary Kanban communication system (which we will discuss more about later).
- Reduction of warehouse stocks: with the JIT system, in fact, only the pieces needed to support the monthly production plans were ordered, that is, following a logic based on the pull[9] system. Soon the warehouses were emptied and the rotation of the warehouse decreased to only one month.
- Increase in profits thanks to the reduction of costs: by producing only the machines requested by customers, Toyota did not only save in the supply of components, but also the cost of the workforce collapsed.
- Customer satisfaction: the goal that Toyota sought to pursue through the JIT system was "the customer satisfaction". The production of small batches on commission, allowed Toyota to concentrate on the product specifications requested by customers, which those who produced in large batches were unable to do.

[8] To notice how the word Muda does not find a recurring use in the book "Toyota production system", is used as a synonym of trash by Womack and Jonson and becomes a recurring word in the literature on Lean thinking.
[9] For the Pull Ohno system was inspired by the shelf refuelling methods used in American supermarkets (The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer, 2004)

At the same time, however, the JIT system presented some critical issues:

- Coordination of processes within the same plant.

- Need for a timely supply of raw materials. As Taiichi Ohno reports, in the first years after the introduction of the JIT, suppliers struggled to align themselves with Toyota's production system and often delayed delivering the parts, which turned into a production block and a delay in the delivery of cars. to customers.
- Production levelling: Toyota had to be able to vary its production capacity in a short time, so that it could always meet market demand. In 1950, following the outbreak of the Korean War, there was an exponential growth in the Japanese automotive sector, just 3 months before Toyota had finished laying off about a quarter of its workers. Despite this, thanks to Ohno and his ability to level production, Toyota managed to take advantage of the increase in demand and began to establish itself as a leader in the production of cars in Japan.

1.3.5 The Autonomation system (Jidoka)

The idea of autonomy was born with the invention of the Self-Activated Frame of Toyoda Sakichi, the frame was in fact equipped with a device that automatically and immediately stopped the machine in case of breakage or depletion of the vertical or lateral wires. Toyota decided to install preventive "devices", capable of detecting anomalies, on its machinery. If a problem had occurred, production would have stopped immediately so that defective parts were not produced. With the prevention mechanisms, the workers' task was no longer to check the state of health of the machinery, but rather to intervene if the prevention mechanisms indicated a malfunction. This

allowed managers to assign multiple machines simultaneously to a single employee. The advantages of adopting the autonomation system were:

- Elimination of defective parts: thanks to the prevention mechanisms, as soon as an anomaly was detected, the machinery was stopped by the worker. This mechanism ensured that no defective parts were produced within Toyota's plants. The correct functioning of the autonomation was guaranteed in this case by the "visual control" system implemented by Toyota, which makes worker intervention timely in the event of anomalies.

- Elimination of overproduction: Thanks to the prevention systems, Toyota leaves the logic, at the time prevailing, to exploit the maximum production capacity of a machine before it showed faults or defects. In other factories the machines were left on for hours to produce parts that they would end up in the warehouse.

- Reduction of costs and consequent increase in profits: reduction of the cost of the workforce, in the purchase of raw materials and reduction of costs due to the elimination of the production of defective parts.

- Increased productivity: each worker is assigned to multiple machines.

Critical aspects of the autonomation system:

- Autonomy presupposes flexibility of workers, who must play multiple roles simultaneously.
- Autonomy presupposes that the worker develops skills on the use of multiple machines.
- Autonomy assumes that prevention systems are working properly.

HISTORY OF THE TOYOTA PRODUCTION SYSTEM

JUST-IN-TIME

1945

1949 ▸ Intermediate warehouses abolished

1958 ▸ Warehouse withdrawal slips abolished

1950 ▸ Machining and assembly lines synchronized

1955 ▸ Assembly and body plants linked

1948 ▸ Withdrawal by subsequent processes ("upstream" transport)

1953 ▸ Supermarket system in machine shop

1955 ▸ Required number system adopted for supplied parts

1953 ▸ Call system for the machine shop

1955 ▸ Whirligig water system (small load/mixed transportation)

1945-55 ▸ Setups (2 to 3 hours)

1957 ▸ Procedural chart (*andon*) adopted

1947 ▸ 2-machine handling (parallel or in L-shaped layout)

1949-50 ▸ 3- or 4-machine handling (horseshoe) or rectangular layout)

Separation of machine work and worker's work begins

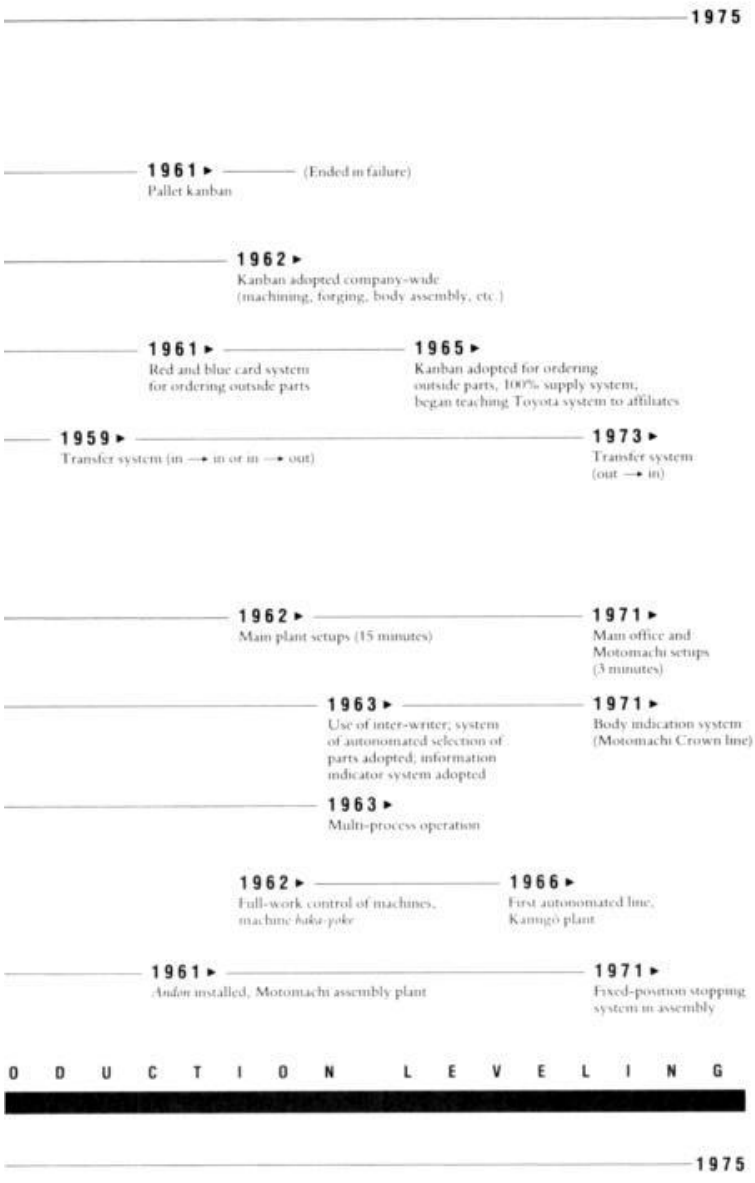
1950 ▸ Visual control, *andon* system adopted in engine assembly

1955 ▸ Main plant assembly line production system (*andon*, line stop, mixed load) (automation → autonomation)

1953 ▸ P R

AUTONOMATION

1945



1.4 THE OIL CRISIS

The oil crises of 1973 and 1979 generated changes that shocked the world and made mass production and its principles obsolete.
During the chapter, we will focus on 3 factors that contributed to the end of the Fordist era:

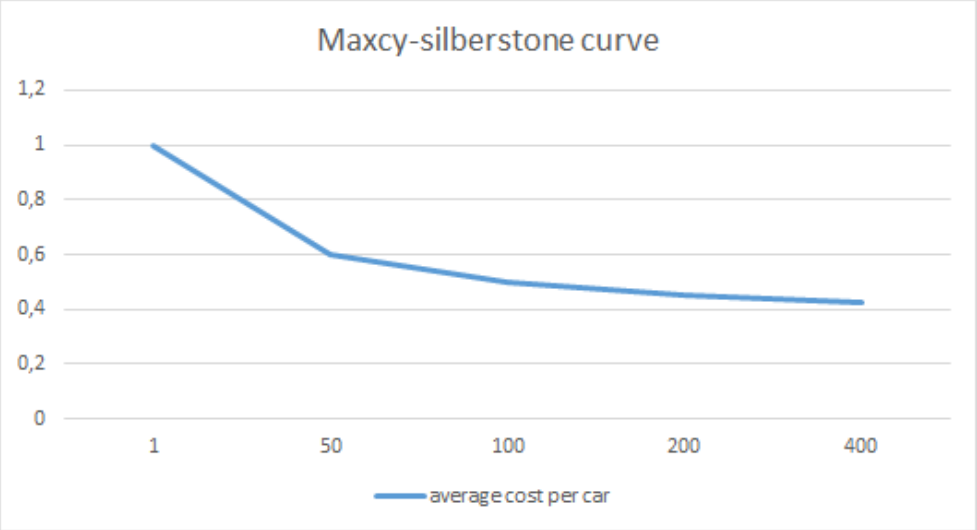
[10] Taiichi Ohno, N. Bodek, *Toyota production system, beyond large-scale production*, 1988

- The evolution of consumer tastes: fragmentation of the demand curve in the automotive sector in different consumer groups with different needs and preferences.
- Rising raw material costs and labor costs: production models based on economies of scale stop working (Maxcy-Silberstone curve).
- Market stagnation: Demand curve contraction in the automotive sector and in other sectors.

During the same years, western companies, which previously ignored the innovations introduced inside Toyota plants, began to study TPS and during the late 80s conceptualized it by creating a philosophy based on reducing waste and continuously improving business processes, which took the name of Lean Thinking.

1.4.1 The Maxcy-Silberstone curve

In the 1950s Maxcy and SIlberstone conducted a study of the British car companies which they published in the book "Motor Industry"(1959).
The study highlighted a positive relationship between the increase in production volume and the reduction in the average unit cost of production of cars, the relationship was expressed through the "Maxcy-Silberstone" curve.



An example of application of the MS curve in literature is the essay by Clement Allan Tisdell, where the Australian author ("Efficiency and decreasing cost industries, 1970) hypothesizes that by concentrating the production of Australian automobiles in one company, production costs would have collapsed. .

DATA collected by Maxcy and Silberstone in the book "Motor Industry"

Annual volume of cars '000	Average cost per car
1	1
50	0,6
100	0,5
200	0,45
400	0,425

“In doing so, we must be cautious because their findings are based principally on United Kingdom experience and the production mix and technology of over a decade ago and are subject to variation depending upon the length of run of models and the variety of models, etc. Nevertheless, the findings can be treated as a rough guess.” (Alan Tisdell)

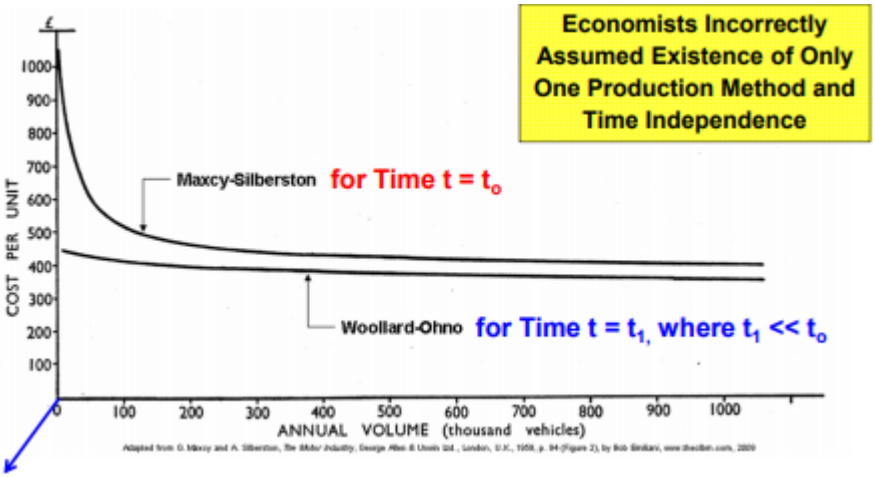
He took the car number produced by American companies: B.L.M.C., Chrysler, Ford and G.M.H. in Australia and to each company it associated an average cost rate based exclusively on the production volume, according to the parameters identified by Maxcy and Silberstone (average cost per car).

Annual Output	Average Cost
50.000	0.6
50.000	0.6
75000	0.55
150000	0.475
(tot Output = 325.000)	0.43 (if the total volume was produced by one firm)

The concentration of production in a single company would have generated a reduction of average unit production costs of 19%, the conclusion of the study was that large companies are more competitive on the market than small companies. Although the M-S Curve stems from a study in the automotive sector, it has found application in all Cost Decreasing sectors. The curve lost its meaning in the 70s, following the increase in the cost of raw materials and labour, so the increase in production no longer guaranteed a substantial reduction in costs. In this scenario, the advantages of the Lean company emerged, which is much more flexible

than the large business model, as it is able to produce any quantity of product and thus adapt to fluctuations in the demand curve.

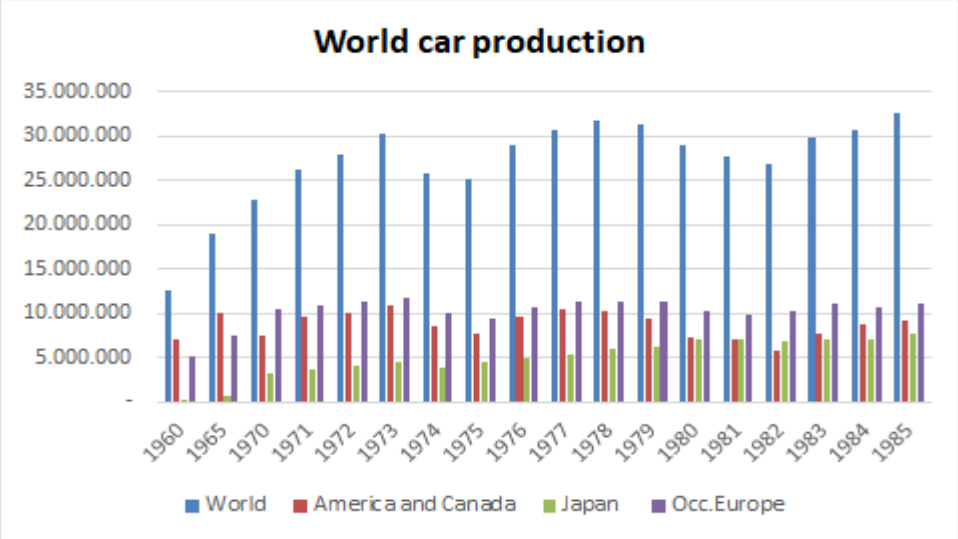
For Lean firms, the curve that best describes the relationship between production volume and average unit cost is the Wollard-Ohno curve.



Source: https://bobemiliani.com/goodies/emiliani_eos_slides.pdf

In the Wollard-Ohno curve, economies of scale do not occur, the average unit cost remains constant as production varies.

1.4.2 The demand curve in the automotive sector



Source: https://www.anfia.it/it/automobile-in-cifre/statistiche-internazionali/produzione-mondo

Year	World	America and Canada	Japan	Occ.Europe
1960	12.603.237	7.000.079	165.094	5.118.064
1965	18.992.826	10.044.795	696.176	7.393.102
1970	22.794.169	7.473.640	3.178.708	10.397.143
1971	26.356.272	9.666.854	3.717.858	10.931.515
1972	27.945.861	9.963.907	4.022.289	11.427.653
1973	30.231.474	10.901.718	4.470.550	11.837.032
1974	25.806.973	8.511.034	3.931.842	9.956.673
1975	25.290.371	7.770.860	4.567.854	9.340.310
1976	29.095.188	9.635.206	5.027.792	10.775.208
1977	30.792.399	10.376.173	5.431.045	11.231.857
1978	31.714.019	10.336.039	5.975.968	11.318.355
1979	31.301.930	9.421.335	6.175.771	11.337.899
1980	28.967.094	7.222.283	7.038.108	10.371.936
1981	27.722.408	7.056.255	6.974.131	9.816.310
1982	26.919.858	5.881.141	6.881.586	10.286.838
1983	29.924.841	7.750.051	7.151.888	11.137.331
1984	30.637.562	8.794.878	7.073.173	10.707.162
1985	32.620.037	9.262.756	7.646.816	11.196.243

The data refer to the production of passenger transport vehicles and do not include freight transport vehicles (LCV).

As we can see from the production data in the automotive sector in 1974 and 1980, or the years following the two crises, the quantity of cars produced in the world decreased by 17% and 8% respectively compared to the previous year. Only in 1984 (30,637,563) was the number of cars that were produced in 1973 (30,231,474) reached. The number of cars produced by the Japanese grew progressively until 1980, when the Japanese production reached the American and Canadian ones in numerical terms.

1.5 INTRODUCTION TO LEAN THINKING

è bene sottolineare che la produzione snella è la concettualizzazione americana di un fenomeno giapponese che i giapponesi non hanno mai concettualizzato.[11]

Outside of the Toyota world, TPS is known as Lean Thinking. The term was coined by John Krafick in 1988 in the article "Triumph of the Lean production system", is and was later taken up by J. Womack and D. Jones in the books "The machine that changed the world" and "Lean Thinking, how to create value and banish waste ".

Before the studies conducted by Krafick, Japanese growth was justified by Americans and Europeans through the "Country Specific" factors:

- Cost advantage due to low wages, favorable exchange rates and low capital costs.
- Production of low consumption cars.
- Use of large machinery and use of automation in factories (in fact it was the exact opposite).
- Huge funding from the state to rebuild the Japanese productive fabric after the Second World War through the MITI- Ministry of International Trade and Industry.
- Intrinsic value of Japanese culture, according to which Japanese workers were dedicated to sacrifice and had a group mentality.
- Low union conflict.
- Creation of financial groups between companies, rather than the use of vertical or horizontal integrations.

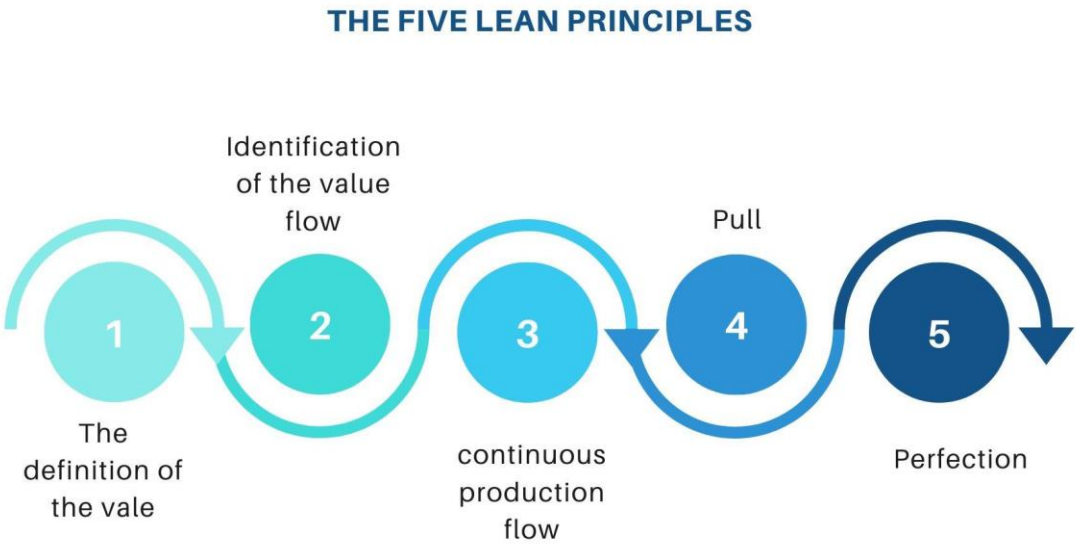
The reasons for Toyota's success were clear to everyone when, in the late 1980s, the American author published the results of one of the largest sector studies ever conducted: "World assembly plant study (IMVP)". The IMVP began in 1986, born with the aim of studying the performance of car assembly plants around the world, in total data was collected on 90 plants in 17 different countries. The study showed a clear superiority in terms of productivity, product quality (expressed in numbers of assembly defects per

[11] Mario deaglio, prefazione *la macchina che ha cambiato il mondo*,1993, p. XVII.

100 cars), inventory management and space used for the assembly of the Toyota Taokaka factory compared to the assembly of other factories. Furthermore, the results of the analysis indicated that in the "NUMMI" plant in West America, where Lean practices were applied, the performance was far above average and almost comparable to that of the Taokaka plant. At the end of the research Krafick had conclude that Lean production could be exported to the West with excellent results.

1.6 THE LEAN PRINCIPLES

In the book Lean Thinking: how to create value and ban waste, the 5 Lean principles are described for the first time, which are a guideline for all companies that decide to convert to the Lean methodology. During the discussion I will report the Lean principles and compare them with the classic managerial principles, trying to highlight the similarities and divergences.



1.6.1 The Definition of Value

The company that adopts Lean thinking must therefore start from a conscious attempt to precisely define the value in terms of specific products with specific characteristics offered at specific prices through a dialogue with specific customers.[12]

The main goal of a Lean company is to eliminate all waste, the different types of waste were listed, as we have already seen, by Taiichi Ohno. The Lean principles are a guideline on how eliminate waste, the starting point is precisely the correct definition of value:

- The value is defined by the customer.
- It is the company that creates value.
- The value is subjective and is associated with the good or service.

Defining the value in these terms became fundamental for companies when, at the end of the 70s, markets began to be characterized by the division of demand into many uneven groups of consumers. This obviously penalized mass producers who, organized into functional structures, were accustomed to producing only one type of product at a time.

1.6.2 Identification of The Value Flow

After defining the value for the customer, thus avoiding launching products not requested by customers on the market, we move on to the second phase: the identification of the flow of value. The flow of value is defined as: "the set of actions required to conduct a given product through the three critical tasks of the management of any business: The resolution of problems (from concept to launch in production through detailed design and l 'engineering), information management (from receipt of order to delivery through detailed programming) and physical transformation (from raw material into a finished product in the customer's hands) "(Womack, Jones) Reconnecting to what we said in the definition of value, the customer defines the value, but it is still the company that creates it. Identifying the

[12] Womack and Jones, *Lean thinking: Come creare valore e bandire gli sprechi*, 1997, p.48.

flow of value means, however, to focus on the company and not only ... In its value creation activity, in fact, the company meets a series of economic agents such as suppliers, who are involved as much as the company in the process of creating value.

Once the flow of value has been identified, it must be analysed to find all the waste present in the business processes. According to Womack and Jones, through the analysis of the flow of value, 3 types of activities can be identified:

- Activities that create value.
- Activities that do not create value, but which are inevitable (type one muda).
- Activities that do not create value and can be eliminated immediately (type two muda).

The goal of the Lean company is to eliminate the type two muda and to transform the type one muda into type two muda and then eliminate it.

1.6.3 Continuous Production Flow

Once the value has been precisely defined, that the flow of value for a given product has been reconstructed and that unnecessary activities have been eliminated, we arrive at the next step of the Lean thought: "to flow the value-creating activities" .

The continuous production flow was introduced by H. Ford, in the Highland Park factory, and companies still follow this concept. In 1913 Ford reduced the work required by assembling a Model T car by 90% by converting the final assembly to continuous flow. Later he tried to build flows along the entire production path, from raw materials to the shipment of the finished car. Continuous flow was used to produce in large batches, so the mass production model became continuous flow with a logic based on lots and tails.

Toyota also adopted continuous production flow, which unlike Ford's, was designed to produce in small batches, continuous flow based on small batch production. As we have seen in the previous paragraphs, the choice

of Toyota proved successful, especially after the energy crises, when companies were forced to live with stagnant demand and increasingly demanding consumers. It was Taiichi Ohno in the 1950s who introduced this new system to Toyota, leveraging on the use of multifunctional machines, on the ability to reduce the time and costs of retooling and on staff training. The advantages of small batch production are:

- The possibility of producing a large variety of products in the same plant.
- The possibility of producing the same product with different specifications in the same plant.
- Produce while keeping inventory in a very low level.
- Ability to level production to respond to fluctuations in the demand curve.

1.6.4 The Pull System

Once the flow flows according to a logic based on lots and queues, another important principle must be introduced: "pull". The companies that adopt the pull system only produce what is expressly requested by the customers, both in the ways and within the established times. The Pull system was introduced by Toyota in 1950 and is inspired by the refuelling system of American supermarkets. The pull logic contrasts with the Push one used by those who produced in batches and queues according to which it is necessary to produce as much as possible and then push the product to end customers. The main problem with this method is obviously the fact that since the customers did not request the product, the companies had no guarantee of sale. So, in the late 70s, when the markets froze, businesses found themselves with warehouses full of unsold products. Inside the Toyota, the Pull system proved to be particularly effective thanks to the implementation of the "Kanban" communication system, both mechanisms also allowed the "JIT" system to function correctly.

1.6.5 Perfection

The fifth and final principle is perfection: Perfection is like an asymptote, which although unattainable must play a constant role of reference, in order to keep a systematic improvement process active.[13] The principle of perfection pushes the Lean company to start two different types of improvement cycles:

- The continuous and gradual improvement cycles or the Kaizen, which have the aim of eliminating the muda left after the Kaiaku activities within the company.
- The extraordinary and radical improvement cycles or Kaiaku, mainly used in the conversion of the company into a Lean company.

  Both improvement cycles are essential for the company to improve internal processes, thus creating a quality product capable of satisfying the customer.

Until the 70s, companies were focused more on quantity and on the control of production costs rather than on quality, the quality management system was mainly based on "quality control".

1.7 CONCLUSION OF CHAPTER I

Although studies conducted at the end of the 80's have highlighted the superiority of Lean thinking compared to mass production in the automotive sector, and subsequently also in other sectors, the dominant model has remained the mass one.

Lean production remains the exception and not the rule, compared to the past, however, important milestones have been achieved and we can say that now Lean philosophy has spread in all western countries.

In Italy, starting from the 70s, an interest in the topic of quality management has arisen which has involved not only companies but also scholars, this was the first step to the creation of an Italian Lean movement.

[13] Womack and Jones, *Lean thinking: Come creare valore e bandire gli sprechi*, 1997, p. 149.

During the second chapter we will talk about Lean Thinking in Italy: the history, the success stories, the characteristics and the current scenario.

	Fordism	**Post-Fordism**	**Lean Production**
Product range	Limited	Extended	Extended
Product variety	Standard product	Customizable product (color, shape, ...)	Mass customization
Production volume	High	Medium	Low
Technology used within plants	Simple and dominant	Complex and dominant	Complex and adaptive
Production flexibility	Low	Medium	High
Production focus	Production costs	Product quality	Value for the client
Machine usage	Maximum exploitation of machinery	Maximum exploitation of machinery	Production leveling

CHAPTER II

This table rappresent the evolution in the adoption of qualitative management tools in the italian firms.

1970-80	**1989**	**2005**
Quality circles	Total quality project/ fabbrica integrata (fiat)	World class manufacturing (Fiat)

2.1 QUALITY MANAGEMENT

Since the 1950s, the issue of quality has been addressed in both Japan and the United States, and a similar but at the same time divergent thinking has developed in each of the two countries.
Considering that quality control had so far been applied in companies, which included only the product without defects, now the discourse was evolving towards quality management, which implied an integrated vision.
In Japan, TQM develops which "pays particular attention to the concept of quality in processes and products through the involvement of all individuals present in the organization, from top management to the worker"; a concept that only spread to the West in the late 1970s.
In America, however, Armand Feigenbaum introduced the concept of "Total quality control", TQC, underlining how improving the quality within the company would also improve its financial performance.

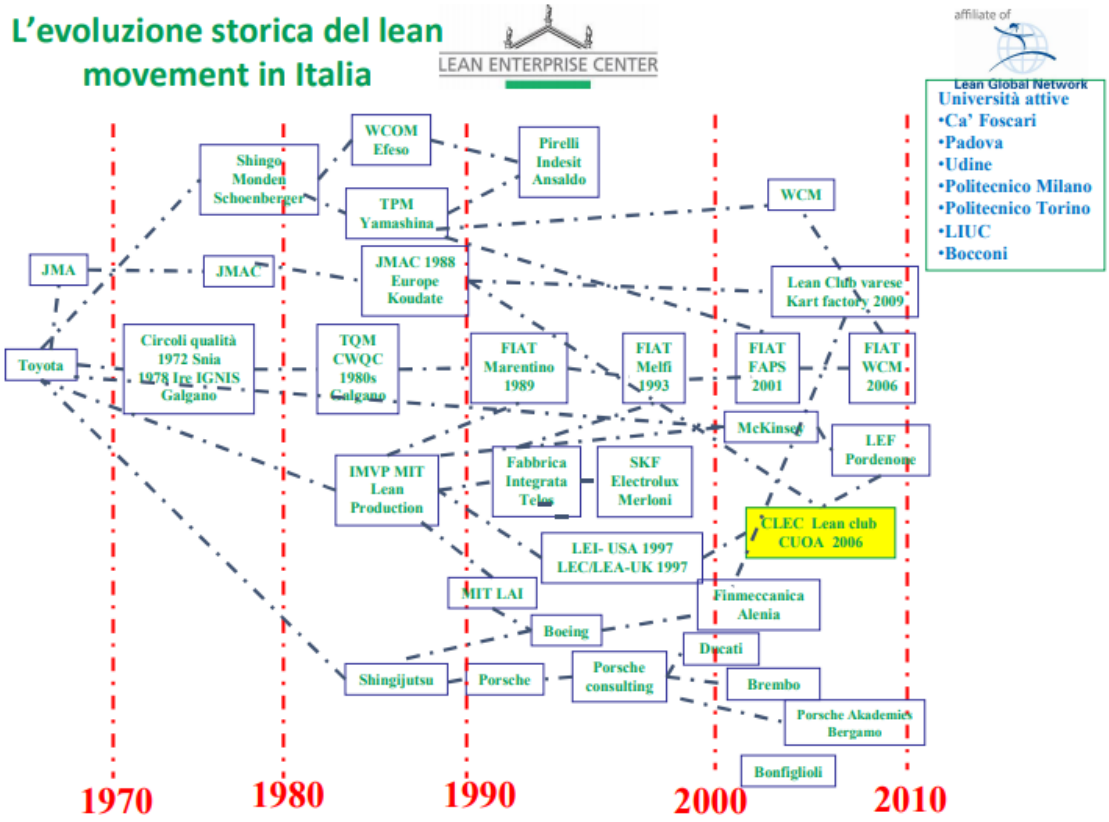
In essence, the TQC was a system designed for skilled workers, which did not provide for direct involvement of managers in the development of quality projects, while the TQM system is based on the assumption that: "Managers of all levels must be involved in quality projects"[14]. In addition to the two systems mentioned, some important innovations that have always been introduced over the years in terms of quality management should be highlighted:

[14] Juran 1954.

- In 1968 Karou Ishikawa, reworked the concept of TQC in the "company wide quality control" (CWQC) model, according to which product quality is based not only on reliability and compliance with standards, but also on "consumer satisfaction" or the product must respond to customer needs ".

- Quality projects are developed through an integrated process built on the basis (Juran) of 3 distinct managerial processes: quality planning, quality control and quality improvement.

The first quality management systems have been applied in Europe since the 1970s, marking a failure due to cultural and technical reasons (Camuffo). In Italy, for example, the first implementations of quality management were based exclusively on the introduction of quality cycles, with the belief that this tool would have generated an improvement in company processes in the short term. Quality cycles were introduced as an isolated tool within the Fordist scheme, without triggering a real organizational change deemed necessary by the Japanese model.
Only in 1989, with the total quality project of FIAT will we come to understand the true essence of quality management.



Source: https://www.slideshare.net/fondazionecuoa/linee-di-sviluppo-del-lean-in-italia

2.1.1 Quality circles

In Italy, the first introductions of the quality cycles were recorded in 1972 and 1978 respectively in the factories of SNIA Viscosa and Ire Ignis.
Quality circles were created by engineer Ishikawa, who defined them as: "a small group of people (8-10) in the same work area who have similar tasks, who meet regularly and voluntarily under the guidance of a coordinator, learning to identify and analyse the problems of their work, propose solutions, implement them, test them and measure the effects "(Camuffo 2013).

All’inizio degli anni 80 i circoli di qualità iniziarono lentamente a diffondersi in aziende di tutte le dimensioni, fra i più diversi settori merciologici, dalle industrie manifatturiere alle società dei servizi.[15]

The 1985 survey, conducted by Galgano Consulting, showed that more than 400 quality circles had already been launched in Italy. As we have already seen in the previous paragraph, the results of the "quality circles" far below expectations, so after only a few years from their introduction, the Italian companies lost interest in this tool and were no longer interested in the topic " Quality Management ".
The failure of the "quality circles" is attributable to two specific factors[16]:

- Poor knowledge of the "quality Circles" and poor involvement of managers. Italian companies in the 1980s expected quality circles to bring about a rapid improvement in the production process leaving the organizational structure unchanged.
- Insufficient training of operators in terms of problem solving: the main objective of the quality circles was to stimulate employees in promoting actions that would improve company performance. The structure of Italian companies in the 1980s was characterized by a centralization of power and top-down tools, which inhibited employees' ability to make decisions. The Quality Circles need a decentralized structure with "bottom-up" tools, this structure accustoms employees to make decisions independently and to think of the company outside the task they perform.

2.2 TQM: THE FIAT CASE

The application of TQM began to spread in Italy in 1989 with the "total FIAT quality" project.

[15] Gualtieri 1985.
[16] Camuffo 2013

In a famous speech at the FIAT management meeting in Marentino, Cesare Romiti state that: “the Japanese competition, based on the concept of total quality and Kaizen, was threatening the very survival of Western car manufacturers, emphasizing the urgent need to adapt production methods and approaches to remain competitive.” At the end of the 1980s, the market difficulties linked to the strong competition from car manufacturers all over the world, and the Japanese ones, highlighted Fiat's strategic and organizational weaknesses. These factors triggered a profound restructuring process. The plan presented on this occasion included five years of structured work in interventions on three levels: the company as a whole, the functional areas, the microprocesses and the individual activities.

In 1991, with Paolo Cantarella appointed CEO of the Turin company, the five-year plan was divided into 20 macro-specific initiatives, to support this reorganization, until 2000 an investment of 40,000 billion lire was planned with which to launch 20 new models. of cars, two per year. With the new program, the Turin-based company had started collaboration policies with suppliers based on trust, long-term contracts, comaker ship, policies that have reduced the number of suppliers and the degree of vertical integration. Similar initiatives have also been launched for the sales network and after-sales services.

The commercial strategy was aimed at improving customer satisfaction (the customer satisfaction index or CSI was introduced), building customer loyalty and conceiving and implementing new procedures for closer collaborations with retailers.

The focal point of the first Fiat reorganization according to the dictates of Lean Thinking was the transition from a high automation factory to an integrated plant (IF) in the assembly plants[17].

According to the IF formula, the integration of processes and the governance of organizational interdependencies have been the engines of productivity. The key element was the Elementary Technological Unit (UTE), defined as the primary organizational unit that governs a specific

[17] Camuffo and Micelli,1999.

segment of the process and operates as a self-sufficient team in the management of processes and resources, in monitoring productivity, costs and execution of the technology maintenance, continuous quality control and improvement.
The main objective of UTE was to identify and solve production problems where they occur and as soon as possible: the worker was therefore asked to identify the first signs of malfunction, to directly verify the application of production standards and to suggest improvements. The system incentivized workers to offer suggestions for improvement and was supported with quality circles that operated outside of working hours (quality circles are used within the UTE).

2.2.1 Results

The organization based on UTE / team has allowed Fiat to reach the desired level of integration, has increased flexibility in processes and reduced production costs. Despite some positive results, however, many elements suggest that the first attempt at Lean transformation into Fiat was only partially successful. The main reason is that the changes in the product development, production and supply chain areas were not supported by a Lean evolution in the management area, as the management system proved to be much more difficult to change.[18] The factories of Melfi and Marentino became points of reference for the other Italian companies that in the wake of Fiat began to develop TQM systems.

2.3 THE DEVELOPMENT OF TQM IN LARGE-SIZE ENTERPRISES

The first "lean" wave in Italy[19] occurred in the early nineties, when several large Italian companies, including Merloni, Pirelli, SKF Italia and Zanussi-Electrolux group, brought within their factories some Lean tools (TPM,

[18] Pichierri, 1994.
[19] Camuffo, 2014.

SMED, ...) and other aspects related to the organizational structure in their production units. After mentioning the role played by Fiat in, it is now time to highlight the factors that have favored the development of Lean techniques and tools in the plants of Italian companies:

- The need for Italian companies to be competitive on the market / survival (Camuffo). Italian companies were suffering more and more competition from foreign companies that were more efficient and more productive, which pushed them to introduce Lean innovations.
- The external environment, (complexity of business models) that pushed Italian companies to adopt a flexible organization, capable of managing and solving problems and capable of facing ever-changing challenges.

The experiments mainly concerned the production and management of suppliers, less effort was put instead in the field of new product development, there was a strong emphasis on technical improvement tools such as JIT, TPM, Kanban and Kaizen projects applied to specific areas of intervention. As with Fiat, there were no major changes in the management system and no structural and long-term changes were developed in the other business areas. Finally, there were few changes in the management of human resources as well, with the result that employees were not adequately trained to work in the new production system.

2.4 THE DEVELOPMENT OF LEAN PRACTICES IN ITALIAN SME

The application of Lean thinking in the 2000s in Italy extends from large companies to medium-small ones. To understand the recent evolution of the Lean movement in Italy and analyse the application of Lean Thinking in Italy in the 2000s, in particular in the first part of the decade, we can refer to the publications of some consultants who are deserved in spreading the

principles of Lean Thinking in medium-sized companies that have been experimented with in larger companies in the previous decade.
Among these publications are those of Alberto Galgano (2002, 2005) mentioned earlier in this chapter, which support the need for radical change, a revolution to be undertaken with courage and risk-taking by Italian companies that wanted to survive and return. to growth. According to this approach, the three fundamental revolutions to apply the principles of Lean Thinking are: the centrality of the product in the process, emphasizing the flows of materials and information; impulse production in line with market changes, which must involve the entire production structure; rapid and continuous improvement, the results of which should become evident and measurable in a few days (in terms of waste reduction).

Since the early 2000s, Lean principles and techniques have been applied not only in large companies, but also in Italian SMEs. An important contribution to the diffusion of the phenomenon was given by the publication of some texts, such as "Toyota. Why the Italian industry is not progressing[20] "and" thinking lean, thinking in the Italian way "[21] which have inspired many Italian companies in applying Lean techniques and principles.

2.5 BLACK FACTORY

In his book Bonfiglioli mentions the concept of a black factory[22], according to which within the "normal" factory, there is a black factory that produces costs ranging from 6% to 13% of turnover. To these costs we must also add the fact that some customers would be willing to pay a higher price for quality products, so the black factory can cost the company from 20% to 25% of its turnover.
Based on these considerations, it is clear that the main objective of the company must be quality, so far, however, nothing new has been said with

[20] Galgano, 2005.
[21] Bonfiglioli, 2001
[22] Colonna, 1993.

respect to what Italian companies in the 2000s already knew. And this is what Lean thinking comes into play, which according to Bonfiglioli goes beyond the concept of quality management (TQM), integrating it into a more complex system, such as that of Japanese companies. In the Japanese model, the main objective of the company remains quality, which must be pursued through a process of continuous improvement (Kaizen), making use of statistical tools (PDCA) to measure the company's performance, involving all workers and all sectors of the company, especially the top management (the transformation must start from the involvement of the top management).[23]

1) All the people and all sectors of the company are interested in quality, (phase 4) concept expressed by the TQM.

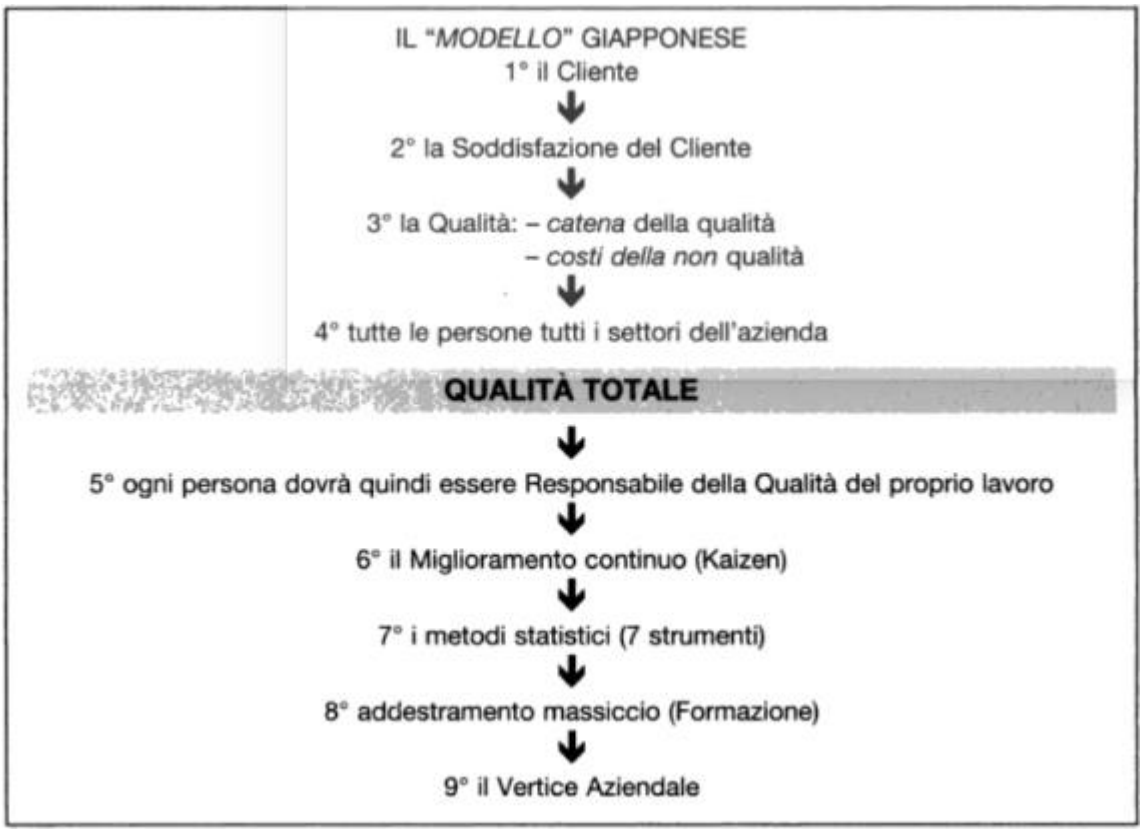
2) The company must not limit itself to checking the quality but must continuously improve it "kaizen" (phase 6).

3) Use of statistical methods to achieve quality improvement, such as the PDCA cycle (phase 7).

4) Training of all company staff in the quality mentality and the use of statistical tools (phase 8).

5) The top management must be very involved in the quality management process, training must start from the top. (phase 9)

[23] Bonfiglioli Consulting*, Pensare snello. Lean-thinking alla maniera italiana. Costruiamo l'impresa competitiva (più produttività-minori sprechi) 5 nuovi casi italiani di successo*, 2001.



The spread of Lean Thinking however remained modest in size, a rough estimate indicates that only 1% of Italian companies belonging to Confindustria and the association of Italian Manufacturers, have adopted or tried to adopt at least one Lean tool.[24]

Even fewer were the Italian cases that can be considered successful or exemplary cases, this always because Italian companies continued to approach Lean thinking with the wrong spirit, applying only a few tools and using a short-term mentality. While success stories were already emerging in Europe and America, such as the German companies Porsche and Techinick or the American company Wiremold analysed by Womack and Jones in the book "Lean thinking, how to create value and ban waste".

2.6 THE GROWTH OF LEAN PRACTICES IN THE LAST DECADE

[24] Camuffo 2014.

In the last decade there has been a further increase in the spread of Lean Thinking tools and principles that has involved mainly Italian SMEs. The growth of this phenomenon was the result of the evolution of the institutional and economic context in which SMEs operate:[25]

- Relocation of production to countries with lower labor costs. The delocalization has produced cost advantages in the short term for the companies that have adopted it, only to see the benefits obtained eroded within a few years. (Cost of ownership of the product remained unchanged).
- Offshoring and Outsourcing.
- Competition with countries with a low labor cost such as the Asian and Eastern European countries.
- Economic and financial crisis of 2008: companies that started a Lean transformation process before the crisis reacted better than non-Lean companies or companies that adopted post-crisis Lean tools.

Moreover, thanks to the publications of the experts and to the companies that have already converted to Lean logic for many years, the degree of understanding of the success factors has increased: Lean Thinking requires a profound review of the company organization and is applicable to all business areas and processes from product development to information systems to human resource management.
A true holistic vision of Lean thinking has developed, according to which the Lean transformation of a company must be pursued by leveraging on 4 dimensions: Lean culture, Lean concepts, Lean management and Lean tools.

[25] Source: https://www.slideshare.net/fondazionecuoa/linee-di-sviluppo-del-lean-in-italia

2.7 THE WORLD CLASS MANUFACTURING

World Class Manufacturing was theorized by the Japanese H. Yamashina in the mid-2000s[26] and arrived in Italy in 2005, when Fiat adopted it as a standard approach for production management.

W.C.M integrates some concepts of TQM and Lean Thinking such as kaizen or PDCA cycles but differs from them for the cost deployment approach. According to the C.D approach all business problems, whether maintenance, logistical, qualitative or organizational, must be addressed on the basis of their economic impact.

To implement the W.C.M system, Fiat called Yamashina and then tested some practices in the factories of di Melfi and Tychy. In the plant between 2006 and 2009, operations that do not bring added value (errors, waste and inefficiencies) fell by 60%, As the WCM was gradually extended to Mirafiori and Pomigliano in Italy and Bielsko-Biała in Poland. In 2009 the program

[26] The term World Class Manufacturing (WCM) was coined by Richard Schonberger World Class Manufacturing: The Lessons of Simplicity Applied (1986) to identify "TPS", but was soon replaced by the expression "Lean Production" by J. Krafcik. The term was later taken up by H. Yamashina.

began to be gradually used also in Chrysler's American plants and was extended to suppliers, in 2014 over 60% of Fiat suppliers converted to WCM.

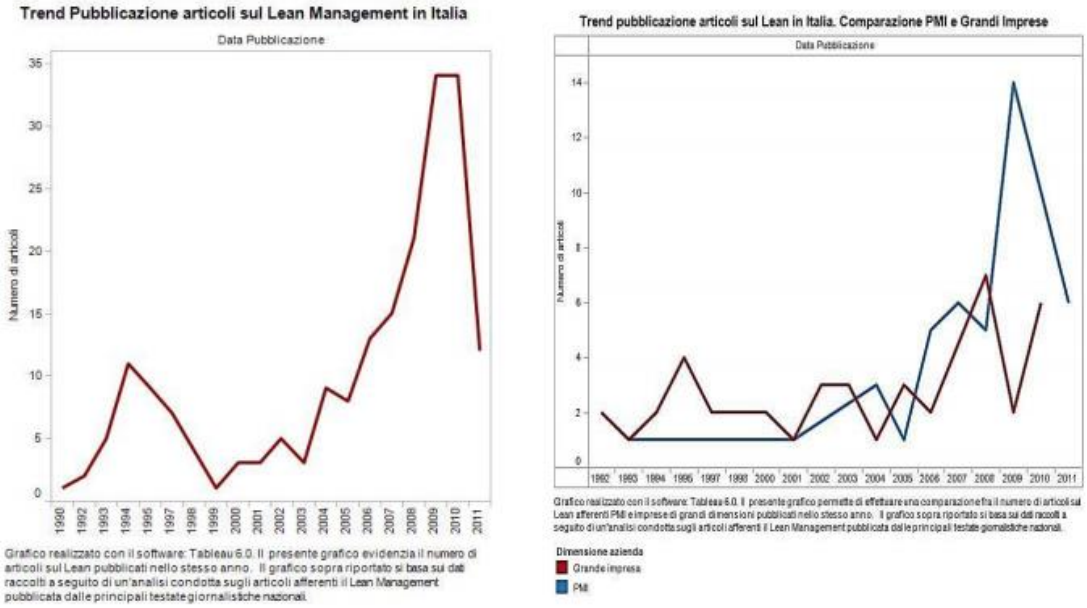
The W.C.M program has made Fiat one of the most efficient companies in the world, over the past few years Fiat has become an example model not only for Italian companies but for companies all over the world.

2.8 DISSEMINATION OF THE PHENOMENON

In Italy, a census of companies that adopt Lean practices is not made, so a way to have a perception of the level of diffusion of Lean thinking is to use secondary sources. A recent analysis conducted on the articles of the “Sole 24 ore” concerning Lean Thinking, revealed that there has been an increasing trend over time in the number of articles published with two frequency peaks, one between 1993 and 1997 and another between 2008 and 2012. The diffusion occurred mainly in large enterprises in the period 1993-1997 and in small and medium-sized enterprises 2008-2012.

As for the type of companies involved, in the first wave these were concentrated in the automotive and mechanical sectors, while subsequently the spread has also extended to other sectors (such as furniture and furnishings) and, recently, to that of services. As far as geographic location is concerned, the companies that adopt Lean practices are located almost in North East Italy.

Esperienze “lean” di imprese italiane sulle principali testate italiane 1990-2011



Fonte: elaborazione su dati IlSole24Ore e Factiva

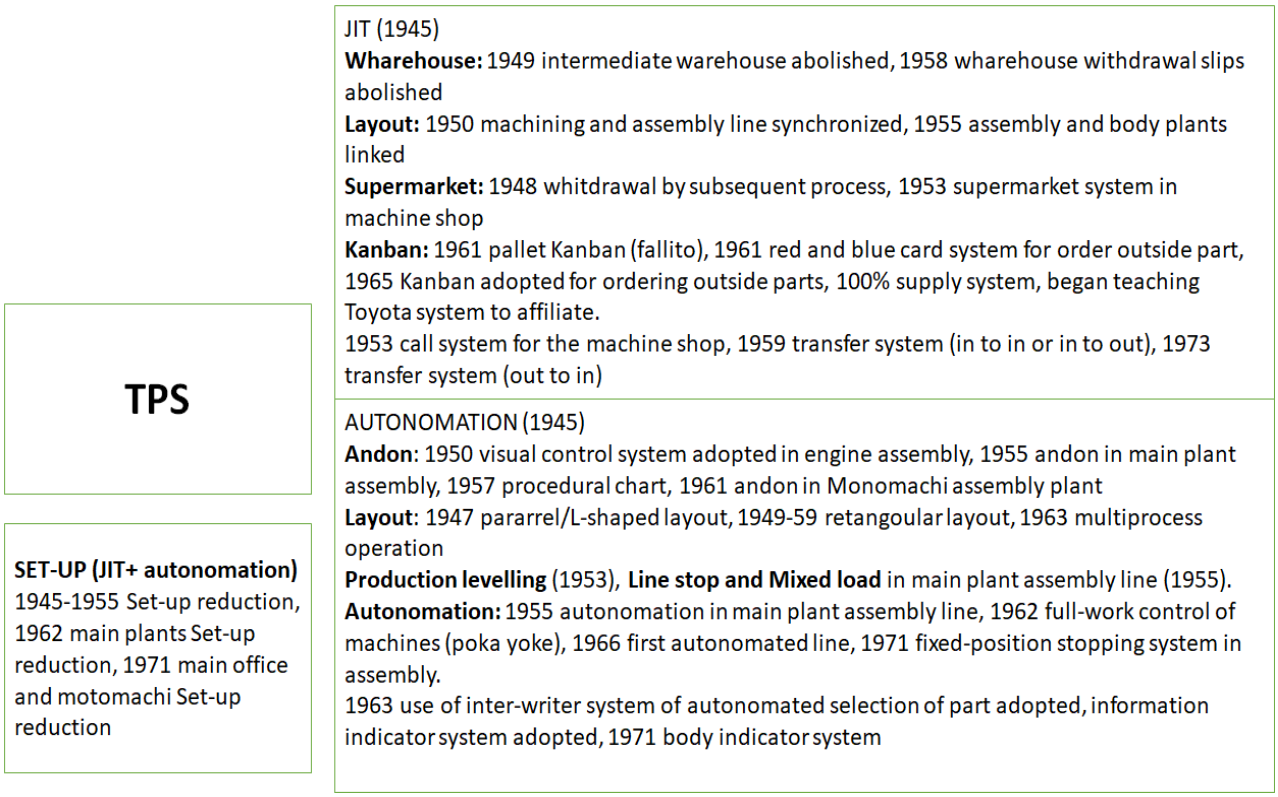
Source: https://www.slideshare.net/fondazionecuoa/linee-di-sviluppo-del-lean-in-italia

CHAPTER III

3.1 TPS

The Lean philosophy is a constantly evolving process, which has its roots in the production system implemented by Toyota in the early 40s: the TPS (Toyota Production System).

It is thanks to Ohno's writings that the TPS became world famous and came out of the Toyota context.



The TPS is considered the precursor of Lean Production; between the two managerial systems we can observe several features in common, including the use of the same techniques and tools.

3.2 LEAN PRODUCTION

Lean production was born in the late 1980s (the term Lean was coined by John Kraficik), and has become famous all over the world thanks to the books by Womack and Jones, in which the 5 Lean managerial principles were introduced: The Definition of Value, Identification of The Value Flow, Continuos Flow Production, Pull, Perfection.

At the beginning, Lean Production had very few changes compared to TPS. Over the years, however, Lean thinking has evolved and its boundaries have expanded: Lean Production has gone from being considered a

production system (Like TPS) to a real management system[27]. Today, in fact, Lean production is applied not only to the entire "Gemba" but also in many other business areas: management of the value chain, relationship with suppliers and distributors, relationship with customers, management of the relationship with workers based on HR practices.

One of the main problems of Lean Production is that there is still no clear and unambiguous definition of what it is. What many authors agree on is that Lean Production is a managerial practice in constant evolution (Shah and ward 2007; Petersen 2009), whose boundaries are wider and wider and wider are the business areas that are involved.

From this perspective, the idea of considering Lean production as a set of practices (managerial tools) applied both in the plants and in other areas of the company takes shape and which over the years have gradually increased. Following this logic, Galeazzo and Furlan in the work "Lean Bundles and configuration: a fsQCA approach" described Lean manufacturing as follows:

1) Lean manufacturing refers to a wide range of practices that increase the stability of operations by reducing machine set-up times, guaranteeing overall equipment effectiveness and introducing standard work.

2) Practices that promote ways to create flow by replacing the push-oriented manufacturing planning and control systems with the adoption of a pull logic (Demeter and Matyusz, 2011) and to improve quality by eliminating scraps, defects and reworks.

3) Practices that involve the search for continuous improvement to sustain Lean manufacturing over time, and practices that involve employees and increase their responsibilities and competences.

However, it would be wrong to talk about Lean Production only like as set of practies. Lean production is, as we have also emphasized previously, a

[27] “Lean production is a managerial system that involves the entire firm” (Galeazzo 2018).

management system composed of both a technical part (Lean practies) and a methodological part (principles and objectives).

3.2.1 Technical orientation and philosophical orientation

To complete the analysis carried out so far, in which only the technical aspect of Lean Production emerged, we will now focus on the methodological aspect. We can therefore consider Lean production as the union of two different orientations that coexist and complement each other: the philosophical orientation and the technical orientation (Shah and Ward 2007).

The philosophical orientation is represented by philosophy and guiding principles.

- Philosophy: The absolute elimination of waste
- Principles: The Definition of Value, Identification of The Value Flow, Continuous Flow Production, Pull, Perfection.

The technical orientation, on the other hand, refers to Lean practices:

- Practices, techniques or tools.

Once the discussion on the definition of the Lean Production concept is finished, we can now start talking about Lean practices. Lean practices are all those tools that are applied within the company with the aim of systematically reducing all waste. Lean practices are often grouped into more complex systems to better analyze their performance. In fact, many studies have been conducted in the literature to evaluate the effectiveness of Lean production on companies that have revealed the existence of some problems:

- Lean practices to be analyzed in the study.
- The grouping criteria of Lean practices.

So far, no one has given a clear answer to these problems and building a representation model based on the grouping of Lean practices in Lean bundles could be a valid tool for Lean Production studies. The representation model can in fact lead to the resolution of some specific problems:

- Preliminary work should no longer be conducted to identify practices to be used in the study.
- Using the same model, Lean Production performance studies can be easily compared, which is not currently the case.
- Studies that simultaneously analyze the effect of multiple Lean practices on the company can be conducted more easily.
- Studies that analyze the synergy between Lean helping practices can be conducted more easily.

3.3 LEAN BUNDLES

There are many authors who have applied the concept of bundle to the Lean reality, but most of them have focused their attention on the definition of a specific group of practices, without looking at the system as a whole. The two authors who, on the other hand, were deeply interested in the definition of bundles with reference to the Lean Production system are Shah and Ward who, with their two articles, published in the "Journal of Operations Management" respectively in 2003 and 2007, contributed to the creation of a solid methodological and conceptual basis regarding, on the one hand, the definition of Lean bundle and, on the other hand, the study of the relationship between multiple clusters of techniques and various performance indicators, without stopping at a technical analysis by technique .

In this section we will analyze some of the most important studies on Lean Bundles

3.3.1 Cua

Cua is credited with being the first to simultaneously analyze the practices belonging to the JIT, TPM and TQM groups.

Another important aspect of Cua's work is that concerning the construction of groups, called Framework in the text: for the research the exploratory or confirmatory factor analysis method was applied, to combine individual practices in a multiplicative function to form orthogonal and unidimensional factors. The practices were identified thanks to the analysis of the most important articles about JIT, TPM and TQM. The result of the research led to the formation of:

- 4 Framework: JIT, TPM, TQM and Common practices
- 17 practices: divided between common practices and specific practices of the single framework.

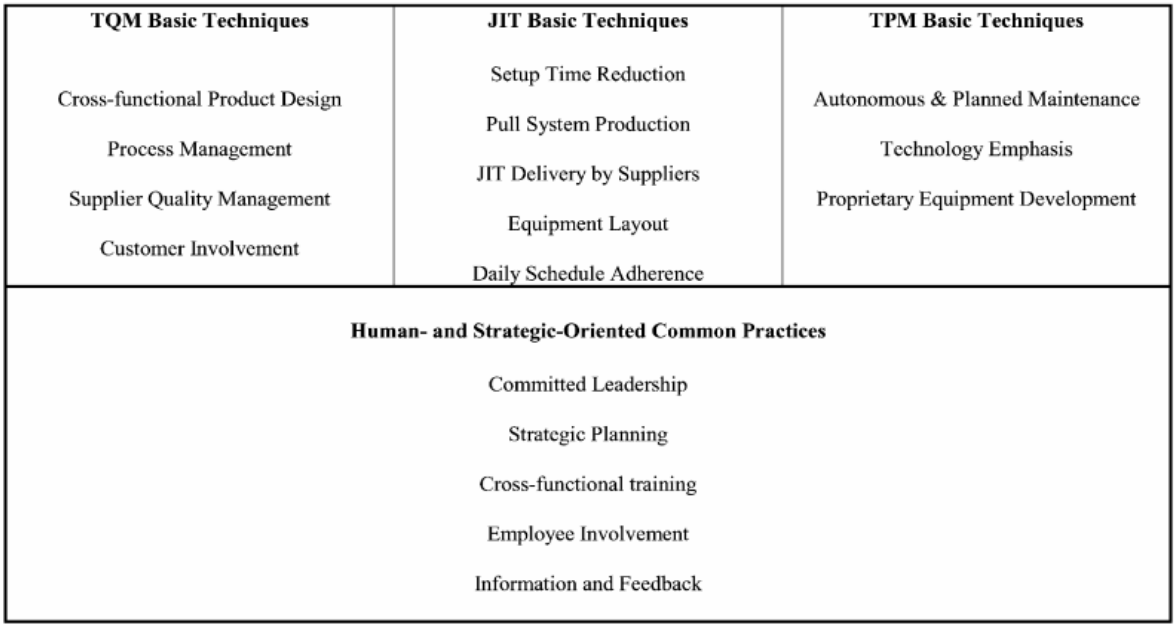


Fig. 1. An integrating framework.

"Even fewer studies have investigated the simultaneous synergistic effects of multiple aspects of Lean implementation and performance implication. A noteworthy exception is Cua et al.'s (2001). However, conceptual research continues to stress the importance of empirically examining the effect of

multiple dimensions of Lean production programs simultaneously "(Shah, Ward 2003).

Although Cua's work had laid the foundations for a joint study of Lean practices, still many steps forward had to be made before reaching the resolution of the problem.

3.3.2 Shah and Ward

"A contribution of this research is that we identify four specific practice bundles from the literature, we validate the bundles empirically by extracting orthogonal components consistent with the literature and we show that all four bundles are significantly related to performance."
The method used by Shah and Ward (2003) for the empirical validation of Bundles is the additive index. Like Cua the literature in the JIT, TPM, TQM and HRM topics was first analysed.

Lean practices and their appearance in key references (adapted from McLachlin, 1997)

Lean practice	Sources															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Bottleneck removal (production smoothing)																
Cellular manufacturing									*			*	*	*	*	*
Competitive benchmarking																
Continuous improvement programs		*				*	*	*	*		*	*	*	*	*	*
Cross-functional work force	*		*		*	*			*		*	*	*	*	*	*
Cycle time reductions									*			*	*		*	*
Focused factory production									*		*	*	*	*	*	*
JIT/continuous flow production	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Lot size reductions	*	*		*	*	*	*	*	*	*	*	*	*		*	*
Maintenance optimization																
New process equipment/technologies									*			*			*	
Planning and scheduling strategies																
Preventive maintenance			*			*		*	*	*	*	*	*	*	*	*
Process capability measurements									*			*	*	*	*	
Pull system/kanban	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Quality management programs		*														
Quick changeover techniques	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Reengineered production process																
Safety improvement programs									*			*			*	
Self-directed work teams		*					*	*	*	*	*	*	*	*	*	
Total quality management		*				*	*	*	*		*	*	*	*	*	*

(1) Sugimori et al. (1977); Monden (1981); Pegels (1984); (2) Wantuck (1983); (3) Lee and Ebrahimpour (1984); (4) Suzaki (1985); (5) Finch and Cox (1986); (6) Voss and Robinson (1987); (7) Hay (1988); (8) Bicheno (1989); (9) Chan et al. (1990); (10) Piper and McLachlin (1990); (11) White (1993); (12) Shingo Prize Guidelines (1996); (13) Sakakibara et al. (1997); (14) Koufteros et al. (1998); (15) Flynn et al. (1999); (16) White et al. (1999).

22 practices were identified and divided into 4 Lean Bundles. The division was carried out by first defining the main aspects of each Lean Bundles and then evaluating the link between the practices and the Bundles themselves.

1) JIT Bundles: The underlying rationale is that JIT is a manufacturing program with the primary goal of continuously reducing, and ultimately eliminating all forms of waste (Sugimori et al., 1977). For instance, all practices related to production flow were combined to form the JIT bundle. Two major forms of waste are work-in-process (WIP) inventory and unnecessary delays in flow time. Both can be reduced by implementing practices related to production flow.

2) TQM Bundles: Practices related to continuous improvement and sustainability of quality products and process were combined to form the TQM bundle.

3) TPM Bundles: includes practices primarily designed to maximize equipment effectiveness through planned predictive and preventive maintenance of the equipment and using maintenance optimization techniques.

4) HRM Bundles: A different discussion must instead be made for the HRM Bundles, the only one with a strong theoretical basis: “Further, we extend Osterman (1994) and MacDuffie's (1995) notion of bundles from human resource practices to a larger set of manufacturing practices ". For the formation of the HRM Bundle Shah and Ward have included a series of lower level practices in higher level practices (Boyell and Pagell 2000). The result of this operation was the creation of two higher level practices: flexible / cross-functional work force and self-directed work teams.

Once formed, the Bundles were validated through reliability analysis (Cronbach coefficient α) and principal components analysis with varimax rotation.

Table 4
Principle components analysis to validate lean bundles–rotated component matrix

	Factor loadings			
	JIT	TPM	TQM	HRM
Lot size reductions	**0.659**	0.062	0.007	0.031
JIT/continuous flow production	**0.649**	0.081	0.213	0.116
Pull system	**0.647**	−0.147	0.256	0.118
Cellular manufacturing	**0.631**	−0.234	0.180	0.105
Cycle time reductions	**0.586**	0.248	0.014	0.054
Focused factory production systems	**0.562**	0.051	0.170	0.164
Agile manufacturing strategies	**0.552**	0.327	0.075	0.146
Quick changeover techniques	**0.537**	0.336	0.030	−0.064
Bottleneck/constraint removal	**0.501**	0.349	0.126	0.151
Reengineered production processes	**0.440**	0.288	0.138	0.023
Predictive or preventive maintenance	−0.001	**0.715**	0.198	0.116
Maintenance optimization	0.038	**0.681**	0.168	0.176
Safety improvement programs	0.012	**0.552**	0.240	0.089
Planning and scheduling strategies	0.314	**0.458**	0.050	0.141
New process equipment or technologies	0.248	**0.418**	0.147	−0.197
Competitive benchmarking	0.256	0.364	**0.361**	0.073
Quality management programs	0.024	0.178	**0.741**	0.079
Total quality management	0.177	0.219	**0.705**	0.160
Process capability measurements	0.211	0.101	**0.660**	−0.079
Formal continuous improvement program	0.179	0.271	**0.605**	0.206
Self-directed work teams	0.138	0.128	0.208	**0.758**
Flexible, cross-functional workforce	0.259	0.177	0.042	**0.710**
Eigenvalue	5.88	1.98	1.25	1.05
Initial percent of variance explained	26.74	9.01	5.67	4.72
Rotation sum of squared loadings (total)	3.79	2.58	2.39	1.39
Percent of variance explained	17.23	11.74	10.85	6.33
Cronbach α (sample N)	0.81 (1508)	0.74 (1579)	0.74 (1588)	0.51 (1709)

Extraction method: principal component analysis. Rotation method: varimax with Kaiser normalization.

The components conform almost perfectly to the conceptual bundles with the sole exception of "competitive benchmarking." Competitive benchmarking is conceptually linked to TQM practices and was in the TQM bundle. Once validated, the model was tested on a sample of companies and the initial expectations were largely met: Lean Bundles are positively correlated to the performance of companies, more specifically they have a crucial impact on the difference in performance between two companies". These bundles explain about 23% of the variation in operational performance after controlling for the effects of industry and accounting for the effects of plant size, plant age, and unionization".

3.3.3 Osterman

Osterman's study (1994) has shown that flexible organizations, i.e. organizations that have adopted innovative management techniques (teams, job rotation, quality circles, and Total Quality Management), are organizations that make extensive use of HRM practices. The author started from the assumption that HRM tools are essential for introducing TPM and TQM within the company: "here is a widespread view that work organization changes need to be accompanied by supporting HRM practices.

The study was conducted on a sample of 694 American manufacturing companies, employees and managers of the companies were asked to fill in a questionnaire and the results obtained were:

- Some HRM practices are widely used by flexible organizations, such as the "HRM department role" practice.
- Flexible organizations use HRM practices much more than normal organizations.

Table 6. The Relationship Between the Presence of Human Resource Practices and the Adoption of Flexible Work Practices: Significance Tests.

Human Resource Practice	*All*	*Establishment Has at Least One Flexible Work Practice with 50% Penetration*	*Establishment Has No Flexible Work Practice with 50% Penetration*	*t-Statistic*
Gainsharing	.137	.144	.126	.946
Pay for Skill	.304	.364	.197	4.676**
Profit-Sharing/Bonus	.447	.478	.393	2.008*
Wage Premium	.365	.376	.345	.792
HRM Department Role	.541	.564	.501	2.338*
Percent in Off-the-Job Training	.320	.375	.219	4.838**
Percent in Cross-Training	.451	.529	.314	7.456**
Employment Security Policy	.398	.394	.404	.179
Points for Increasing Skill	136.664	142.849	125.899	2.651**
Points for Increasing Commitment	191.711	199.713	177.521	2.430**
Points for Reducing Employment	80.455	80.195	80.916	.851
Percent Contingent	.076	.066	.090	2.237*
Percent Temporary	.070	.071	.070	.915
Seniority Hiring	.708	.721	.701	.474
Seniority Promotion	.303	.313	.286	.211

Note: T-statistics are based on equations that include CORE occupation and industry controls.
*Significantly different at the .05 level; **at the .01 level.

The main problem with Osterman's paper is that the practices have been analyzed individually, without considering the effects they would have produced if they were considered as a homogeneous group. McDuffie instead, unlike Osterman, don’t studies HRM practices as a whole, but creating an HR Bundle.

3.3.4 McDuffie

"Innovative HR practices are often studied in a vacuum, with more attention paid to isolating the effect of individual practices than to understanding how different HR practices interact to reinforce one another, or how they are linked to business functions and strategies."

The McDuffie study has shown that there is a positive relationship between HR practices and the economic performance of companies. Furthermore, McDuffie was the first to build the HR Bundle and to study HR practices as a homogeneous group. The study is based on surveys distributed to 62 automotive assembly plants in 1989-90.

The additive approach was used for the formation of the Bundles, while 3 different types of analysis were used for the validation: Reliability analysis, Factor analysis and Cluster analysis.

Table 1. Innovative Human Resource Practices and Their Link to the Conditions for Economic Performance.

Innovative HR Practice	*Skill/ Knowledge*	*Motivation/ Commitment*	*Integration of HR with Production System, Strategy*
Work Systems Index			
Work Teams	X	X	X
Problem-Solving Groups (Employee Involvement or Quality Circle groups)	X	X	X
Employee Suggestions Made and Implemented	X	X	X
Job Rotation	X		X
Decentralization of Quality-Related Tasks	X		X
HRM Policies Index			
Recruitment and Hiring	X	X	
Contingent Compensation		X	X
Status Differentiation		X	
Training of New Employees	X	X	
Training of Experienced Employees	X	X	

3.3.5 Research summary

1) In the study of Shah and Ward 4 Bundles were identified and validated: JIT, TQM, TPM and HRM. bundles have been shown to positively correlate with business performance.

2) In the Osterman study a strong correlation was identified between HRM Practices and the implementation of TQM and TPM.

3) In the Cua study 3 Bundles have been identified and validated: JIT, TQM and TPM. it has been shown that there is a positive correlation between the performance of the company and the simultaneous implementation of the JIT, the TQM and the TPM.

4) In McDuffie's study the HR bundle was identified and built. it has been shown that the use of HRM practices improves the overall performance of companies. (McDuffie)

5) In Bevilacqua's study, no positive relationship was found between the company's growth and the application of the tools: HRM, JIT, SM and TQM.

CHAPTER IV

4.1 OBJECTIVE OF THE STUDY

The main purpose of the following research is to better understand the level of adoption of the Lean Production instruments in the Italian context, assessing whether there has been an evolution compared to the past. In particular, the data collected through the Qualitative methodology were aimed to find out what Lean practices are adopted inside the SME Italian firms. Also, the research could be a valid tool for Lean Production studies, particularly for those who analyze the effects of Lean practices on companies.

4.2 METHODOLOGY

Qualitative and quantitative research are two types or approaches to data collection and analysis used to understand or explain a phenomenon. These strategies also provide a guideline or methodological structure to present, in writing, both the process and the results of a study in the form of an essay or research report. The selection of the method will largely depend on the decision of the researcher and the nature of the subject matter of study. Some subjects have such characteristics that they can be studied better with a qualitative approach, while others are more easily explored through a quantitative magnifying glass.

In essence, the two approaches present different ways of accessing reality, but not exclusive to each other, as both conceive a scientific investigation and an exploration of the available information on a subject, in order to obtain some kind of conclusion once the information has been obtained and analysed.

But in the face of a common cognitive "mission" the two approaches define various types of research, addressing them according to their specific working methodology. So, as mentioned above, a quantitative survey uses numerical quantities to express its work, through experimental or statistical

techniques, whose results are therefore mathematically representable. Quantitative methods are all those modes of research focused on the cause and effect of things, as in most natural sciences. They show descriptive results that can then be generalized. The present study applies the qualitative method, because Rather than a statistical representation, which would have been provided by a quantitative research, I was interested in formulating hypotheses, conjectures and identifying connections or differences among the companies object of the analysis. First the model of representation was built, the data collection was carried out through the Research Gate portal, where studies on Lean Bundles and Lean practise were identified. After I collected data from 21 Italian companies, the data was collected through interviews with companies (primary data) and through books, newspapers and specialized journals (secondary data). The interviews were conducted in a semi-structured way with a series of open questions, giving to the firm the faculty to deepen and detail the answers. Once collected, the data was analyzed to identify the Lean practices used by the companies. The practices were identified thanks to the keywords, namely:

- Explicit keywords: the practice was directly named
- Implicit keywords: an instrument or a technique related to the Lean practice has been named

Lean practices relating to each company have been included in the model of representation.

4.2.1 Model of representation building

1) Identification of practices: Lean practices present in the following studies have been reported on an excel table: Osterman (1994); McDuffie (1995); Cua (2001); Shah and ward (2003); Petersen (2009); Bevilacqua (2016).

2) Creation of the Bundles: 5 Bundles have been selected in which to group the Lean practices: Just in Time, Total productive maintenance, Total quality management, Human relationship management and Supplier and customer relationship. All the bundles used for the research have been empirically validated: McDuffie (1995) used the HRM Bundle, Shah and Ward (2003) used the JIT, TPM, TQM and HRM Bundles Shah and Ward (2003), while Bevilacqua (2016) used the HRM, JIT, TQM and SM Bundles.

3) Insertion of practices within the Bundles: once the Bundles have been chosen, the practices have been inserted within them. Except for Petersen, all the studies already presented a subdivision of the practices into groups: TPM, TQM, JIT ...

For the JIT, TPM and TQM Bundles, a comparison was made between the practices present in the text of Cua and those present in the text of Shah and Ward: during the comparison, the repetitions of the same practices were eliminated, after which the practices were grouped (lower practice) that expressed similar concepts in more complex practices. (Higher practice)[28]. Once formed, the bundles were integrated with the practices / characteristics present in the other studies:

- The JIT Bundle has been integrated with the Features present in the Petersen groups “Just in time practices” and “Resource reduction”. The decision was motivated by the similarities that the two groups have with the JIT Bundle; in the first case the connection is evident as the group refers directly to the practices related to Just in Time, in the second case the group contains a series of characteristics linked to the main objective pursued by the JIT techniques: the elimination of waste (Sugimori 1977)
- The TPM Bundle has been integrated with the features present in the Petersen group “Defects Control”. The decision was made taking into account that the main objective pursued by the TPM is to eliminate the faults and defects in the production phase (Nakajima 1984), therefore the control of defects is an essential part of the TPM.

[28] Operation done by Shah and Ward for the development of the HRM Bundle.

- The TQM Bundle has been integrated with the features present in the Petersen groups "Improvement strategies", "Scientific management" and "Standardization". The decision is justified by the following elements: the “Improvement strategies” group contains techniques used to pursue the continuous improvement of products and processes, the main objective of the TQM (Flynn 1995, Cua 2001). In the "Scientific management" and "Standardization" groups, on the other hand, there are tools necessary for the redesign of processes and the measurement of results, elements deemed necessary from a TQM perspective (Ross 1994).
- The TQM Bundle was integrated with the “Process Feedback”, “Statistical process control” and “Value Stream Mapping” practices present in the Bevilacqua study. Over 10 of the 22 articles analyzed by Bevilacqua consider the Process Feedback and Statistical Process Control practices belonging to the TQM. Instead, a different speech was made for the Value Stream Mapping practice, which found little space in the literature, and an article in which it was included in the “Manufacturing process and equipment” bundle was cited alone. However, since this is an activity focused on the analysis of business processes, I decided to include it in the TQM Bundle under "Focus on process".

For the formation of the HRM Bundle, on the other hand, a comparison was made between the practices of Osterman and those of McDuffie, the same procedure used for the construction of the JIT, TPM and TQM Bundles was applied. Once formed, the HRM Bundle was integrated with the practices listed in the following studies:

- The “Team organization” and “Employee involvement” characteristics present in the Petersen study have been integrated. Both characteristics have been included by Petersen in the Human relations management group.
- The practices present in the Bevilacqua study were integrated: Self-directed work teams, Goal oriented team, Few level of management,

Create a multi Skilled workforce, Lean management training and Rewards and recognition. All these practices have been cited by several articles in the literature and almost always associated with the concept of HRM. Finally, for the formation of the SCM Bundle, the practices present in the studies of: Bevilacqua (2016). Once formed, the SCM Bundle was integrated with the practices present in the following studies:

- The “Supplier quality management” practice present in the Cua study. The practice was included by the American author in the TQM group, which in the past has often been associated with practices relating to the management of relationships with customers and suppliers. Over time this aspect has assumed an ever greater strategic importance for companies, and several authors have emphasized the application of Lean techniques in the management of external relationships: Therefore, to pursue Lean production and minimize inventory, firms have to manage (reducing or minimizing) variability in supply, processing time, and demand (Hopp and Spearman, 2004; De Treville and Antonakis, 2006). At the basis of the formation of the SCM Bundle there is the idea according to which all the practices concerning the management of relationships with suppliers and customers must be grouped and isolated from other practices.

4.2.2 Just In Time Bundles

JIT is a manufacturing program with the primary goal of continuously reducing, and ultimately eliminating all forms of waste (Sugimori et al., 1977, Shah and Ward 2003). The elimination of waste is carried out through the simplification of production processes such as for example the elimination of excess stocks and the reduction of batches (Flynn et al., 1995). Also, JIT are a series of practices that are implemented to support manufacturing processes (set-up time reduction, Equipment Layout) and that deliver products at the right time, quantity and place (Pull system).

Practices:

1) Pull system: Pull system, Pull system production (Cua 2001; Shah, Ward 2003), Kanban (Petersen 2009).

2) Equipment layout: Equipment layout (Cua 2001), Cellular manufacturing (Shah, Ward 2003)

3) Set-up time reduction: Quick changeover techniques (Cua 2001; Shah, Ward 2003) Set-up time reduction (Cua 2001; Shah, Ward 2003; Petersen 2009)

4) JIT: JIT delivery by suppliers (Cua 2001; Shah, Ward 2003), Lead time reduction (Petersen 2009)

5) Small batch production: Agile manufacturing strategies, cycle time reductions, lot size reductions, Bottleneck / constraints removal, Focused factory production system (Shah, Ward 2003), Production leveling, Process syncro, Takted production (Petersen 2009).

6) Resource reduction: Inventory reduction, Resource reduction (Petersen 2009)

7) Continuous Flow: JIT/continuous flow production (Cua 2001; Shah, Ward 2003).

4.2.3 Total Qualitative Management Bundles

TQM encompasses the use of practices that strive to excel in quality products and processes. (Galezzo, Furlan 2017) it also Includes practices related to continuous improvement, standardization and scientific management.

Practices:

1) Focus on Process: Process capability measurements (Shah, Ward 2003), process management (Cua 2001), Process Feedback (Bevilacqua 2016), VSM

2) Standardization: Housekeeping (5S), Standardized work, Visual control and management (Petersen 2009)

3) Scientific management: Hoshin Kanri, Time / work studies (Petersen 2009), Statistical process control (Bevilacqua 2016).

4) Continuous improvement: Formal continuous improvement program (Shah, Ward 2003), improvement circles, Kaizen, Root cause analysis (5 why). (Petersen 2009)

5) Total quality management: Competitive benchmarking, Quality management programs, Total quality management (Shah, Ward 2003), cross-functional product design (Cua 2001).

4.2.4 Total Productive Maintenance Bundles

TPM triggers the adoption of routine maintenance (Planned and Predictive maintenance) that maximizes equipment effectiveness and workplace improvement to stabilize processes. (Cua 2001; Shah, Ward 2003; Furlan 2017). More generally, emphasis on maintenance may also be reflected by the emphasis given to new process equipment or technology acquisition (Cua et al., 2001).

Practice:
1) Maintenance: autonomous and planned maintenance (Cua 2001), Preventive maintenance, Maintenance optimization (Shah, Ward 2003).

2) Defects control: Autonomation (jidoka), Failure prevention (poka yoke), 100% inspection, Line stop (Andon) (Petersen 2009).

3) New technology development: Technology emphasis, proprietary equipment development (Cua 2001), New process equipment (Shah, Ward 2003).

4) Worker Safety: Safety improvement program (Shah, Ward 2003).

5) Planning and scheduling strategies (Shah, Ward 2003)[29].

4.2.5 Costumer and Supplier Bundle

Therefore, to pursue Lean production and minimize inventory, firms have to manage (reducing or minimizing) variability in supply, processing time, and demand (Hopp and Spearman, 2004; De Treville and Antonakis, 2006).

Practice:
1) Supplier involvement: Involvement of supplier in the Lean journey, Supplier quality involvement, Supplier involvement in design, Total cost supplier evaluation, Supplier training and development (Bevilacqua 2016).

2) Customer involvement: customer involvement in product design, customer involvement in product offerings (Bevilacqua 2016).

3) Supplier relationship: Supplier partnership, Reducing number of suppliers, Supplier proximity (Bevilacqua 2016), Supplier quality management (Cua 2001)[30].

4) Sharing information with suppliers / clients: Sharing information with suppliers, use of EDI (electronic data interchange) with suppliers.

[29] Cua inserts this practice into the JIT
[30] Cua has included this practice in the TQM Bundle.

4.2.6 Human Relations Management Bundle

The main characteristics of human resource management refer to the training and knowledge of employees that determine the professional skills that the company can have, the adaptability of employees that determines the strategic flexibility of the company. (Grant, 1991). HRM practices focus on the organization of the company and the goal of those who implement them is to make the organizational structure as flexible as possible (Bouquet 2019).

Practice:
1) HRM Organization: HRM Department role (Osterman 1994), Problem Solving Groups, Employee suggestion made and implemented (McDuffie 1995).

2) Employee incentives: Gainsharing, Pay for Skill, Profit Sharing / Bonus, Seniority Hiring, Seniority Promotion, Wage premium, Employment security policy (Osterman 1994), Contingent compensation (McDuffie 1995), Rewards and recognition (Bevilacqua 2016).

3) Training: Percent in Off-the Job Training, Percent in Cross-training (Osterman 1994), Training of New Employees, Training of Experienced Employees (McDuffie 1995), Lean management Training (Bevilacqua 2016).

4) Flexibility in Work: Work team, Job Rotation, Decentralization of Quality-related tasks (McDuffie 1995), Team organization (Petersen 2009) Create a multi skilled workforce, Goal oriented teams, Self-directed work team, Few level of management (Bevilacqua 2016).

5) Employee involvement (McDuffie 1995; Petersen 2009; Bevilacqua 2016).

Summary table of Bundles and identified practices:

JIT	**TQM**	**TPM**	**SCM**	**HRM**
Pull system	Focus on Process	Mainteinance	Supplier involvement	HRM organization
Equipment Layout	Standardization	Defects Control	Customer involvement	Employee incentives
Set-Up time reduction	Scientific management	New Technology Development	Supplier relationship	Training
JIT	Continuous Improvement	Worker safety	Sharing information with suppliers/clients	Flexibility in work
Small batch production	Total Qualitative Management	Planning and scheduling strategies		Employee involvement
Resource reduction				
Continuous flow				

4.3 COMPANIES

All the companies researched are based in Italy, are all SMEs and have been applying Lean transformation for at least 5 years.

Firm	Headquarters	Agent of Change	Start of Lean activities	Activity description	Ateco code
Pietro Fiorentini S.p.a	Via Enrico Fermi,8/10, 36057 Arcugnano (VI)	Mario Nardi	2000	Manufacture of equipment for cleaning and filtering liquids and gases for non-domestic use	282991
Fradent Gruop S.r.l	Via Garzigliana, 37, 10060 Osasco (TO)	Ezio Bruno	2006	Manufacturing of other machines for agriculture, forestry and livestock	283090
Unox S.p.a	Via Marjorana, 22, 35010 (PD)	Enrico Frazolin	2000	Manufacture of household appliances	275100
Sicon S.r.l	Via Trebeghino, 63, 48024 Massalombarda (RA)	Renato Fratta	2002	Computer fabrication and electronics and optics products, electromedical appliances, appliances and watch measurement	260000
Spesso Gasket S.r.l	Str. del Francese, 133, 10156 Torino (TO)	Giorgio Possio	2000	Manufacturing of other parts and accessories for motor vehicles and their engines	293209
Carel S.p.a	Via dell'Industria, 11, 35020 Brugine (PD)	Francesco Nalini, Luigi Rossi Luciani, Luigi Nalini	2007	Manufacturing of other electrical equipment	27.9*
Caron AeD S.r.l	Via A.Moro, 2, 36060 Pianezze (VI)	Diego Caron	2006	Forming or cold-bending	243302
Brovedani S.p.a	Via Venzone, 9, 33078 San Vito al Tagliamento (PN)	Sergio Barel, Benito Zollia	2006	Manufacturing of other metal products	259000
MUT Meccanica Tovo S.p.a	Via Bivio S. Vitale, 54, 36075 Montecchio Maggiore-Alte Ceccato (VI)	Michele Tovo	2008	Manufacturing of other taps and valves	281400

Acqua minerale San Benedetto S.p.a	Viale Kennedy, 65, 30037 Scorzè (VE)	Pierluigi Tosato	2008	Soft drinks, mineral water and other bottled water industry	110700
Alf Uno S.p.a	Via San Pio X, 17, 31018, Gaiarine (TV)	Maria Cristina Piovesana	2009	Manufacture of furniture for home furnishings	310910
Comer industries S.p.a	Via Ferdinando Magellano, 27, 42046, Reggiolo (RE)	Fabio Storchi	2009	Manufacturing of other electrical equipment	2790*
Esmach S.p.a	Via V. Veneto, 143, 36040, Grisignano di Zocco (VI)	Luciano Delpozzo	2013	Manufacturing of food, beverage and tobacco industry machines (including parts and accessories)	289300
Geox S.p.a	Via Feltrina Centro, 16, 31030 Biadene di Montebelluna (TV)	Giorgio Presca	2014	Footwear manufacturing	1520
Tenova S.p.a	Via Monte Rosa, 93, 20149 Milano(MI)	Mauro Medici	2004	Manufacturing of metallurgy machines	289100
Rossimoda S.p.a	Via Venezia, 22, 35010, Vigonza (PA)	Frederick Munoz	2009-2011	Footwear manufacturing	152010
Carpigiani - Ali S.r.l	Via Emilia, 45, 40011 Anzola dell'Emilia (BO)	Andrea Cocchi	2013	Trade in machinery and equipment	518
Cielo e Terra S.p.a	Via IV Novembre, 39, 36050 Montorso Vicentino (VI)	Luca Cielo	2006	Table wine production and v.p.q.r.d	110210
Iveco S.p.a	Via Puglia, 35, 10156 Torino (TO)		2007	Vehicle manufacturing	291000
Videotec S.p.a	Via Friuli, 6, 36015 Schio (VI)		2007-2009	Manufacture of sound and image recording and playback equipment	264001

Firm	**Lean companies for over 5 years**	**Lean companies for over 10 years**	**Lean companies for over 15 years**
% Firm	**100%**	**81%**	**24%**
Number of firm	**21**	**17**	**5**

4.3.1 Structure of the interviews

The interviews were conducted by telephone, by e-mail and directly on site. The following questions were asked to the interviewed company

1. In what year did the Lean transformation of the company begin?

2. Who was driving the Lean transformation of the company? Were external agents involved in the implementation of the construction sites: external consultants (individuals, consulting firms, Lean experts), suppliers, customers, …?

3. What Lean projects have the company started? in which company areas have the projects been developed?

4. Description of Lean projects

5. What impact has the transformation had on the company's employees and what HRM practices have the company introduced?

6. What are the tools that have been implemented within the production plant?

a. JIT tools: Pull system, Kanban, small batch production, Cellular manufacturing

b. TPM tools: Preventive maintenance, defect control, Worker safety, development of new technologies

c. TQM tools: Scientific management, standardization, quality control, Focus on process (Value stream mapping ...)

7. How has the relationship with suppliers and customers changed?

4.4 COMPANIES INTERVIEWED

4.4.1 Esmatch S.p.a

Esmach's Kaizen project was born at the end of 2013, when due to the economic crisis the sales volumes and turnover of the Ali Group are reduced, thus creating the need to review the organization of the group's companies. Esmatch's first Kaizen projects were implemented on the “Fixed bowl dough” product range. After the initial success, the company decided to extend the Lean philosophy throughout the company.

4.4.1.1 First site: Product mapping

In the first Kaizen construction site, which saw the collaboration of all company areas, the company focused on products belonging to the "fixed bowl dough" range, a range consisting of three series of machines: Spi, Spiral and Psr. (the best-selling product range in the company)
Before the Kaizen project, the fixed bowl dough range was divided into 3 work centers: small, medium and large mixers.

Centro di lavoro	Capacità di impasto [Kg]
Piccole	30
	45
Medie	60
	80
	100
Grandi	130
	160
	200

Thanks to the volume-regularity matrix, used to compare actual sales with the frequency of product sales, the company realized that the work center of the small and medium mixers had the same sales frequency in terms of weeks per year. 'year. This factor involved the top management to unify the two work centers of the small and medium mixers, and to leave the work center of the large mixers autonomous (which has a lower sales frequency). The solution was also taken into consideration that small and medium-sized mixers have many common production components and a very similar packaging process.

4.4.1.2 Second Kaizen construction site: Flow mapping

In the second Kaizen site, two tools for flow mapping have been introduced: the Value stream mapping and the spaghetti Chart.
The VSM was used to map the production flow in the pilot site (fixed tank mix), thanks to the VSM the company has identified a large amount of company waste. The waste was mainly due to two factors:

- The excessive number of material transports within the factory
- The high number of stocks of finished products in the shipping department.

The Spaghetti chart was used instead to monitor the movements made by the worker during the packaging phase of the mixers. Again, a large amount of muda came out in the packing process.

4.4.1.3 Construction site: Pilot channel concept

In the third Kaizen site implemented by the company, the "Muda Free" activity was promoted.
After introducing the Spaghetti Chart, the company decided to conduct tests with the aim of identifying all the muda produced. The test showed that by eliminating the muda during the packaging phase, the company could save 50% of the time it took to assemble the mixers (both small / medium and large). This prompted operators to radically revise the process, so much so that the first change was to move from work-cell production to continuous production flow. Other changes were:

- the introduction of a new company figure "the picker". The picker is an operator who is exclusively involved in creating kit trolleys that are used to supply the 2 assembly lines with the components necessary for production.
- The concepts of Takt time and number of phases were introduced, to identify the time needed to carry out each phase.

Finally, the assembly lines were built to respond to seasonal peaks, so in the high peaks the work was divided into four phases for large mixers and two phases for medium / small mixers. While in the low peaks the work is divided into two phases for the large mixers and one phase for the medium / small mixers.
All these changes led to a redesign of the assembly lines, with a consequent change in the layout of the machinery.

Fig. rappresent the diagram of the final layout of the pilot channel with two assembly lines and their respective supermarkets.

4.4.1.4Construction site: Plant layout

After the success of the Muda free project, the Lean principles and tools have been extended throughout the company. the construction site was therefore started: Plant layout, a repetition of the concepts underlying the three construction sites seen previously, with the difference that this time all product ranges that had not been seen up to now were taken into consideration. The plant was divided into two areas:

A) area 80-20: it is the area where the company produces 80% of its turnover, compared to the past where the company was organized in functions, now there are 4 product lines (continuous) from production to final packing. For the supply, a "supermarket" area has been set up, moving from two-meter high shelves on which components of all kinds were placed, to small shelves that contain only packages containing the components necessary for production. of products. The components are picked up with trolleys and taken to where they are needed.

B) Long-tail area, where there are products with low frequency and low sales volumes. The aspect that stands out immediately is the high variability of machines within this category, so following numerous ideas and proposals, we have opted for an innovative logic that has never been used before in the company, i.e. the production of pre-booked machinery (specific customer requests) on modular and multifunctional assembly stands, to which it will be assigned from time to time and depending on the needs , the production order. The characteristics of this area are the flexibility and versatility (more than 16 different modules) of the production.

Fig. rappresent the factory layout after Kaizen shipyard

Compared to the previous company structure, the warehouse has been eliminated (now there is the vacated area), the space occupied by the mechanical workshop has been reduced (there are many fewer quality defects, so maintenance is no longer necessary). we have gone from a production area of over 10000 m2 to one of just over 7000 m2 with about

3000 m2 of space freed, 30%, now available for possible applications and future investments.

4.4.1.5 Shipyard: Daily Kaizen

The Daily Kaizen shipyard is a project aimed at the continuous improvement of company activities. Daily, half-hour meetings have been set up in which various employees of the company participate who form a cross-functional team. The team meets in the Gemba, solves problems, and puts into practice the improvement proposals (all following the logic of the Deming cycle).
The team is made up of a representative of each company function plus a Kaizen manager, the project was initially developed only in one part of the company and is gradually spreading throughout the assembly department.
The interventions are carried out following the criterion of the time-impact matrix of the result.
According to this logic, priority is given to interventions that require less time and have a greater impact at the company level.

4.4.1.6 Shipyard: Kanban and supermarket

The supermarket and kanban system were initially implemented in the pilot site. The project involved, first, the organization of the warehouse according to the supermarket logic in the assembly lines of the range of fixed tank products.
The materials used in production were divided into 4 different categories (depending on weight, size…), the heavier materials were placed next to the assembly line while the lighter ones were placed in the warehouse. After arranging the materials, new standard containers were introduced that were consistent with the size and weight of the different production materials.
The warehouse was resized, the components were first coded and then managed with the Kanban system or the Junjo system, the company decided to adopt 4 different types of Kanban systems: The single kanban, the dual kanban, the batch kanban , the signal kanban.

EK 03 A 01 – 4 F

(example of component identification code)

The calculation of the needs of each component is done according to mathematical-statistical methods and considering the type of Kanban associated with the same component.

The implementation of the Kanban system has prompted Esmach to create an integrated network with its suppliers, with the aim of stabilizing stocks in the warehouse, the space occupied and connecting the internal production line with that of the supplier. However, this has also increased the transport costs for the supply, which is why the company has decided to simultaneously implement a policy of reducing suppliers, focusing mainly on those in the province of Vicenza.

The company has also decided to have a relationship with suppliers based on maximum collaboration and complete mutual trust, thus seeking to build a long-term relationship.

As a demonstration of the new supply policy pursued, the company has decided to invest entire days to train suppliers in the use of the Kanban system.

The strategic integration of suppliers in the company supply chain has allowed the elimination of quality control in acceptance: if you buy a defective piece, it is detected directly during the assembly phase. This immediately triggers an alarm, and everything is reported to the Kaizen team, according to the logic of self-activation.

4.4.1.7 Conclusion

Finally, other tools not listed in the Kaizen yards just described have been introduced in the company:

- The 5s.

- Milk Run or turn of milk for the delivery of containers to kanban: it is the company that collects the materials directly from the supplier, the project aims to find the right trade-off between storage costs and transport costs, finding the optimal number of withdrawals to minimize the total cost.
- Zoning, the introduction of floor markings as a visual management tool.
- Mizu, a logistic train equipped with numerous trolleys for the simultaneous collection of several finished products.
- Reorganization of the spare parts warehouse for the realization of the consigment stock with suppliers, i.e. an agreement in which it is established that the transfer of ownership of the goods takes place only at the time of withdrawal of the products for actual use.

4.4.2 Valid Plastic S.r.l

The Lean trasformation of the Valid Plastic S.r.l started about 10 years ago, when it was included in the "integration" project of ABB in Frosinone. The integration project began with a workshop lasting a month and a half, where ABB technicians came to train within the company. The management immediately believed that Lean was the right way to go, and that excellent results would soon arrive. Thanks to Lean techniques and tools, the company has in fact managed to reduce business costs and increase productivity. These two factors were necessary to ensure Valid's permanence on the market, which in the last decade has been characterized by increasingly aggressive competition due to the entry of Chinese companies.

In the words of engineer Enrico Valeri: "We are forced to reduce prices more and more, and the only way to survive is to be attentive to our costs. Thanks to the Lean philosophy we have managed to remain competitive on the market, unfortunately our business is strongly linked to the ability of our suppliers to be punctual in deliveries. To date, one of the most important

problems to face is the one concerning the Lead Time of our suppliers which is about a month and a half, while ours is 24 hours.

4.4.2.1 Quality Wins Valid Project

QUALITY - FPY line SA: 93,1% - FPY line M: 99, 5%	**PRODUCTION** RB1374801 - Line SA: 1 FTE - Prod: 147 pcs/h * FTE
HURRY - Hurry n.8 - OEE= 84,6%	**INTAXTRICE** - Intaxtrice n.1 - OEE= 50,6%

4.4.2.2 Application of the Q6 Methodology

Through the Q6 methodology, the company can identify the critical points in the production process in which to perform checks to verify the quality of the product. These points are called Quality gates, in Valid Plastic the first Quality Gate was identified during the acceptance phase: the first check takes place during the delivery of the material by the suppliers, tests are carried out on the quality of the raw material and if the tests do not are exceeded, the product is returned to the supplier.

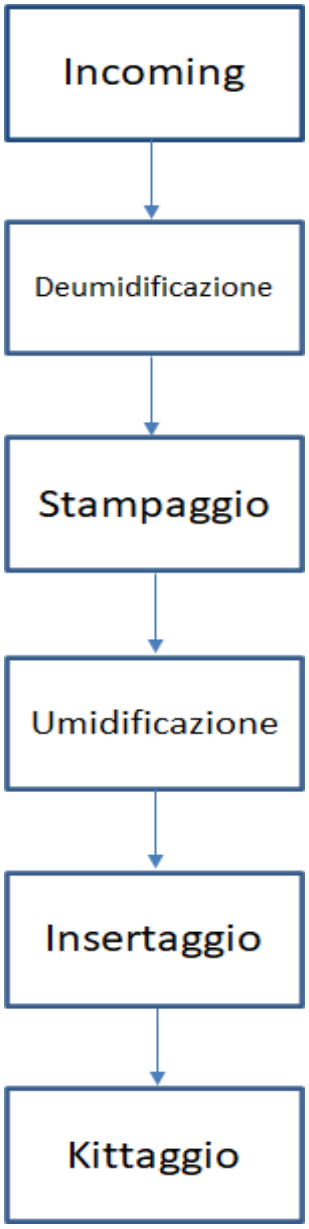
The second Quality Gate was identified during the production phase, where dimensional, color and quality checks are carried out (the checks are standard).

The third Quality Gate has been identified before delivery of the final product, the product is checked again to see if the customer's specifications have been met or if there are any errors or manufacturing defects.

Less repeatable machines have been replaced with electrical machines (electric presses) which have a much better repeatability of the molding cycle (fewer stops).
In the company were introduces new professional figures New company figures involved in the control process during the product acceptance phase.

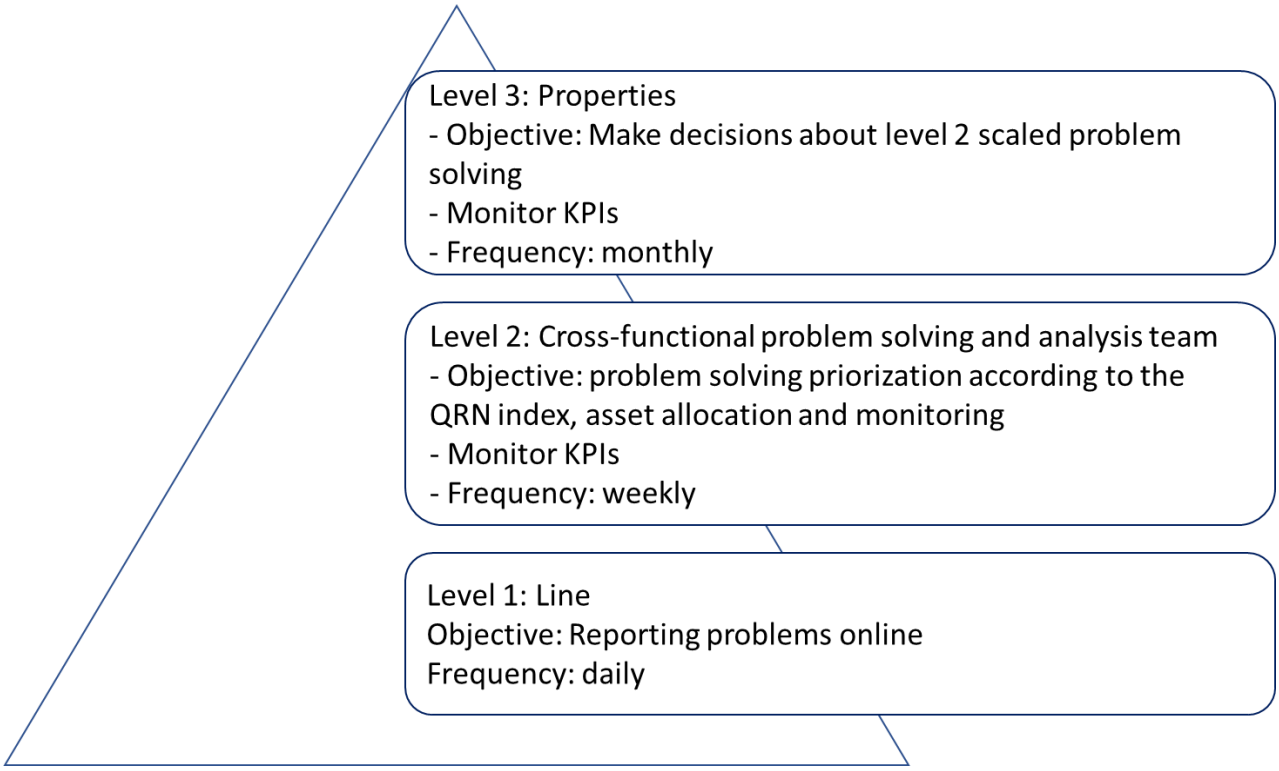
4.4.2.3 Flow analysis

To identify the Quality Gates, it is first necessary to map and analyze the company's value stream. Valid Plastic therefore performed a Value Stream Mapping (VSM).



4.2.2.4 Quality Circle

The Quality Circle structure guarantees continuous quality improvement through a constant flow of information between all levels.



The cross-functional team was composed to perform the analysis and management of problem solving, the team technicians were trained on the 5s methodology (separate, rearrange, clean, standardize and disseminate) to best perform their task.

The Company to measure the quality of business processes has decided to use the FPY index, which is the index that highlights the percentage of activities that at the first attempt are compliant and do not need adjustments. The FPY of the manual line is about 100% and has remained constant during the weeks of Lean transformation, a similar argument can be made for the semi-automatic line, where the FPY is between 96% and 100%.

4.4.2.5 5s (Seri, Seiton, Seiso, Seiketsu, Shitsuke)

The application of 5s involved all company employees, with the aim of eliminating all company waste. First, an intervention area was identified,

"the molding warehouse" or the area where there were more NVAA activities (activities that do not generate added value), after which the work plan was defined, KPIs (Key performance index) and the KAIs (Key activities Index, Step by step).
Among the KPIs used we find indices of: productivity, defects per unit, NVAA evolution, benefits obtained and costs saved.

4.4.2.6 TPM: Total Productive Maintenance

The maintenance system was implemented on the binder, the machinery was first subjected to the inspection cleaning activity, after which the implementation of the TPM system was performed. The results achieved were very satisfactory, the OEE of the packer has grown from 50% to 60% in a few weeks, with peaks of 65%. the OEE is a global efficiency index of the plant that shows the relationship between the time spent in the production of the so-called good pieces (value-added operating time) and the total production time.
The company has managed to develop both autonomous maintenance and preventive maintenance.

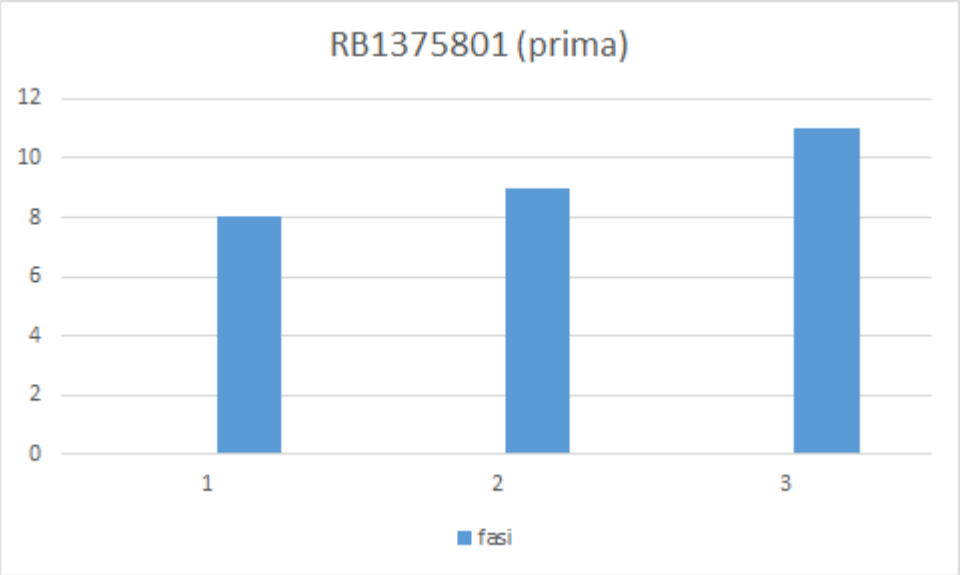
4.4.2.7 SMED

Valid Plastic S.r.l has detected and evaluated the Set Up times of its machinery, after which it has traced all the necessary activities and divided them between internal and external Set Up.
The preparation activities of the Set Up have been formalized and standardized, an example is the mold change procedure developed by the company's top management with the help of operators. The machine re-tooling time has been significantly reduced, the estimated time for the operation is between 30 and 60 minutes.

4.4.2.8 Scientific Management

The production of the RB1375801 assimilation kit was subjected to a Lean intervention, the data before the intervention are as follows:

- FTE (Full Time Equivalent): 3
- Theoretical production: 109 pcs / (h * FTE)
- Real production: 94
- 3 operators online



As you can see from the graph, the phases are not balanced, therefore the concept of Takt Time has been introduced to balance the work of the 3 line operators. The result was a calibration of the process that led to an increase in theoretical production to 114 / (h * FTE), or a 5% increase in productivity.

4.4.2.9 Employee training

The company's employees did not immediately have a positive impact with the innovations introduced, their workload suddenly increased and they had to adapt to new production techniques. Despite this, the employees immediately showed an active participation in the supplier integration project, the company on the other hand immediately started internal training

courses for operators, with the aim of making people understand how to work with the techniques. and Lean tools.
Valid Plastic also adopts an approach of promoting operators' suggestions, employees are asked if there are things that should be improved, then they try to improve them all together.

4.4.2.10 Relations with customers

The company is used to meeting all the customer-specific requests and if there are any critical issues, they are communicated to the customers. Before starting production, drafts are sent to customers and if they give the OK, production proceeds.

4.4.2.11 Kanban system

Currently the company manages about 190 codes with the Kanban system. The production of orders is managed in collaboration with 3 cooperatives outside the company, the lead time of orders is only 24 hours.
When the customer's order arrives, we immediately enter it into our system and the cooperative that is delegated to production can immediately view the order on their computer. In addition to displaying the Kanban, the cooperative can also check the stock of components in our warehouse, which is organized in such a way as to ensure the materials for the production of a certain number of Kanban (orders), as soon as the components go down. below the threshold a request is made to buy the missing parts.

“We have a very high reliability on Kanban management, the customer sends us a monthly report of our performance and the result is that out of 200 orders per day (on average), 99% is delivered respecting the 24-hour Lead Time. “(Enrico Valeri)

4.4.2.12 Development of a proprietary system

All the information necessary to complete the production process has been recorded in a database and managed through the company proprietary system, designed and created within the company. The system was implemented before joining the ABB integration project and proved to be an indispensable support tool for all the innovations introduced: standardizing production, tracing the entire production chain "from purchase to sale".
The machines have been connected to the proprietary system, ie the company can remotely check the productivity trend of each machine. Machinery maintenance has also been integrated into the system. The machines transmit signals that are saved by the software. From these

signals it is thus possible to understand if there have been machine downtime or if there has been an abnormal variation in the cycle time.

4.4.3 Fradent S.r.l

The Lean transformation of Frandent S.r.l began in 2006. Frandent, like many companies in the province of Turin, was affected by its proximity to the Fiat factories, where Lean practices had already been adopted for several years.
In 2006 the company moved its production to a new plant, approximately 3 times larger than the previous one (3600 meters). After 6 months, however, the management realizes that production was not increasing, that costs are rising and that a turnaround was absolutely necessary. After visiting the plant of a Lean supplier, the management decides to undertake the business streamlining process.
As with Valid Plastic and Esmatch, the implementation of Lean techniques and tools quickly made the company lucky, which managed to survive in the market and become one of the leaders in the sector.

4.4.3.1 Asaichi: The morning market

The company has adopted the quality management tool called "Asaichi (morning market)", whose operation is simple but at the same time very effective. Every morning the entrepreneur Ezio Bruno meets with the team leaders of the various departments / divisions[31], the technical department, the purchasing department, the group leader (workshop manager), the administration and the management to check the situation and to discuss company problems.

[31] The company is formally divided into different areas: carpentry, assembly, finishing (painting and final assembly of the product) and logistics (incoming and outgoing).

The duration of the meeting is approximately 15 minutes, during which the reading of some display boards containing the following elements is performed:

- Quality indicators: good first-time products and products with defects.
- Production indicators: hours used / machines out, the indicators are used to measure the performance of the departments.
- Reporting of accidents or near misses: the company is focused on guaranteeing safety in the workplace for employees.
- Customer warranty cases: Defective products returned by the customer

After finishing the check of the indicators, we move on to the analysis of business problems: before being examined, the problems are identified in one of the 4 business sectors: technical office, production, shopping and logistics.

The problem is transcribed on an A3 sheet which is divided in half, in the first half the space is reserved for a photograph of the problem, next to which there is a letter A, B, C which indicates at what stage of the process it is the problem was found (A = initial phase, B = intermediate phase, C = final phase / problem identified by the customer).

The operator who presented the problem, exposes his reasoning to the group about the causes and possible solutions to the problem, the information provided by the operator is then developed by the entire group.

The first phase of the Deming cycle then opens (opening the problem), a cycle through which the company identifies the cause of the problem, solves it and standardizes the process that led to the resolution of the problem.

The morning market serves to create a climate of improvement within the company, which pushes employees to leave the comfort zone and admit their mistakes.

4.4.3.2 Relationship with employees

Lean techniques and tools were adopted as soon as the new plant was built, this helped the company employees to adapt faster to the innovations introduced. At the same time, the Lean philosophy pushed the entrepreneur Ezio Bruno to adopt an approach focused on the well-being of employees: "I always tell my employees that when they enter the company they must feel good, they must be happy to work and happy when they leave work" .
Employees, on the other hand, declare that they are very happy with Frandent and to prove it is the absence of turnover, that is, the employees decide to stay in the company for many years.

4.4.3.3 Staff training activities

In the company, team building and staff training activities are promoted: mind maps, Try Storming activities, improvement activities carried out together with employees, courses to improve memory, humor courses.
Two moments a year have been established, one at the end of July and one at the end of the year, where the company shares data relating to production trends, current performance data compared with performance data for the years with all staff.
Finally, are presented (by the team that implemented them) all the improvement activities completed by the company in that time frame.

4.4.3.4 Just In Time System

The Just In Time System implemented by Frandent has significantly decreased the Lead Time. To date, after the customer has requested a product, the same is delivered after a maximum of three weeks.
The order is managed with a weekly schedule visible to all employees, it is represented on a display board: week 0 (in progress and already planned) which is located on the upper part of the display board, week +1 which is located on the low of the scoreboard and week +2. Once the order is accepted and sent to production, all operators can see the progress of the order and everyone knows when and what type of task they must perform.

The foreman takes care of checking that each operator does his job and that everything is proceeding according to plan, and every Friday he takes care of replacing week +1 with week 0.

4.4.3.5 Relationship with suppliers

The implementation of a JIT delivery system would have been impossible without the involvement of suppliers who, like Frandent, have decided to streamline their organization. The company's goal is to build a network of Lean suppliers, which is why it favors the conversion of its key partners by sending them Lean business consultants for 2 or 3 days.
Having Lean suppliers' means being able to have a supply of the parts necessary for production in a short time, the advantages are considerable:

- Reduction of the lead time of suppliers, which currently is around 8 days.
- Creation of a Kanban order management system.
- The possibility of requesting pieces with specifications and with a higher quality.
- Supply of small batches, for which the stocks in the warehouse have been drastically reduced and the management of the components has become easier.

All these elements together have contributed to increasing business profitability and improved customer satisfaction.

4.4.3.6 Creation of a Partnership with suppliers

Frandent has set up solid and lasting relationships with suppliers, so much so that they have become real partners of the company.
Suppliers are involved in improvement activities; they are involved in the design phase of new products and optimization of existing products.

4.4.3.7 Other tools implemented within the Gemba

Since Frandent has become a Lean company, both relations with suppliers and customers have improved, and attention to the company's employees has also increased.

Compared to the Lean projects listed so far, the company has implemented other Lean techniques within the production plant:

- Standardization of business processes: application of the Takt Time concept, of 5s, creation of work islands, introduction of the spaghetti chart. In addition, footage is taken of the operators while they are in the workstation, then the videos are watched together with the operators, analyzed and endlessly trying to improve the processes.
- Introduction of continuous flow and constant flow mapping through the VSM
- Leveling of production

4.5 CONCLUSION

The following table shows Lean practices for 21 Italian companies.

Firm	JIT	TPM	TQM	HRM	SCM
Esmatch S.p.a	Continuos Flow, Pull system, Small Batch Production, Equipment layout, Resource reduction, JIT,		Focus on process, Standardization, Scientific Management, Continuos Improvement, TQM	Employee Involvement	Supplier Relationship, Supplier Involvement
Valid Plastic S.r.l	Set-up time reduction, JIT	Defects Control, Mainteinance, New Technology Development	TQM, Focus on Process, Standardization, Scientific Management	HRM Organization, Training	Costumer Involvement
Frandent S.r.l	JIT, Resource reduction, Continuos Flow, Small Batch Production,	Worker safety	Scientific Management, TQM, Focus on Process, Continuos Improvement, Standardization	HRM Organization, Flexibility in Work, Training	Supplier Involvement, Supplier Relationship,
Pietro Fiorentini S.p.a			Continuos Improvement, Scientific Management, Standardization.	Training, Flexibility in Work, HRM Organization	

			Focus on Process		
Unox S.p.a	Equipment Layout, JIT, Continuos Flow, Small Batch Production	New Technology Development	Continuos Improvement, TQM, Focus On Process, New Product Developement	Worker Training	Costumer Involvement, Supplier Involvement, Supplier Relationship
Sicon S.r.l	JIT, Pull System, Small Batch Production, Continuos Flow		Continuos Improvemet, Focus On Process, Standardization	Training, HRM Organization, Flexibility in Work	Supplier Partnership
Spesso Gasket S.r.l	JIT, Pull System	Defects Control	Continuos Improvment	Training, Flexibility in Work	Supplier Partnership
Carel S.p.a	JIT, Pull System	Defects Control	Scientific management, Standardization, continuos improvment	Training	Costumer Involvement
Caron AeD S.r.l	Continuos Flow, JIT		Continuos Improvement, Standardization	Training, Flexibility in Work	Supplier Relationship, Costumer Involvement
Brovedani S.p.a	Small Batch Production, Set Up Time Reduction, Resource Reduction	Mainteinance, New Product Development	Continuos Improvement, Standardization, Scientific management,	Training, Flexibility in Work, HRM Organization	Costumer Involvement

			Focus on Process		
MUT Meccanica Tovo S.p.a	JIT, Pull System, Resource Reduction, Equipment Layout		Continuos improvement, Scientific management	Training	
Acqua minerale San Benedetto S.p.a	Small Batch Production, Resource Reduction, Set Up Time Reduction	Work Safety, Defects Control	Continuos Improvement, Standardization, Eco Sostenibility, Scientific Management	Training, Employee Involvement	
Alf Uno S.p.a	Continuos Flow, Resource Reduction		Continuos Improvement, Standardization, Focus on Process, Scientific Management, New Product Development		Costumer Involvement, Supplier Involvement, Supplier Relationship
Comer industries S.p.a	JIT, Resource Reduction		Continuos Improvement, Focus on Process	Training, Employee Incentives	
Geox S.p.a			Continuos Improvement, TQM, Standardization,	Training	Costumer Involvement

			New Product Development		
Tenova S.p.a	JIT, Pull System		Continuos Improvement, Standardization	HRM Organization, Employee Incentives	
Rossimoda S.p.a	Small Batch Production		Continuos Improvement, Standardization, Focus on Process	Training	Costumer Involvement
Carpigiani - Ali S.r.l	Pull System, Continuos Flow, JIT		Continuos Improvment, Focus on Process	Training, HRM Organization	Costumer Involvement
Cielo e Terra S.p.a	JIT, Resource Reduction		Continuos Improvement, Eco Sostenibility, New Product Development		Supplier Partnership
Iveco S.p.a	Continuos Flow, JIT	New Technology Developement	Continuos Improvement, Focus on Process, Standardization, Scientific Management	HRM Organization	Supplier Partnership
Videotec S.p.a			Continuos Improvement, Focus on Process	HRM Organizarion, Training, Employee Incentives	

Limitations of the study:

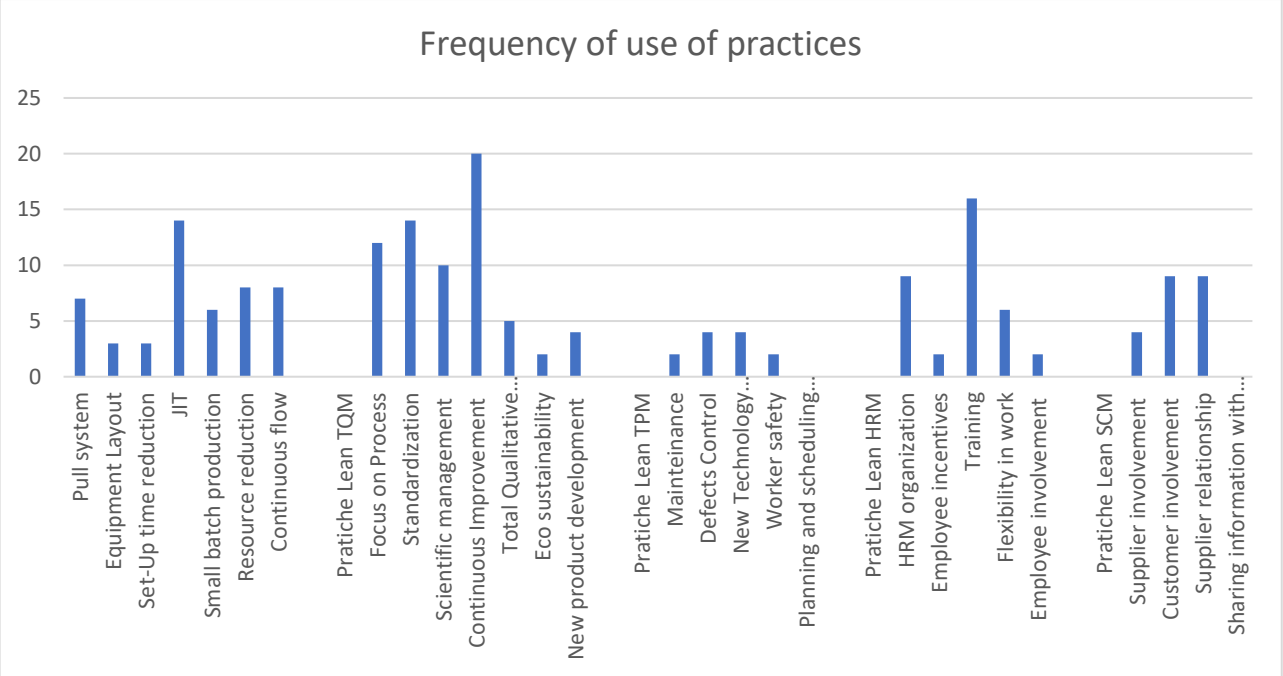
- Sample unevenness: The companies analysed have different settors and come from different geographical areas.
- Use of secondary data: In companies analyzed with secondary data, it was not possible to verify the presence of some Lean practices.
- Annangraphic: The companies analyzed have achieved at least 5 years of Lean experience.

Evidence:

Analysis has shown that the most used practices of companies are:

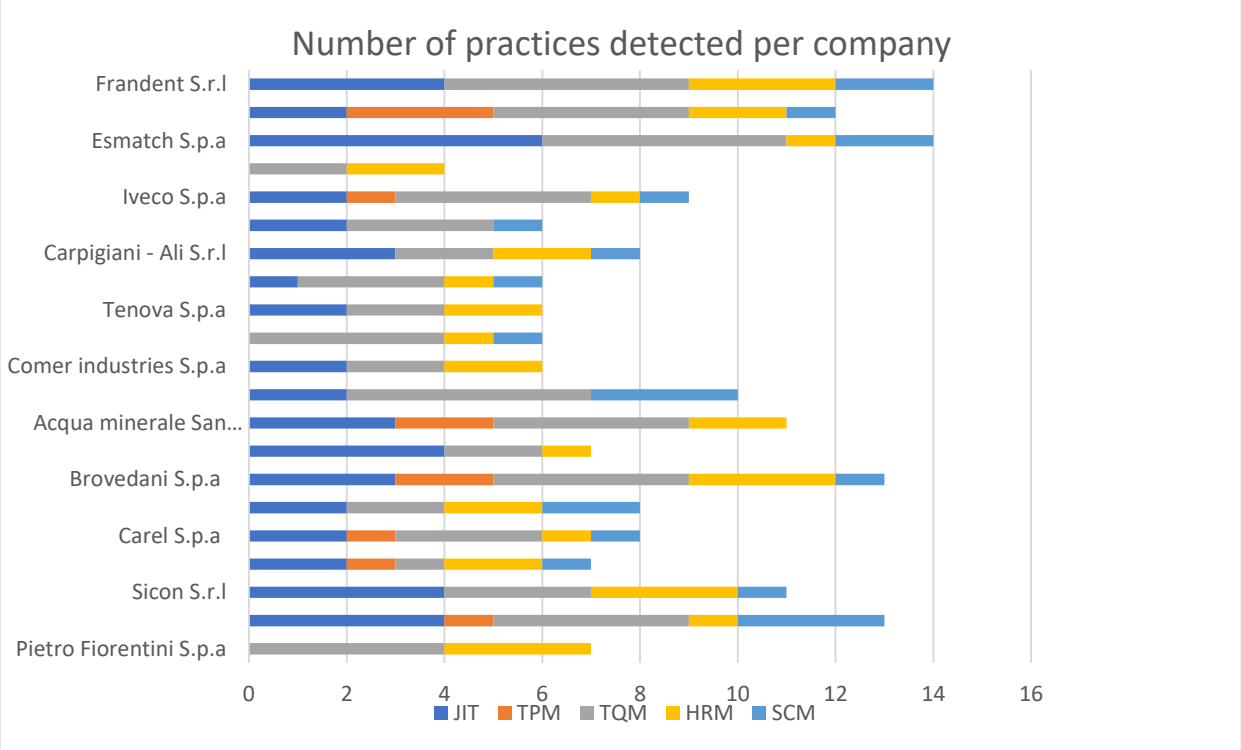
- the continuous improvement applied by all the companies analysed;
- the JIT applied by 14 companies;
- the standardisation of processes applied by 14 companies;
- employee training applied by 16 companies.

Only two of the practies present in the model of representation were not identified in the companies analysed: Planning and scheduling and Sharing information with the supplier. Instead, two new TQM practices (not present in the representation model) were found: Eco stustanability and New product development. Companies generally showed frequent use of TQM practices and JIT practices while TPM practices were the least used.



The "number of practies detected per company" table shows the number of practices implemented by each company divided into Bundles. The data shows that all companies applied at least 4 different Lean tools and that the application was focused on more than one different scope. Italian companies have therefore demonstrated a profound conception of Lean Production and unlike what was said in Chapter 2 the overall trend seems to have changed.

"Even fewer were the Italian cases that can be considered successful or exemplary cases, this always because Italian companies continued to approach Lean thinking with the wrong spirit, applying only a few tools and using a short-term mentality."



Some elements of interest emerged from the research:

1) The factors that most facilitated the Lean transformation of the companies analysed were:

- Competitive environment: Increased competitiveness is one of the main drivers of change. In fact, many of the companies analysed belong to sectors with high competition, generated by the entry into the market of large foreign players who can count on a low-cost workforce and have a much greater investment capacity. These companies have not seen any major changes in terms of turnover or profitability since applying Lean Production, but if we compare their economic results with those obtained by their competitors, the difference appears to be clear. We can conclude that while the general tightening of competition has forced many small and medium-sized enterprises out of the market, Lean companies are instead able to remain competitive by initiating a deep process of cost review and efficiency of business processes.
- The influence generated by key trading partners: Slender companies in the supply chain overhaul process, focused on eliminating waste, are pushing their key stakeholders to convert to the Lean philosophy. The

influence exerted may be direct (as in the case of Valid Plastic) or indirect (as in the case of Frandent), in any case the companies analysed have shown that Lean transformation is often favoured by companies with which they are engaged in business relations. This mechanism generates a ripple effect, with the result that Lean Production will be implemented by more and more companies within the network of the Lean enterprise.

2) Application of Lean Production in customer and supplier relationship management:

Lean Production has a strong impact on managing the relationship with the company's suppliers and customers:

- Reducing the number of suppliers: Tight delivery times and the high quality required for products mean Lean companies reduce the number of suppliers by keeping only the most efficient ones.
- Partnerships with suppliers: while the number of suppliers decreases on the other hand, it improves the relationship with those that remain. Lean companies tend to establish a relationship with suppliers based on maximum collaboration and complete mutual trust, trying to build a long-term bond.
- Customer relationship: The use of Lean tools in identifying customer needs (The voice of consumer) was found in the analyzed cases. "More recently, we have launched a series of improvement groups, tasked not only with simplifying our processes, but also finding better ways to meet our customers' needs and improve their lives. (Carel S.p.a) "

3) Application of Lean Production in employee relationship management:

A lot of different studies have shown that the company's employees did not immediately have a positive impact with Lean Production because their workload suddenly increased and they had to adapt to new production techniques. Despite this, if the employees immediately showed an active participation in the new innovation process and the company immediately started internal training courses, with the aim of making people understand

how to work with the techniques and Lean tools, the negative effects produced by the introduction of Lean Production are diminishing. In fact, the companies analysed found that the high involvement of managers and employees facilitated the successful implementation of Lean Production.
In addition, Lean tools have been used by companies in managing their relationship with employees: "The Lean philosophy pushed the entrepreneur Ezio Bruno to adopt an approach focused on the well-being of employees: "I always tell my employees that when they enter the company they must feel good, they must be happy to work and happy when they leave work".
Employees, on the other hand, declare that they are very happy with Frandent and to prove it is the absence of turnover, that is, the employees decide to stay in the company for many years."
And in fostering a more flexible structure that would encourage employee initiatives: "Valid Plastic also adopts an approach of promoting operators' suggestions, employees are asked if there are things that should be improved, then they try to improve them all together."

Results:

From the results produced by the research we can finally say that: Italian EMS have reached a higher Lean maturity than in the past.
Italian companies have demonstrated a holistic approach to Lean Production, based on the application of Lean instruments in the following contexts:

- Corporate culture: All companies have developed a corporate culture based on the continuous improvement they pursue through Kaizen's periodic activities.
- Human resource development: Companies focus on developing human resources by investing in Lean training of their employees and fostering a flexible structure based on the use of HRM practices.

- Leadership: Business managers are fully involved in the business transformation process, encouraging the creation of business management based on Lean principles.

CHAPTER V

In the first part of chapter I talk about the history and the key elements of the Zero-based (ZB) approach. The ZB approach was born in the 1970s and is used in the analysis of administrative costs (ZBB), but over the years it becomes an increasingly complex managerial tool. Its most modern applications are the ZBx and the ZBR.

5.1 LEAN PRODUCTION AND ZERO-BASED APPROACH

	Lean Production	ZB approach
Scope	Reviewing and improving business production processes	Administrative Cost Analysis
Measuring processes	Value Stream Mapping of the business production processes	Business task mapping
Goal	Systematic elimination of all corporate waste	Redesign the business organization by eliminating all inefficiency costs
Activities	- Kaizen Activity (continuous improvement) - Kaiaku Activity (radical improvement)	White sheet redesign of the business organization (radical improvement)
Levers of improvement	Applying Lean tools and techniques	Evolutionary Initiatives

1) Although the two management systems are created with different scopes (Lean Production is used within production facilities while the ZB is applied in the analysis of administrative costs) Both over the years have expanded the scope to cover various aspects of the organization:

2) Lean Production and ZB are approach based on the centrality of measurement. Both start with a detailed internal analysis with the goal of measuring business processes/activities. Lean Production focuses on mapping business production processes through Value Stream Mapping, while ZB focuses on mapping the activities of functions in scopes.

3) Lean production aims to eliminate all corporate waste (achieve perfection) through the performance of Kaiaku activities and Kaizen activities. The ZB approach, on the other hand, aims to redesign the company's organization, redesigning it from scratch, to eliminate all the costs of inefficiency of the structure.

4) After mapping the processes/activities in both management systems, tools are applied to solve the identified problems. In the case of Lean Production, the levers of improvement are the application of Lean tools and techniques. In the ZB approach the organization designed and implemented evolutionary initiatives: structured interventions, focused on a specific organizational area, that generate cost savings for the company.

5.1.1 The history of the ZB approach

In 1970 Peter Pyhrr published an article in the Harvard Business Review in which he introduced the concept of Zero-based budgeting (ZBB). Pyhrr's idea is simple: starting from scratch, gradually adding only the costs deemed necessary and functional.
The ZBB approach is used in Budgeting operations and represents a completely new methodology compared to those used previously. In the first years of life, the ZBB is applied only for the analysis of administrative costs.
In 1989 Jorge Paulo Lehman, Marcel Telles and Carlos Alberto apply the zero-based approach in a small beer shop called Brahma, within a few years the business becomes a world-famous brand. It was precisely in those years that the ZBB began to acquire a certain notoriety, finding more and more space within companies. At the same time the ZBB continues to evolve with the introduction of new concepts:

- Cost category ownership: create a positive organizational tension between the categories and the entity owner.
- Bad cost and good cost: in the early 2000s the ZBB approach becomes a "full-fledged management technique" that eliminates the bad cost of non-work by increasing the costs of good work.

- Closed-loop approach: closed-loop management to ensure that cost savings remain so over time. It's a capability that involves full-level visibility into all business units, categories and geographies, and exploring how to spend money wisely to add value and drive growth.

5.1.2 The ZBx

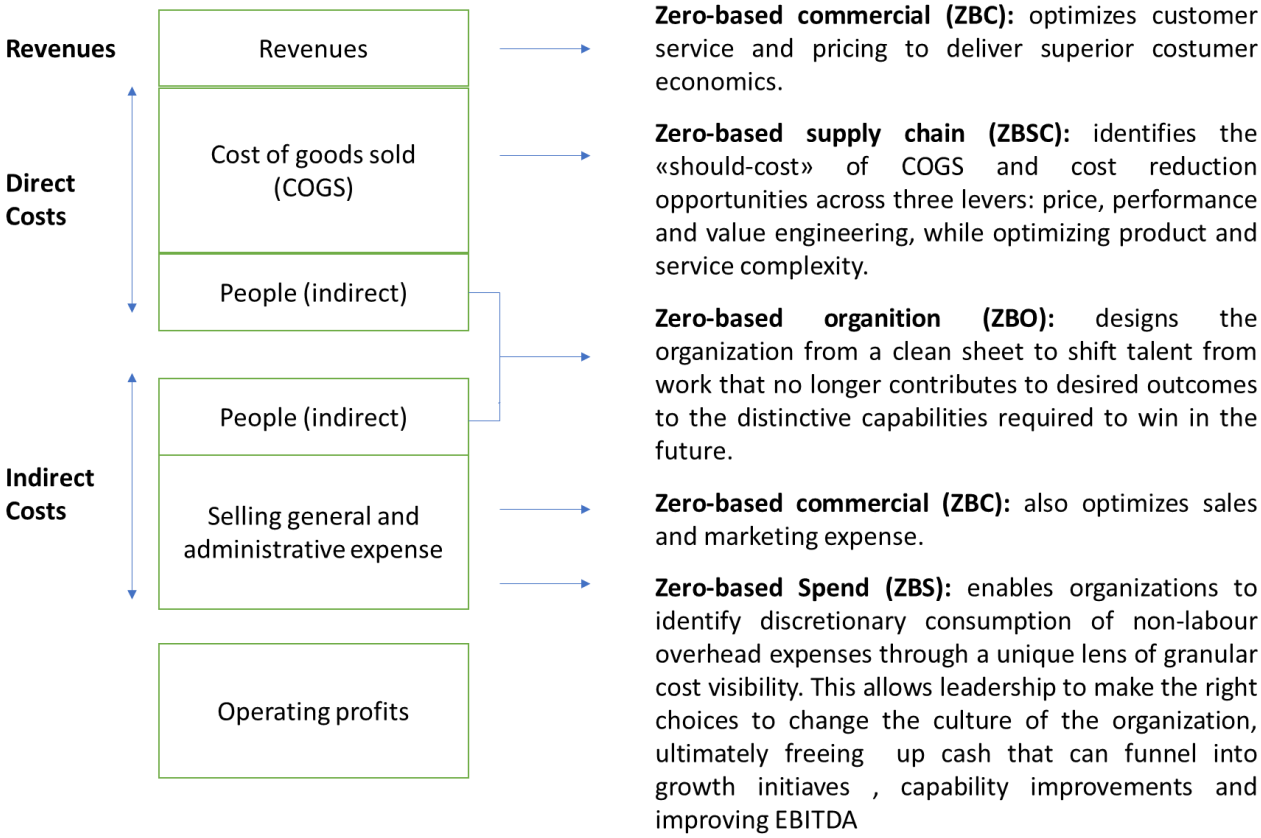
In recent years, the ZB methodology has been applied in other business areas in addition to the administrative one. In 2016 Accenture divided the zero-based application into 4 micro-categories:

1) ZBS (zero-based spend): zero-based application to reduce the general and administrative costs of the company.

2) ZBO (zero-based organization): zero-based application to redesign the organization from scratch.

3) ZBC (zero-based commercial): zero-based application to identify the "should-cost" of COGS and cost reduction opportunities across 3 level: price, performance and value engineering

4) ZBSC (zero-based supply chain): zero-based application to optimize costumer services and pricing to deliver superior costumer economics.



The ZBS, ZBO, ZBC and ZBSC are part of the zero-based mindset macrosystem, better known as ZBx. Through the ZBx, organizations apply a cost and process review process throughout the company.

5.1.3 Closed Loop Approach

The Closed Loop ZBx is a virtuous cycle through which the company continually renews itself and improves day after day. In the big zero book the closed loop is described as a secret sauce made up of six ingredients that makes the zero-based mindset sustainable:

1) Driving visibility: Through Driving Visibility, the company transparently defines the organizational structure trying to identify the exact place where the cost was generated. The costs are then divided into "Bad cost" (costs to be eliminated) and "Good cost". Thanks to Driving visibility, the company creates a "one version of truth".

2) Value targeting: Through Value targeting, the company finds the Gaps (opening the Gap) on cost or revenue performance, analyzes them (monetization of the Gap) and finally resolves them (closing the Gap). Value Targeting is a fundamental tool for developing an organizational culture

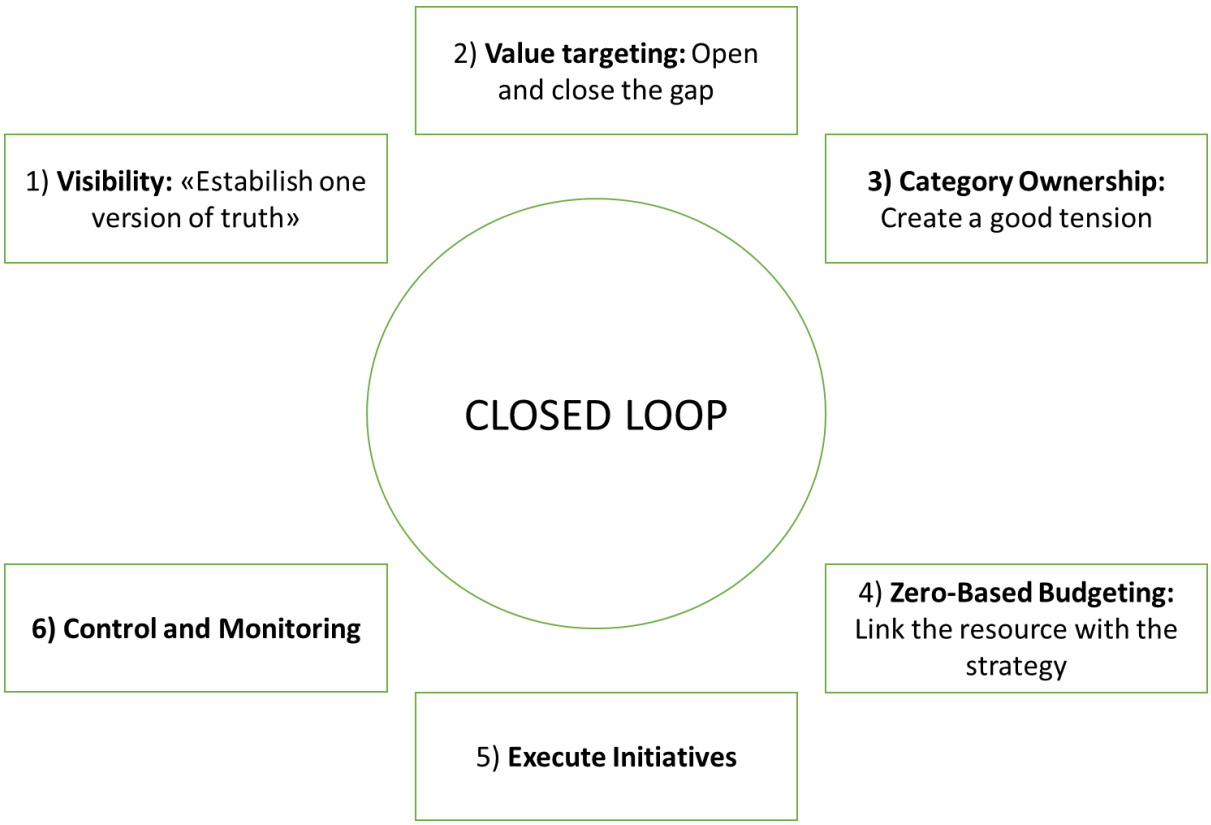
based on continuous innovation in the areas of cost efficiency and revenue growth.

3) Category ownership: Through Category ownership, the company involves the business areas involved in the budgeting operation, thus creating a dual vision (Category and entity owner) of responsibility, cost and resource management. Category ownership inevitably leads to the creation of a tension, which is however perceived as a positive and constructive element.

4) Zero-based Budgeting: Through Zero-based Budgeting, the company assesses the degree of consistency of the ZBx proposals with the corporate strategy and with the resources available.

5) Execute initiatives: Through the execute initiatives the company decides how to implement the newly created strategy.

6) Control and monitoring: once the operation has started, the company must monitor it and if there is a need to initiate corrective actions.



5.1.4 The ZBR

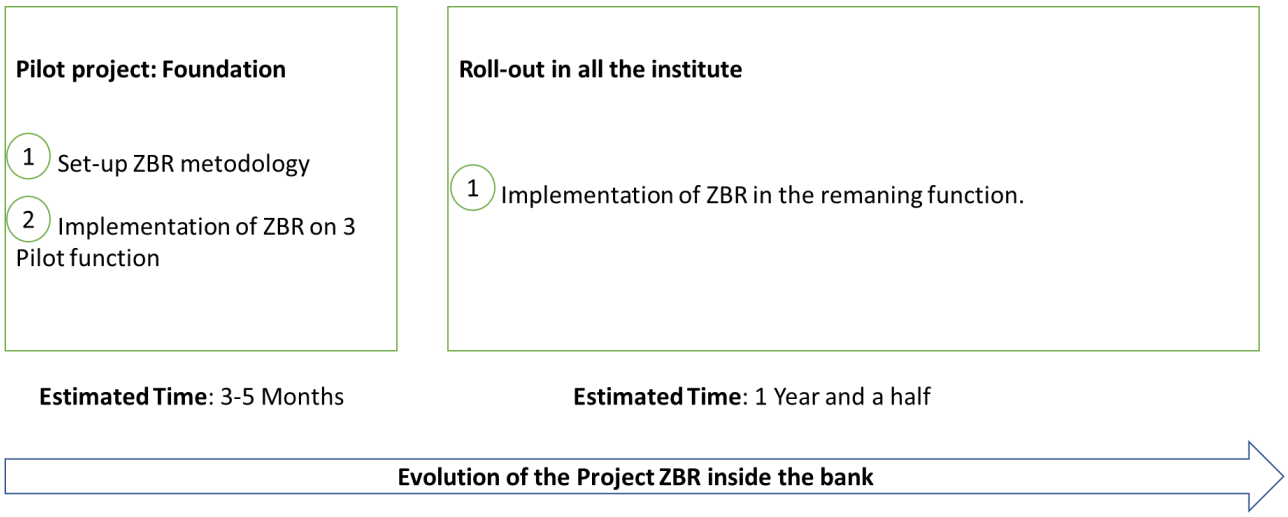
The second evolution of the ZB approach is the Zero-Based Review. With the ZBR, the organization adopts a new mindset and new behaviors around cost, continuously striving for maximum efficiency and greater savings through the integration of the organizational structure, governance, accountabilities and processes. Ultimately, the ZBR helps the organization to focus on the activities that fuel the competitive advantage and eliminate many of the ones that do not.
The ZBR will be described in more detail during the chapter where the practical case of the application of the ZBR within the banking institute where I did the internship will be reported.

5.2 ZBR PROJECT

5.2.1 Introduction

The ZBR project is part, together with other corporate projects, of the industrial plan of the bank. The plan has a five-year duration and aims to achieve operational efficiency through a systematic reduction of costs and a rationalization of resources.
The ZBR project provides for a "blank sheet" redesign of the operational and organizational model and of the main business processes, considered essential by the banking institution. Until recently, in fact, the organizational focus was more based on the provision of the service, which had to be punctual and available to all those who requested it, sometimes not maximizing cost efficiencies. The ZBR therefore represents a clear turnaround compared to the past, an important demonstration by the banking institution of wanting to eliminate organizational waste.

Evolution of the ZBR project:



The bank launched the ZBR project during the current year, with the aim of optimizing the entire organization over two years. The ZBR project is divided into two distinct phases:

- Foundation (ongoing): during the Foundation phase, the working methodology was defined taking into account the particular characteristics of the banking institution. In addition, 3 pilot functions were identified in which the methodology was "tested".
- Institute roll-out (scheduled phase): Once the work in the 3 pilot functions has been successfully completed, the ZBR approach will be patchily extended to the entire banking institution. The Institute Roll-out phase is the one that will require the greatest efforts both in terms of time and resources.

During my internship I worked on the development of the ZBR in the three pilot functions: Marketing, Back office and Digital Innovation. In the chapter, therefore, I will only talk about the Foundation phase.

5.2.1.1. Key elements and levers of the methodology

1) Targets: with the ZBR project, the bank wants to redesign the operating model and the main processes to reduce costs / complexity and streamline the organization. The main objectives are:

- Redesign the operating model making it efficient and aligned with the group strategy.
- Rethink the "ways of working" by developing new processes and new approaches.
- Take the opportunity of redesign to reach full digital potential

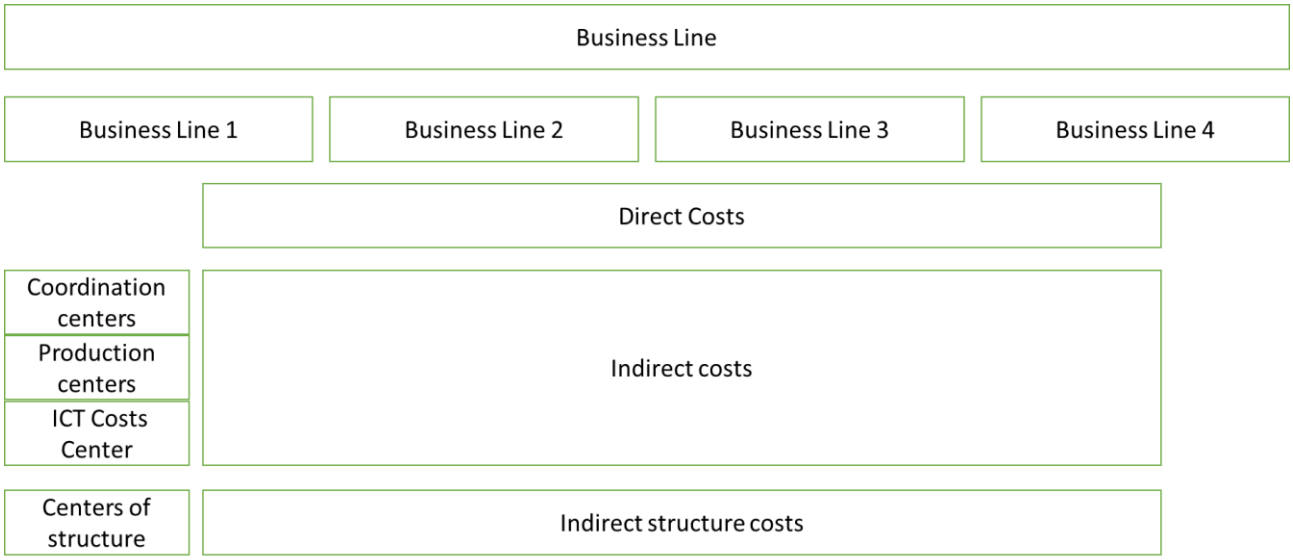
2) Levers: the key levers of the ZBR for achieving the objectives of the project are:

- Elimination / reduction of work: elimination of non-core or "nice-to-have" services / activities, reduction of service levels, reduction of frequency or # of deliverables.
- Better organization: simplification of the organizational model, creation of clear roles and responsibilities, centralization or consolidation of processes and activities….
- Increased productivity: automation and digitization of activities, increased outsourcing and offshoring, standardization of processes and activities ...

3) Operational phases: the process by which the ZBR is implemented on each function is divided into 3 operational phases:

- Granularity: During the granular phase, the activities are mapped (identification of the perimeter area) and the related costs associated with them. The reclassification of costs based on three cost drivers will then be applied: HR costs (personnel costs), ASA costs and indirect costs.
- Investment posture: during this phase the investment posture is defined with the involvement of top management on the operating model to aim for.
- Identification of ZBR levers: In the last phase, the intervention levers are identified for the optimization of the functions, useful business cases are prepared for estimating the costs saved and the investments necessary to carry out the intervention.

5.2.1.2 The cost allocation of the bank



The bank's cost allocation process is based on the logic of cost centers (CDC). Each business organizational unit is categorized into one of the cost centers types: Production Centers, Coordination Centers, Information Technology (IT) Cost Centers, Structure Centers, and Lines of Business.
All costs from CDCs other than business lines are reallocated to the same business lines. The business lines are in fact the final unit on which all the costs of the institution are allocated. Considering the current cost structure, with the ZBR project the costs incurred by the various functions in scope at the single activity level have been granularized, favoring the understanding of Activity-Based costs.

5.2.2. The ZBR methodology set-up

During the first step of the Foundation phase, the set up and calibration activities of the methodology on the banking institution, the development of ZBR internal skills for the roll out (train the trainer) and the prioritization of efficiency interventions were started. The activities described above were focused on achieving three key objectives:

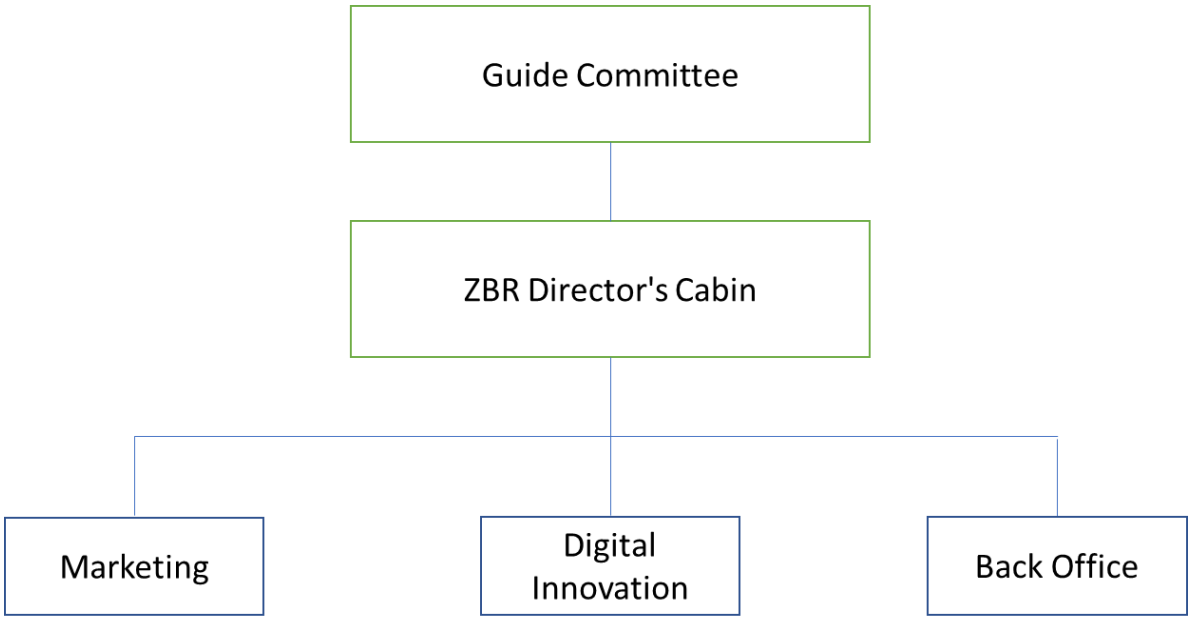
- Definition of the company ambition: the company ambition has been defined and a detailed mapping of the attackable base has been started.
- Calibration of the methodology on the bank
- Internal skills development

Also, to create an ad hoc methodology for the bank, it was necessary to identify the characteristic elements and the possible impact they have on the application of the ZBR (methodology calibration):

- The corporate governance system of the banking institution: Presence of agreements or contracts with other stakeholders internal or external to the group that represent constraints in defining the hypothesis of reduction / efficiency of ZBR activities.
- Cost structure: the cost classification was carried out taking into account the peculiarities and organizational structure of the institution. for the purposes of the project, it is necessary to know the activities classification mechanisms and the related cost association logics.
- Qualification of revenues against costs incurred.
- The institute acts as a product factory.
- Presence of transversal processes: The classic approach of the ZBR suggests focusing function on function, however in the presence of transversal processes (such as strategic planning, budget ...) which involve the involvement of numerous functions of the banking institution and other institutions connected to it, it is necessary to evaluate whether to adopt a transversal approach in order to capture and address any duplication of activities.

5.2.2.1 Internal skills development

For the ZBR project, the institute decided to set up a dedicated Working Group, consisting of three organizational levels:



The steering committee, consisting of the general manager of the bank, the project manager and the sponsor figure covered by the COO (Chief Operating Officer), was placed at the head of the ZBR project. Below the steering committee is the queen ZBR cabin and further down are the perimeter functions, i.e. the areas affected by the ZBR project. Two key figures were introduced in each perimeter function: the organization contact person and the ZBR manager (the ZBR managers were identified and trained during the methodology set-up). The project also provides for the involvement of the heads of the functions and the Chiefs of the same who make up the Leadership Team.

Role	**Responsability**	**Effort expected**
Guide Comitee	- Evaluation of proposed interventions - Business case approval - Involvement for project summary advancements	**-** On-call meetings
ZBR Director's Cabin	- Coordination of project activities -critical reading of inputs received from functions -Definition of the levers of intervention -Proposal to the business case guide committee	**-** Bimonthly progress meeting and in preparation for the Guide Committee. - Vertical operational meetings on individual functions or topics (approximately 1 per week)
ZBR manager	- Pivotal figure belonging to each of the functions in analysis - Point of contact for coordinating operational activities involving the function	- Operational meetings for organizing and discussing task progress - Involvement on demand in the meeting of the director's cabin - Template Compilation Coordination

	- Responsible for compiling templates	
Organization Contact	- Pivotal figure belonging to Organization with Skills on Reference Function - Convolt in the task mapping, review and critical reading phases of compiled templates	- Interviews to discuss the activities of the reference function - Participation in the preliminary reading of the results of the analyses - Involvement on demand in the meeting of the director's cabin
Leadership Team	- Involved in kick-off for illustration of ZBR activities - Involved in the identification of the levers of intervention	- Involvement in kick-off activities

Determination of the application areas: After an initial analysis, the perimeter functions have been identified, i.e. the pilot functions in which the ZBR methodology will be applied in the Foundation phase:

- Back office (Chief Operating officer area)
- Marketing (Chief Business Office area)
- Digital innovation (Chief Business Office area)

5.2.3 Implementation of the ZBR on the identified functions

Objective: implement the ZBR on each function in three distinct phases Granularity, Investment posture and Identification of ZBR levers.

Duration of the phase: From 3 to 5 months.

Description of the operational phases:

	Granularity	**Investment posture**	**ZBR Lever Identification**
Design phases	Mapping tasks and their costs	Definition of investment posture and role of the center	Identifying and estimating necessary savings and investments
Deliverables	- Mapping activities (typically up to L2 level) and cross-processes, with detail of costs and resources - Mapping for input/input process, output, deliverable, and automation level	Top Down view of top management on role/implementation modes for each feature on the perimeter	- intervention levers for optimization and macro-time allocation (BASELINE OPTIMIZATION) - maximum estimation of the investments needed to implement the programme
Main activities	A) Preparing standard templates for mapping B) Template tunning C) First compilation of templates (by functions): - Resource allocation on tasks - Cost/contract mapping by task D) Activity-based cost processing (HR-ASA)	A) Preparing the summary templates necessary for discussion with management about the operating model to tend B) Collection of top management ratings C) Preparation and implementation Workshop "restricted" decision, with sharing of benchmarks and best practies	A) detection, synthesis and sizing identification of possible 360-degree Top down intervention levers on: - Organizational structure - Sizing - Review jobs/tasks/task frequency -Insourcing, automation, changing service level B) Test objectives by function with respect to

	E) Interpretation, verification and alignment information and templates	D) Processing the synthesis of the operating model to tend functions/activities on the perimeter	industrial plan framework C) Objective communication, levers and time allocation to function managers D) Optimized Baseline Tuning and Consolidation Feedback Collection E) Drafting a grounding plan for interventions

5.2.3.1 Granularity timeline

A common timeline has been defined for all three functions of the main activities of the Granularity phase:

A) Preparation of standard templates: in this phase an Excel template is created, and then the activities, the costs and internal resources of the function are mapped.

B) Template Tuning: in this phase the operational kick off is prepared for the presentation of the activities and templates. The correctness of activities and resources reported in the template is also checked thanks to interviews with the function and finally the function itself is asked to perform an evaluation on the information reported in the template.

C) First compilation of the templates: in this phase the resources and ASA costs are allocated on the activities of the function mapped previously.

D) Activity-based processing of costs: in this phase, an activity-based reading of the expenditure methods (both HR and ASA) of the functions involved is processed.

E) Interpretation, verification and alignment of information: the estimated time for this operation is three days; in this period of time, preliminary reflections are made on the application of market benchmarks and on the revenues received against the costs incurred.
In total, the estimated time to complete the granular phase is approximately five weeks.

5.2.3.2 Investment Posture

During the investment posture phase, the operating model is drawn up and the investment posture proposals for the mapped activities are presented. Each proposal is aimed at achieving one of these three objectives:

- Best in cost: achieve maximum operational efficiency in compliance with current regulations;
- Best in class: achieving excellence on service standards by generating a competitive advantage over the market;
- Balanced: focus both on the quality of the service while paying attention to operational efficiency.

5.2.3.3 ZBR levers identification

In the Identification phase of ZBR levers, the "evolution initiatives" are identified. After being identified, the evolution initiatives are then investigated in the business case, which shows the estimates of the costs impacted by the initiative and the potential cost savings.
The following table shows all the macro types of initiatives identified and the ZBR category to which they belong:

ZBR Category	**Type of initiative**
Task perimeter review and cost clean-up	- Operational rationalization - Review unnecessary costs/not relevant - HR Perimeter Review - Redefining business model
	- Reallocation of activities within the bank

Better organization	- Cost Excellence - Outsourcing
More Productivity	- Process Automation - Digitalization - Rationalization of channels and projects

5.2.4 Conclusion

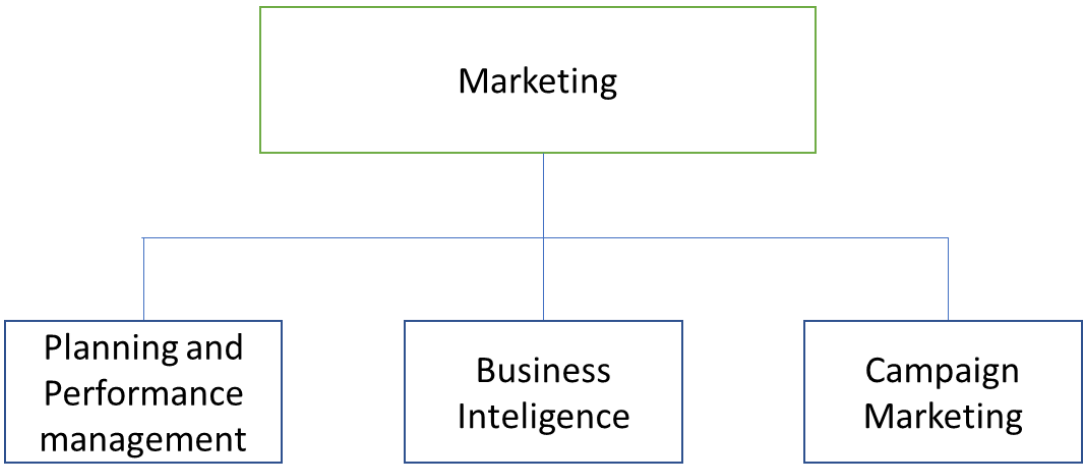
This paragraph describes the set-up phase of the ZBR methodology within the banking institution. From now on, the application of the ZBR methodology on the three pilot functions will be exposed: Marketing, Digital Innovation and Back Office.

5.3 ZBR PROJECT MARKETING FUNCTION

In this paragraph, the application of the ZBR methodology in the Marketing function will be described. The three phases will be analyzed in detail: Granularity, investment posture and identification of ZBR levers.

Granularity	- **Template preparation and taxonomy of tasks and channels.** - **Cost granularity.** - **Revenue granularity.**
Investment Posture	- **Proposals for investment postures**
Identification ZBR Levers	- **Identifying initiatives in a key of evolution**

Marketing function organization chart:



The function headed by the Marketing production center is divided into 3 first reports:

- The Planning and performance management production center
- The Business intelligence production center
- The Marketing Campaign Production Center

The cost allocation methodology applied by the institute provides that the Marketing function, as a production center, reverses 100% of its costs in function of the services provided between: Group Companies and the business lines of the banking institution.

5.3.1 Mission and activities

The Marketing organizational unit is responsible for ensuring the supervision of coordination at Group level of marketing activities, the value chain, product communication, commercial planning and territorial development, both of the commercial portfolio and of new markets.
It contributes to the definition of the Group strategy and is responsible, in conjunction with the Company Commercial Divisions and the Group Companies, to define and coordinate the distribution and commercial strategy aimed at defining the service model as well as marketing strategies aimed at developing commercial performance and enhancing the positioning of the Group.
It also ensures the analysis of the trend of the economic context, the reference markets and the evolution of the commercial positioning and potential of the Group for the various segments of operations.

5.3.2 Marketing function Granularity

5.3.2.1 Preparation of the standard templates

Creation of the Excel template in which the taxonomy of 20 activities belonging to the Marketing function has been defined, the activities have been grouped into 10 different scope:

Scope	**Activity mapped**	**Activity description**
Business Development	- Development of new products and services	- New product development strategy, idea generation, technical and economic feasibility analysis, market testing and marketing logic.
	- Group service templates	- Design of the Group service models, consistent with business objectives and strategies.

Governance projects and activities	- Project management - Monitoring and reporting on the progress of the actions/activities provided by the Business Plan, Territorial Development Plan and marketing plan in line with the objectives and strategies defined.	- Definition, monitoring and updating of the roadmap of perimeter projects, taking care of the progress reporting, the identification and escalation of issues, risks and opportunities, the management of design interdependencies, consistent with the defined strategy and with the actual progress of the project activities. - Monitoring and reporting on interdependencies and the progress of actions/activities provided by the Commercial Plan, Territorial Development Plan and marketing Plan in line with the objectives and strategies defined.
Planning and Business Coordination	- Drafting and monitoring of the group business plan. - Defining, implementing and monitoring Group Companies service models	……

Territorial development plan	- Drafting and monitoring of the territorial development plan	…..
Commercial support	- Contract management (retention and storage of institutional segment contracts for the provision of services to Group Companies)	…..
Reporting and analytics	- Reporting (reporting on customer characteristics and progress of initiatives) - Analytics (market and customer analysis, data preparation and system and business intelligence configuration)	…..
Products, pricing and specialist hubs	- Customer experience presidio - Product management - Pricing - Sector/supply compartment development (Specialist Hubs)	…..
CRM (Customer Relationship Management)	- CRM Management - Multi-channel (design of customer contact channels in multi-channel perspective) - Campaign management	…..

Marketing planning and coordination	- Marketing and communication plan - Multi-channel product communication and advertising - Events and campaigns	…..
Organizational Units Management	- Function/Organizational Unit Coordination	…..

The mapped activities were checked during the template tuning, where the data collected with the in scope function were compared.

5.3.2.2 Activity-based cost processing

Identification of ASA costs: in the first template compilation phase, the ASA costs were identified and associated with the activities of the function.

Identification of HR costs:
HR costs = FTE x employee cost for the company.
FTE calculation: The employees of the function were interviewed and asked to indicate the time they take to carry out the mapped activities. By adding up the answers of all the employees of the function, the total time taken by the function to carry out a specific activity is obtained:

Scope	Activity	Employee 1	Employee 2	Employee 3	**Tot FTE Activity**	**Tot FTE Scope**
A	1	30%	20%	20%	70%	A = 185%
A	2	40%	25%	50%	115%	B = 115%
B	3	30%	55%	30%	115%	
		100%	100%	100%		

Effort (the time spent) is measured in Full Time Equivalent (FTE), a quantity used to calculate the number of full-time workers employed in an activity or

in a company operational process. An FTE corresponds to the workload of a full-time employee that is:
1 FTE = 8 hours x 220 working days.
If an FTE of 3 is attributed to an activity x, it means that 3 employees of the company are employed full-time in activity x.

The Activity-based cost analysis was also performed in the same Excel file where the activities were mapped. In the activity-based analysis, the total cost of a single activity was calculated, obtained from the sum of three factors:

- HR costs (personnel costs)
- ASA costs (costs of projects and consultancy): ASA costs were obtained by evaluating the impact of projects and company consultancy on the activities of the function. For example, if a project cost the company 10,000 euros and 20% of the project involved activity x, an ASA cost of 2000 euros will be attributed to activity x.
- Indirect costs: indirect costs were reversed following, as for ASA costs, the logic of the incidence of costs on the individual activity.

5.3.2.3 Transparency output

The reclassification of costs is summarized in the “transparency output” table. For privacy reasons, I was unable to report the data on the reclassification of costs, however I still decided to insert the table to show the scheme that was used by the bank.

Activity	**FTE**	**HR Costs**	**ASA Costs**	**Indirect production costs**	**Total costs**
Business Development					
Governance projects and activities					
Planning and Business Coordination					
Territorial development plan					
Commercial support					

Reporting and analytics					
Products, pricing and specialist hubs					
CRM					
Marketing planning and coordination					
Organizational Units Management					

5.3.2.4 PeL analysis

Although the Marketing function does not generate turnover since it is not a business line, the cost coverage mechanism applied for all business functions requires the rule that all costs incurred must be justified by revenues. The operation of attributing the revenues to the costs incurred by the activities of the function was therefore carried out. The operation must result in a balance between the costs and associated revenues of the function:
Function costs = associated revenue of the function

5.3.3 Investment Posture Marketing function

After the granular phase, the preliminary Investment Posture and identification activities of the ZBR levers were started.

5.3.3.1 Preparation of the summary templates necessary for the discussion with the management regarding the operating model to aim (preliminary activity)

In the synthesis of the operating model, a preliminary investment posture proposal was made where a first hypothesis of evolutionary ideas was collected starting from the key issues of each area:

		INVESTMENT POSTURE (preliminary))		
Activity	**Key themes**	**Best in cost**	**Balanced**	**Best in class**
Cross	- Cost generation with no full revenue coverage			
Business development	- Partial overlap with the activities of the Digital Innovation function for the activities of identifying partnerships with innovative/fintech companies - Partial overlap with the U.S. Business Intelligence for the production of reporting on industry evolution and major trends - High costs of run consultancy			
Governance projects and activities	- Taking charge of activities not covered by the high-effort function in terms of FTE and consequent increase in headcount compared to the target			
Planning and Business Coordination	- Possible overlap with Strategic Planning in the planning activities of divisions and product companies and commercial structures in the territory			
Territorial development plan	- Support activities for Commercial Unit and Group Companies			
Commercial support	- Existence of paper contracts that require a high effort for management and logistics			
Reporting and analytics	- Possible overlay in the content or recipients of product reports			
Products, pricing and specialist hubs	- Pricing - Product management - Specialist hubs			

CRM	- Lack of integration between Social Media Caring and Customer Support processes			
Marketing planning and coordination	-Fragmented advertising expenses between the bank and related companies, resulting in a lack of economies of scale and reduced bargaining power - High ASA spending on sponsorships and events - High support required for digital innovation function for digital campaign management			

5.3.3.2 Expected evolution

From the interviews with employees it emerged that compared to the current situation described in the table, in some cases changes have already been planned within the function. For example, one of the changes envisaged in the area of planning and coordination of marketing activities is the reduction of the budget for sponsorship and events, one of the key issues discussed in the Investment posture. In evaluating the evolution initiatives, the ZBR team must therefore also consider the changes already planned by the organization.

5.3.4 Identification of levers ZBR Marketing function

5.3.4.1 Identification, synthesis and sizing identification of possible 360 ° Top down intervention levers (preliminary activity)

During the identification phase of the ZBR levers, the evolution initiatives and the relative areas of application were identified. The activity was carried out in a preliminary perspective, so the initiatives must be considered only as proposals for action, for which an in-depth analysis has not yet been carried out (Business Case).
Fourteen evolution initiatives have been identified. The interventions were divided by type of initiative:

Operational rationalization: The proposed initiatives were:

1) The rationalization of the reports produced;

2) Integration of the skills of the Digital Innovation function and Digital Marketing field.

Review of unnecessary costs: interventions focused on the identification and rationalization of costs allocated to the function in scope and which the function does not consider to be relevant to it. The proposed initiative was:

3) The reallocation of costs to run consultancy and projects to the relevant units, which have been erroneously attributed to the Marketing organizational unit.

Reallocation of activities within the banking institution: The proposed initiatives were:

4) Clear definition of the types of projects that are managed by the Marketing organizational unit;

5) Integration of scouting and technology fintech activities with the Marketing feature; (initiative already seen in marketing function)

6) Redefinition of the roles and responsibilities of the organizational units involved in the “planning and performance management planning, strategic planning and divisions” process;

7) Integration of Task Planning of Events with the Marketing Office.

Cost Excellence: interventions focused on optimizing expenses through the renegotiation of the pricing of existing contracts, evolution of the purchase process or internalization of run consultancy. The proposed initiatives were:

8) Reduction of the spending level by exploiting internal resources and skills;

9) Centralize spending, at Group Companies level, on products and services such as advertising;

10) Rationalization of the number of suppliers;

11) Resizing of the structures based on the activities to be carried out.

Process automation: Interventions focused on the automation of repetitive processes that are still carried out manually. The proposed initiatives were:

12) Complete automation of Data preparation processes;

13) Creation of dynamic dashboards so as not to have to create ad hoc reports every time upon request of the other functions.

Digitization: interventions focused on the Digitization of business processes and on contracts managed by the Marketing department. The proposed initiative was:

14) Digitization of contracts in paper format.

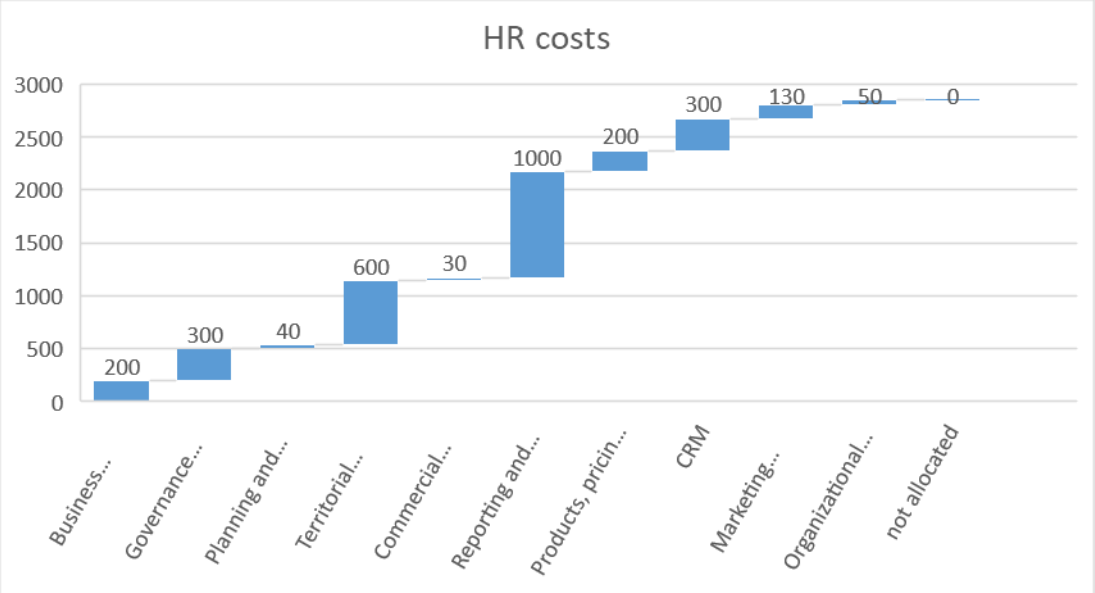
Initiative type	**Scope**	**Possible optimization scope**	**Initiative**
Operational rationalization	- Reporting and analytics - Marketing planning and coordination	- Excessive number of product reports - Digital marketing campaigns with high effort	1) Rationalization of the number of reports produced 2) Internalization of Digital Innovation 's digital skills
Review unnecessary costs/not relevant	- Cross	- Costs for run consultancies and projects currently allocated on the Marketing budget but not used by the facility	3) Reallocating irrelevant costs to organizational units that benefit from them
	- Governance projects and activities - Business development	- Chief Business Office area project management - Fintech scouting activities and technology partners	4) Unique definition of marketing projects and elimination of various redundancies 5) Integration with Digital Innovation Banking Organizational Unit

Reallocation of activities within the institution	- Planning and Business Coordination - Marketing planning and coordination	- Potential overlap of planning and performance management activities, strategic planning and divisions - Partial overlap between Institutional and Marketing activities in operational event planning	6) Redefining the roles and responsibilities of the various organizational units within the process 7) Integration of Task Planning of Events with the Marketing Office
Cost Excellence	- Cross - Marketing planning and coordination - Products, pricing and specialist hubs	- Costs for high run consultancies - Excessive costs attributed to fragmented marketing activities - Potential structure oversizing - Potential oversizing of some structures in relation to run activities	8) Spend less on advice trying to make more money for internal resources 9) Centralization at Group Companies level of the purchase of certain products and services and/or reduction of the sizing of the structure 10) Changing the purchasing model for professional services 11) Resizing of facilities on the basis of the activities carried out to "tend"
Automate processes	- Reporting and analytics	- Preparation date jobs currently performed manually	12) Complete automation of data preparation processes

	- Reporting and analytics	- Realization of "ad hoc" reporting for other functions	13) Building dynamic dashboards to support other functions
Digitization	- Commercial support	- The contract is currently operated in paper form	14) Digitalization of contracting

5.3.4.2 Costs impacted

The analysis of the impacted costs is carried out after the proposal of the initiatives to carry out a rough assessment of the potential of the costs that can be attacked by the ZBR interventions. The analysis of the impacted costs is carried out separately for HR costs and for ASA costs and indirect costs.



Initiative type	Costs impacted scope 1	Costs impacted scope 2	Costs impacted scope 3
Operational rationalization			
Review unnecessary costs/not relevant			

Reallocation of activities within the institution			
Cost Excellence			
Automate processes			
Digitization			
Total cost			
% of the base cost			

The HR costs of the activities of the Marketing function (first graph) were compared with the estimated costs impacted by the ZBR interventions (second graph). The percentage of the cost base that can be attacked (on the individual activity and on the entire Marketing function) is obtained by comparing the HR costs and the costs impacted by the initiatives. The same identical procedure is also applied for the calculation of the percentage of the assailable base of the ASA costs and of the indirect costs.

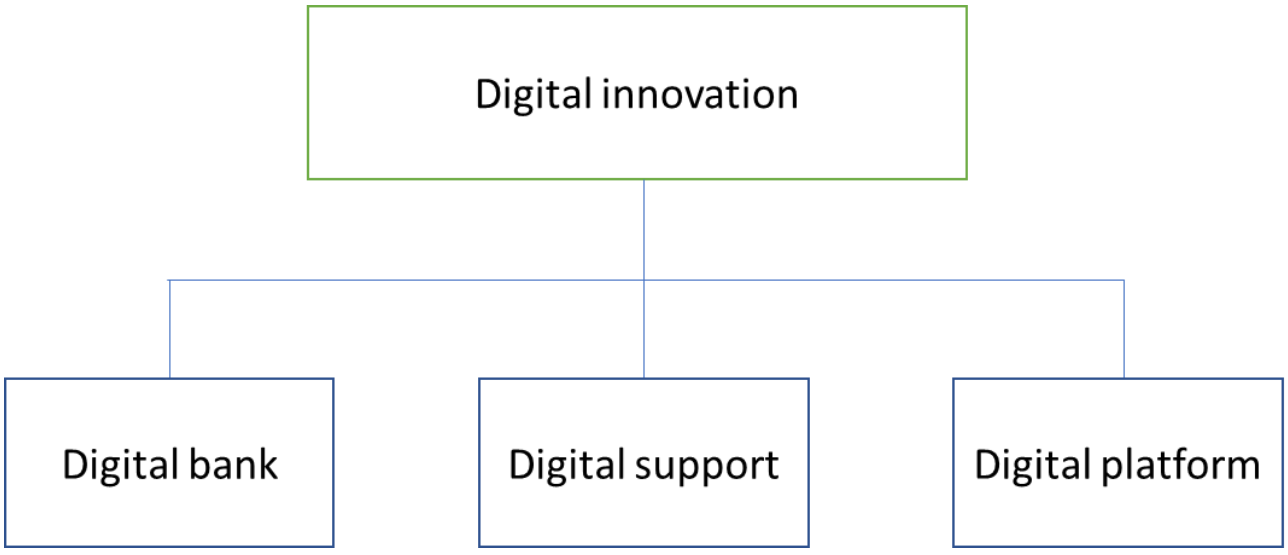
The evolution initiatives will be investigated in the business cases (writing is ongoing and will be completed in the coming weeks), which show the estimates of the costs impacted by the initiative and the potential cost savings.

5.4 DIGITAL INNOVATION FUNCTION

During this paragraph, the application of the ZBR methodology in the Digital Innovation function will be described. The 3 phases will be analyzed in detail: Granularity, investment posture and identification of ZBR levers:

Granularity	- **Template preparation and taxonomy of tasks and channels.** - **Cost granularity.** - **Revenue granularity.**
Investment Posture	- **Proposals for investment postures**
Identification ZBR Levers	- **Identifying initiatives in a key of evolution**

Organization chart Digital innovation function:



The function headed by the Digital Innovation Business line is divided into 3 first reports:

- The Digital Bank cost center.
- The Digital Support cost center.

- The Digital Platforms cost center.

The Digital Innovation function produces digital services used by the same banking institution and digital services provided to associated companies, third-party companies and retail customers.

5.4.1 Mission and activities

The Digital Innovation function is responsible for defining the institute's Digital Strategy and coordinates its development and implementation. It is responsible for managing the process of continuous innovation and digital transformation, ensuring the management of the operating model of digital channels (web, mobile, customer care, social networks, ATM, etc.) It is responsible for the creation and marketing of web and mobile solutions that it creates and manages through its own structure and / or the support of external companies. Consistently with the digital strategy, the Division ensures the development of the open banking and open innovation model. It directs innovation projects aimed at the bank of the future and services for corporate, retail and private customers: on the one hand, through the integration of new services (e.g. application programming interfaces - API) within the products offered and, from 'other, in conjunction with the other structures of the CBO Area, through the implementation of actions aimed at increasing the adoption of digital devices and services by its customers (so-called Digital Adoption).

5.4.2 Granularity of the Digital Innovation function

The Granular phase in the Digital Innovation function was conducted with a structured process and the outcome was: the mapping of the activities and the channels, the reclassification of costs, the tracing of revenues to the activities and the channels analyzed. The granular activity was carried out both by channels and by activity. A different channel has been identified for each type of service produced by the Digital Innovation function.

5.4.2.1 Preparation of the standard templates

Channels: Creation of the Excel template, in total 19 channels have been mapped, grouped into 3 areas:

Areas	**Channels**	**Description**	**Examples**

Digital channels 1	- Credit cards - Digital channels 1 - Costumer care services - Online banking app[32]	- Web and mobile channels for core banking operations - Communication channels	- Internet sites of the companies of the group - Extranet - Group company intranet
Digital channels 2	- Digital channels of the banking institution - Web procedures with associated companies - Digital channels of connection between the bank and the companies of the group - Product sites	- Communication channels - Banking institution websites	- corporate site - Intranet of the bank - Newsletter
Projects / innovation	- Instant payments - Crowdfunding - Online placement platform - Open credit - Phygital (ATM) - Mobile first	- Innovative projects not yet operational, but which respond to an evolution of the business context	- Crowfunding: application for fundraising campaigns for the third sector - PSD2: adaptation of digital channels to payment regulations

[32] Digital channels 1: refer to digital services managed by the bank but used by group companies
Digital channels 2: refer to digital services managed and used by the banking institution.

	- Unique customer service - PSD2		- Phygital: redefinition of the ATM user experience.

Activities: the taxonomy of the activities of the function has been defined, 17 activities have been identified, grouped into 4 areas:

Areas	**Description**	**Activities**
Digital strategy and Governance	All the activities aimed at defining the digital strategy of the banking institution	- Definition of the institute's digital innovation strategies - Definition of the User Experience (UX) strategy - Planning of digital channels - Coordination of IT functions for digital channels - Identification of opportunities for collaboration with companies with a high technological content of the ecosystem
Development and maintenance of digital channels	All the activities necessary for the design, development and maintenance of digital solutions created for the group's stakeholders	- Definition of the operating model of digital channels and user journeys - Service Design of digital solutions - Supervision and testing of evolutionary developments and product management - Demand, PMO and PM

		- IT service maintenance activities - IT service evolution activities
Management of digital channels	All operational management activities of digital solutions produced on the business side	- Commercialization of digital solutions - Support to associated companies for the operational management of products - Support on digital communication issues
Internal processes management	All internal process management activities enabling the correct dissemination of digital solutions	- Identification and management of suppliers (internal and external) of digital services - Development of monitoring systems - Administrative activities such as division budget management, active and passive cycles and the creation of new services / products

Both the activities and the mapped channels were checked during template tuning, where the data collected with the in scope function were compared.

5.4.2.2. activity-based cost processing

The ASA and HR costs associated with the function's activities were identified. The total costs attributed to each individual activity were obtained from the sum of:

- HR costs: HR costs were obtained by multiplying the FTEs charged to the activity by the cost of the employee for the company.
- Direct ASA costs
- Indirect ASA costs:

The activity-based costs were then read for the function channels. The total costs attributed to the individual channels were obtained from the sum of:

- HR costs
- Direct ASA costs: separated into ASA It costs and ASA digital costs
- Indirect ASA costs: separated into indirect IT costs and other indirect costs

Once the costs were identified, the activity-based analysis of the revenues was carried out. First of all, a perimeter of the function's revenues was performed with the support of management control, then the revenues were allocated to the channels to which they belong and the revenues of each channel were divided by activity. Finally, a profitability analysis was carried out.

The Transparency Output was drawn up where the costs and revenues related to the individual channels of the function divided by activity were reported in detail:

Channel / Scope	**FTE**	**Second margin[33]**	**Revenues**	**Costs HR**	**Asa Digital**	**ASA IT**	**Indirect costs**	**Total costs**
Credit card channel								
Digital strategy and governance								
Channel development and maintenance								
Business management of digital channels								
Management of internal processes								

For privacy reasons, the data relating to costs and revenues generated by the function in scope have not been entered.

[33] Second margin = revenues - Direct and indirect production costs

5.4.3 Investment posture Digital Innovation function

After the granular phase, the preliminary investment posture and identification activities of the ZBR levers were started. During the month of September i worked on the development of the operating model containing the various investment posture proposals approved by the top manager.

5.4.3.1 Market macro-trend

In the preliminary phase of the investment posture, the market macro-trends were analyzed on some evidence that emerged during the performance of the granular activity. From the interviews conducted, it emerged, for example, that the core activities of the Digital service design and project management office (PMO) function of digital projects are characterized by high consulting costs. By making a Benchmark with the best practices of companies in the sector, it emerged how the problem can be solved by investing in Human Centered Design activities. The benchmark was then taken into consideration in the discussion on the possible investment posture logics for Digital service design and PMO activities.

5.4.3.2 Preparation of the summary templates necessary for the discussion with management about the operating model to aim (preliminary activity)

In the synthesis of the operating model, a preliminary investment posture proposal was made where a first hypothesis of evolutionary ideas was collected starting from the key issues of each area:

		INVESTMENT POSTURE (preliminary)		
Activities	**Key issues**	**Best in cost**	**Balanced**	**Best in class**
Cross	Often the services offered by the function are not covered by revenues due to a lack of valuation towards customers w sustainable commercial strategy			

Digital strategy and governance	Ecosystem management and scouting of potential technological partners for the innovation of service models			
Development and maintenance of digital channels	- Proliferation of channels dedicated to communication with associated companies - a large share of the costs in digital development and maintenance relate to IT developments. - High incidence of consultancy costs			
Business management and digital channels	- Cost of consultancy for product management activities in strong increase (given the greater number of channels to manage)			
Management of internal processes	- Little transparency in the cost allocation and revenue allocation system			

5.4.4 Identification of ZBR levers Digital Innovation function

During the month of September, the first improvement initiatives were first identified and proposed.

5.4.4.1 Identification, synthesis and sizing identification of possible intervention levers 360 ° Top down (preliminary activity)

In the third phase, the first optimization interventions and the related areas of application were identified. The activity was carried out from a preliminary point of view, so the evolutionary initiatives must be considered as intervention proposals, for which implementation has not yet been planned.

In this paragraph the eleven interventions will be illustrated. The interventions were divided by type of initiative:

Rationalization of channels and projects: In this section we find the interventions focused on the centralization of digital processes offered in a smaller number of channels. The proposed initiatives were:

1) Rationalization of non-essential or strategic projects such as the crowdfunding platform.

2) Rationalization of internal communication channels.

3) Rationalization of the banking institution's sites

4) Rationalization of channels and services

Operational rationalization. The proposed initiative was:

5) Transfer of costs for Digital Factory run developments to third party companies interested in the service.

Business model redefinition. In this section we find the interventions focused on the identification and rationalization of IT costs allocated to the Digital Innovation function with possible "Cloud-based" and "Saas" evolution of the technologies used to offer digital services. The proposed initiatives were:

6) Outsourcing of low strategic value technologies

7) Creation of a new “innovation” organizational unit for the management of innovative company projects.

Reallocation of assets within the bank. The proposed initiatives were:

8) Integration of digital marketing environment management skills with the marketing function.

9) Integration of Digital Brand Identity skills with the Media Relations function.

10) Integration of scouting and technological fintech activities with the Marketing function. (initiative already seen in the marketing function)

Cost Excellence. The proposed initiative was:

11) Reduction of the spending level by exploiting internal resources and skills.

Type of initiative	**Scope**	**Possible scope of optimization**	**Initiative**
Rationalization of channels and projects	- Development and maintenance of digital channels	- Focus of the development projects of new digital solutions towards the strategic objectives of the organizational unit - Rationalization of the channels dedicated to internal communication - Rationalization of the banking institution's sites - Review of channels and services starting from Profit and Loss. Focus on required and / or necessary channels, using the investment postures	1) rationalization of non-essential or strategic projects 2) Centralization of communication channels 3) Rationalization of sites and shutdown of redundant sites 4) Rationalization of channels and services; revision of the logic of sales and contracts
Operational rationalization	- Development and maintenance of digital channels	- Costs for run development of Digital Factoring reversed in the Digital Innovation and marketing functions without corresponding revenues	5) Transfer of Digital Factoring costs to the companies directly involved
Business model redefinition	- Cross - Cross	- Development of proprietary IT systems with growing costs for internal Information Technology maintenance	6) Outsourcing of low strategic value technologies to Saas providers

		- Development of innovative projects, even those not related to digital, attributed to the function	7) Creation of an "Innovation" organizational unit with separate income statement
Reallocation of assets within the bank	- Management of digital channels - Management of digital channels - Digital strategy and governance	- High effort digital marketing campaigns - Creation and updating of digital brand identity manuals - Scouting of fintech and technology partners	8) Integration of digital marketing environment management skills with the marketing function. 9) Integration of Digital Brand Identity skills with the Media Relations function. 10) Integration of scouting and technological fintech activities with the Marketing function.
Cost Excellence	- Cross	- High spending for run consultancy	11) Reduction of the level of spending thanks to the internalization of resources

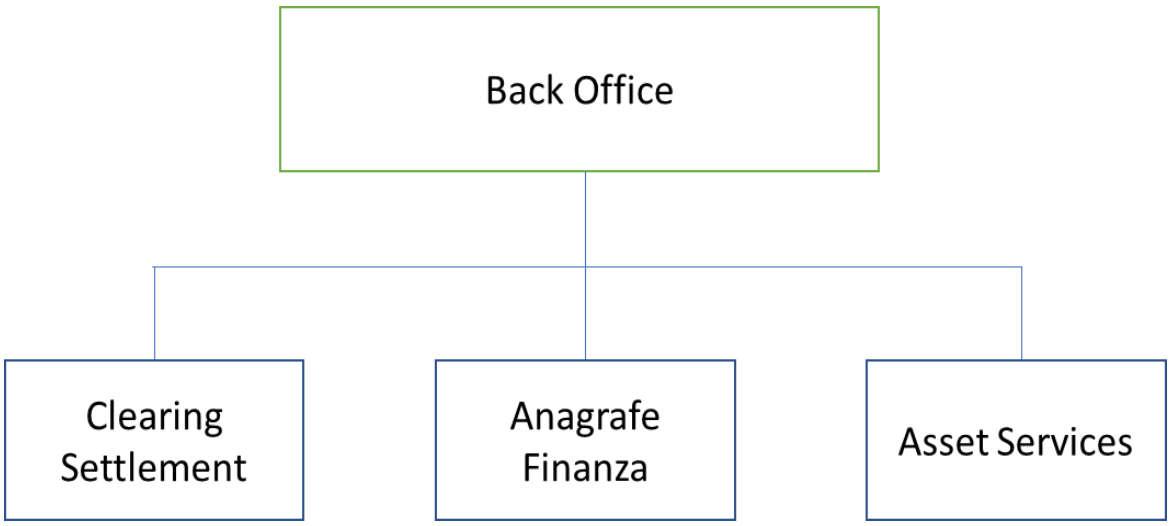
Both the analysis of the impacted costs of the initiatives and the drafting of the business cases will be carried out over the next few weeks.

5.5 Back Office

During this paragraph, the application of the ZBR methodology in the Back Office function will be described. The phases will be analyzed in detail: Granularity and identification of ZBR levers:

Granularity	- **Template preparation and taxonomy of tasks.**
Identification ZBR Levers	- **Identifying initiatives in a key of evolution** - **Business case: "review infoprovider"**

Back office function organization chart:



The function headed by the Back Office coordination center consists of 3 organizational units:

- Line of Business Clearing and Settlement Services

- Business Line of Finance Registry and Regulatory Reporting
- Line of Business Asset Services

5.5.1 Mission and activities

The Back Office organizational unit is responsible for the coordination and development of post-trading activities connected to the operations of the Bank's Finance sector, with particular reference to both the activities related to the management of the proprietary portfolio and to the activities related to the services and investment activities lent to customers pursuant to the TUF.

5.5.2 Back Office Function Granularity

In the Granular phase, the mapping of the activities, the tracing of costs and revenues to the analyzed activities and the PeL analysis was carried out through a structured process.
To this end, the data relating to costs and revenues were obtained from the planning and management control function of the bank and the owner function proceeded to associate these items to each mapped activity.

5.5.2.1 Preparation of standard templates

Creation of the Excel template, Where the mapping of 17 activities carried out by the Back Office function has been performed. The activities have been grouped into 4 different areas:

Areas	**Description**	**Activities**
	- Securities and cash settlement	- Confirmation - Clearing

Clearing and Settlement	- Management of transfers of financial instruments - Management of clearing with clearing houses	- Settlement - Transfer management - Depositary management - Pool collateral
Asset Services	- Custody of securities - Activities related to the person in charge of payments	- Custody services - Tax obligations - Session initation protocol (SIP)
Registry office	- Management and maintenance of the Master data - Census, listing and pricing of bond issues	- Management and maintenance of the master data - Regulatory reporting and communications - Notification of the Pricing of bonds and derivatives - Key Information Documents management - Drafting of regulatory documentation

		- Other activities carried out by the organizational unit
Governance and internal processes	- Governance activities	- Project management - Reporting and documentation

The mapped activities are the result of various refinements made during discussions with the process owners.

5.5.2.2 Activity-based cost processing

After the mapping of the activities, the activity-based reading of costs and revenues was performed: The costs associated with each activity were identified by adding the following items:

- Direct ASA costs: the costs of run consultancy and projects attributed to the activities of the function.
- HR costs: Obtained by multiplying the FTE of the activity by the cost of employees for the company.
- Indirect production costs.
- Indirect structural costs.

The reclassification of costs and revenues of all activities has been shown in the “Transparency output” table.

5.5.3 Identification of ZBR levers for Back Office function

The Back Office function is, among the three pilot functions, the one where the ZBR project is in a more advanced state of analysis. Once the phase of quantifying the profits attributable to each macro-activity was completed, the preliminary investment posture activity was carried out where the preliminary operating model was drawn up (which will not be dealt with in the paragraph) and some possible intervention levers were identified between which: "the rationalization of the Info providers" for which the Business case was drawn up.

In total 9 evolution initiatives have been identified:

Initiative type	**Scope**	**Possible optimization scope**	**Initiative**
Operational rationalization	- Asset Services	- The Treasury Regulation organizational unit and the Derivatives Regulation organizational unit perform similar activities on different instruments	1) Unification of the two structures with renaming into organizational unit Treasury and Derivatives Regulations
	- Registry	- Costs incurred for inactive securities in the registry	2) Identification of securities not used to re-perimeter the costs of info providers, ratings, etc.
HR perimeter review	- Asset Services, Registry, Clering and Settlement	- 5 FTEs have been identified that can be reallocated more	3) Reallocation of the 5 FTEs to other organizational units

		efficiently within the organization.	that are in resource deficit.
Reallocation of assets within the bank	- Asset services	- The back office has been assigned activities related to American taxation that require skills not present in the structure	4) Transfer of activities related to US taxation within the Tax organizational unit.
Outsourcing	- Clearing and Settlement	- Securities transfer activities carried out both by the Back Office function and by another group company	5) Outsourcing of securities transfer activities
	- Asset services	- Custody activities carried out both by the Back Office function and by another group company.	6) Outsourcing of custody activities
	- Registry	- Master data maintenance activity partly overlapped with that carried out by another group company	7) Outsoucing of low value-added maintenance activities
Cost excellence	- Banking institution[34]	- High expenses for Infoprovider	8) - possible savings in relation to the Bloomberg Infoprovider stations

[34] As part of the analysis carried out on the Back Office, it was deemed appropriate to extend the "expenses for infoprovider" initiative to the entire banking institution.

			assigned to numerous users (bank employees). - Identification, at Group level, of any duplication and / or fragmentation of contracts for the supply of market data and personal data.
Process automation	- Registry and Clearing and Settlement	- Manual processes related to active and passive invoicing management	9) In-depth study of automatable processes and identification of application solutions

Based on the initiatives identified, an analysis of the impacted costs is performed.

5.5.4 Business case: Info provider Review

Type of intervention: Cost excellence
Scope of application: Banking institution
Initiative description: The initiative aims to identify possible savings in relation to:

A) The Bloomberg Info provider stations that have been assigned over time, for various reasons, to specific users (these stations are, moreover, "nominative");

B) Identification, at Group level, of any duplication and / or fragmentation of contracts with Info providers in relation to the acquisition of market data and personal data.

The actions taken to focus on the specific interventions to be implemented with reference to the rationalization of Bloomberg stations are shown below.

5.5.4.1 Focus on Bloomberg stations

The first phase consisted in the collection of data, which made it possible to map the Bloomberg stations present in the bank and for each of them, the information relating to the organizational units to which the assigned users belong and the hierarchical level of these in the context's structures.
Thanks to this information, an analysis was carried out to distinguish, based on the nature of the activities carried out in the respective organizational units, which stations should be "devices" (i.e. the terminal must be used to enter orders and / or trade) from those useful only for information purposes.
The ZBR initiative proposes for these latter stations to switch to a service with less functionality and cheaper offered by the Eikon (Light) platform.
Workstations were also identified that are still assigned to users who have in the meantime been transferred to organizational units where the use of the workstation is not consistent with the mission of the structure, or belonging to resources no longer present in the workforce.
Finally, some stations have emerged for which it is appropriate to assess the actual need.

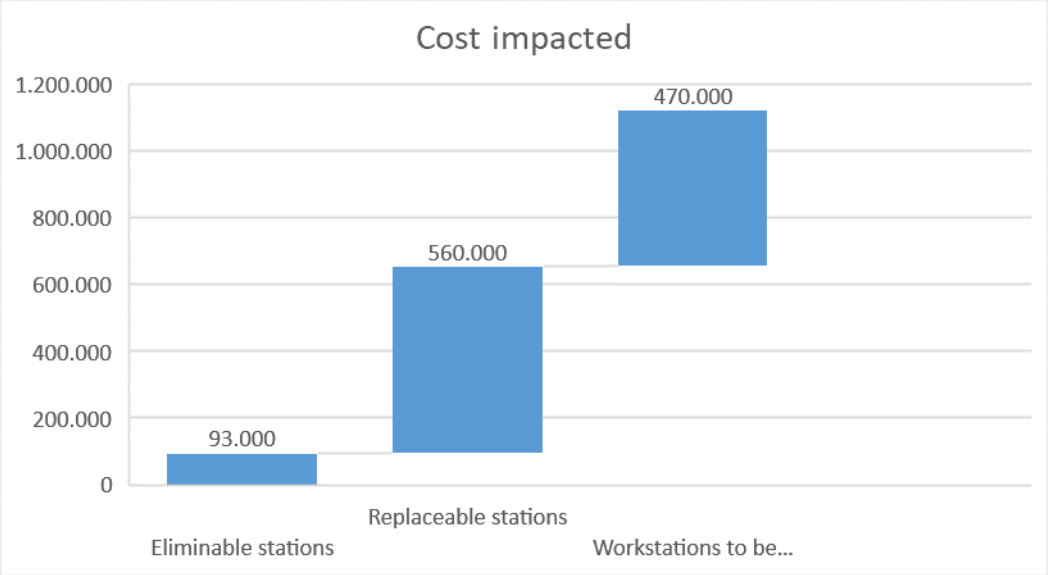
5.5.4.2 Analysis of impacted costs

Actual stations: in the bank there are 93 Bloomberg stations (Open Bloomberg and Bloomberg anywhere), the estimated annual cost for the platforms is 1,917,000 euros.

Replaceable stations: 27 stations that can be replaced with the Eikon light platform have been identified, for a total annual cost of 560,000 euros

Eliminable stations: 4 eliminable stations have been identified for an annual cost of 93,000 euros

Workstations to be evaluated: 20 workstations assigned to resources have been identified, the need for which is to be investigated through comparisons with the respective hierarchical managers, for a total annual cost of € 470,000.



The total costs impacted by the initiative is 1,123,000 euros, approximately 60% of the total expenditure on Bloomberg platforms.

5.5.4.3 Estimated costs saved

The estimate of the total costs saved was obtained considering the savings generated by:

Removable workstations: The estimated saving is 93,000 euros, ie equal to the cost currently incurred by the company for the identified workstations.

Replaceable stations: The estimated saving is given by the difference between the cost currently incurred and the costs of the Eikon light platforms and is equal to 333,000 euros. The amount is estimated based on the market price of the services offered by Eikon Reuters or for each station a monthly cost of 700 euros was considered[35].

Stations to be evaluated: To estimate the savings, it is necessary to consider how many workstations will be converted into stations: replaceable. A conversion rate of 50% has been estimated. Therefore, of the twenty stations to be evaluated, 10 were identified as replaceable stations. Therefore, the cost saving estimate is equal to 151,000 euros.

	Costs impacted	Cost saving
Removable stations	93.000	93.000
Replaceable stations	560.000	333.000
Stations to be evaluated	470000	151.000
Total cost saving	**1.123.000**	**577.000**

The cost saving estimated by the initiative is 577,000 euros. The cost saving will be obtained gradually as the disposal of Bloomberg stations can only take place by respecting the deadlines of the contracts stipulated with Bloomberg itself.

5.6 CONCLUSION

In summary, the results achieved through the ZBR project in the three reference functions are as follows:

A) Marketing:
- 20 activities carried out by the marketing function were mapped and grouped into 10 different areas (Business Development, Governance projects and activities, Planning and Business Coordination, Territorial development plan, Commercial support, Reporting and analytics,

[35] Eikon services range from a cost of € 300 to a cost of € 1800. A cost of 700 euros per month has been estimated for a platform.

Products, pricing and specialist hubs, CRM, Marketing planning and coordination, Organizational units management) and activity based analysis was performed.

- Preliminary investment posture activity was carried out and 14 development initiatives were identified, but the business case has not yet been drawn up.

B) Digital Innovation:

- The mapping of the activities and channels of the function was carried out: 17 activities grouped in 4 different areas (Digital strategy and governance, Digital Channel Development and Maintenance, Digital Channel Management and Internal Process Management) were identified and 19 channel types grouped in 3 different areas (Digital channels managed by the banking institution but used by the group's companies, Digital channels managed and used by the banking institution, Projects/innovation). Activity-based analysis of the function's channels was then performed.
- Preliminary investment posture activity was carried out and 14 development initiatives were identified, but the business case has not yet been drawn up.

C) Back Office:

- 17 activities performed by the Back Office function were mapped, grouped into 4 different scopes (Clearing and Settlement, Asset Services, Registry and Governance and Entire Processes) and activity based analysis was performed.
- 10 development initiatives have been identified for which the overall analysis of impacted costs has been carried out. The business case of the "review info provider" initiative was then drawn up, an intervention aimed at streamlining Bloomberg positions within the bank.

EXECUTIVE SUMMARIES

In 1911 Frederick Taylor, an American engineer, published a series of studies conducted on the work of American workers in factories. He then hypothesized a division of labour based on the execution of simple operations always entrusted to the same worker, then measured the time necessary to perform each operation. Frederick Taylor gave birth to what we commonly call today the "scientific method of work". However, Taylor's work was criticized and found no application in the industrial field, until Henry Ford first used scientific work in automobile manufacturing.

H. Ford founded the Ford motor company in 1903, in the first year Ford plants was unable to produce more than 25 cars per day, the revolution occurred in 1913 with the introduction of the assembly line. The new revolutionary production system took the name: "Fordism". Soon the limits of Fordism became apparent and Ford could no longer replicate the successes achieved in the 1920s, alternating difficult moments such as the crisis of 1931 where many workers were laid off and wages were reduced, to positive moments as in 1932 with the launch of the Model V8.
Although Fordism was exported all over the world in the post-war period and remained the dominant model until the end of the 70s.

Meanwhile, on the other side of the world, Toyota was being born, in 1933 the Toyoda family, which became known for its textile business, decided to enter the automotive industry. The first years of Toyota's life were characterized by many difficulties, at the end of the 30s the production of cars for private use was thwarted by the government, so the company decided to engage in the production of trucks, by order of the Japanese army. After the war, the Japanese economy was revitalized by the American occupation, but despite this, Toyota fell into a deep crisis: To avoid bankruptcy, Toyota adopted strict cost-cutting policies, including voluntary pay cuts by managers and a 10 percent cut in pay for all employees.

In 1950 The new president Eiji Toyoda, took over from his father Kiichiro Toyoda, set the corporate goal of bringing Toyota's production process to the same productivity levels as Ford within 3 years, the task was assigned to the Plant manager Taiichi Ohno. Ohno visited Ford's River Rouge plant to bring American manufacturing innovations inside Toyota but he saw that the Ford system had lot of defects: overproduction problems, Inventories full of stocks, Work force employed in performing unnecessary tasks…
Back in Japan Taiichi Ohno defined the concept of TPS system: the systematic elimination of all waste produced within the company. The first innovation introduced inside the Toyota was the Just In Time system: With the JIT the company base the production volume on customer demand and not on the capacity of the plants.
The second innovation was the autonomation system: Toyota decided to install preventive "devices", capable of detecting anomalies on its machinery. If a problem had occurred, production would have stopped immediately so that defective parts were not produced.

The oil crises of 1973 and 1979 generated changes that shocked the world and made mass production and its principles obsolete. During the same years, western companies, which previously ignored the innovations introduced inside Toyota plants, began to study TPS. The reasons for Toyota's success were clear to everyone when, in the late 1980s, John Krafcik published the results of one of the largest sector studies ever conducted: "World assembly plant study (IMVP)". The IMVP began in 1986, born with the aim of studying the performance of car assembly plants around the world, in total data was collected on 90 plants in 17 different countries. The study showed a clear superiority in terms of productivity, product quality (expressed in numbers of assembly defects per 100 cars), inventory management and space used for the assembly of the Toyota Taokaka factory compared to the assembly of other factories. Furthermore, the results of the analysis indicated that in the "NUMMI" plant in West America, where Lean practices were applied, the performance was far above average and almost comparable to that of the Taotakaka plant. The

authors of the research concluded that Lean production could be exported to the West with excellent results.

In 1988 John Krafick coined the term “Lean Thinking” in the article "Triumph of the Lean production system", the concept of Lean Thinking was later taken up by J. Womack and D. Jones in the books "The machine that changed the world" and "Lean Thinking, how to create value and banish waste”. In the last one, the five principles of Lean Thinking were described: the definition of the value, Identification of the value flow, continuous production flow, Pull and perfection.

Through Lean principles, the authors of the book offer a guideline on how to eliminate waste, the starting point is precisely the correct definition of value:

- **The value Is defined by the customer.**
- **It is the company that creates value.**
- **The value is subjective and is associated with the good or service.**

Once the flow of value has been identified, it must be analysed to find all the muda present in the business processes. According to Womack and Jones, through the analysis of the flow of value, 3 types of activities can be identified:

- **Activities that create value.**
- **Activities that do not create value, but which are inevitable** (type one muda).
- **Activities that do not create value and can be eliminated immediately** (type two muda).

The goal of the Lean company is to eliminate the type two muda and to transform the type one muda into type two muda and then eliminate it.

Once the value has been precisely defined, that the flow of value for a given product has been reconstructed and that unnecessary activities have been eliminated, we arrive at the next step of the Lean thought: "to flow the value-creating activities" .

The continuous production flow was introduced by H. Ford, in the Highland Park factory, and companies still follow this concept. In 1913 Ford reduced the work required by assembling a Model T car by 90% by converting the final assembly to continuous flow. Later he tried to build flows along the entire production path, from raw materials to the shipment of the finished car. Continuous flow was used to produce in large batches, so the mass production model became continuous flow with a logic based on lots and tails.

Toyota also adopted continuous production flow, which unlike Ford's, was designed to produce in small batches, continuous flow based on small batch production. It was Taiichi Ohno in the 1950s who introduced this new system to Toyota, leveraging on the use of multifunctional machines, on the ability to reduce the time and costs of retooling and on staff training.

Once the flow flows according to a logic based on lots and queues, another important principle must be introduced: "pull". The companies that adopt the pull system only produce what is expressly requested by the customers, both in the ways and within the established times. The Pull system was introduced by Toyota in 1950 and is inspired by the refuelling system of American supermarkets. The pull logic contrasts with the Push one used by those who produced in batches and queues according to which it is necessary to produce as much as possible and then push the product to end customers.

Perfection is like an asymptote, which although unattainable must play a constant role of reference, to keep a systematic improvement process active. (Womack and Jones). The principle of perfection pushes the Lean company to start two different types of improvement cycles:

- The continuous and gradual improvement cycles or the Kaizen, which have the aim of eliminating the muda left after the Kaiaku activities within the company.
- The extraordinary and radical improvement cycles or Kaiaku, mainly used in the conversion of the company into a Lean company.

Both improvement cycles are essential for the company to improve internal processes, thus creating a quality product capable of satisfying the customer.

Although studies conducted at the end of the 80's have highlighted the superiority of Lean thinking compared to mass production in the automotive sector, and subsequently also in other sectors, the dominant model has remained the mass one. Lean production remains the exception and not the rule, compared to the past, however, important milestones have been achieved and we can say that now Lean philosophy has spread in the western countries.

In Italy, starting from the 70s, an interest in the topic of quality management has arisen which has involved not only companies but also scholars, this was the first step to the creation of an Italian Lean movement.

Since the 1950s, the issue of quality has been addressed in both Japan and the United States, and a similar but at the same time divergent thinking has developed in each of the two countries.
Considering that quality control had so far been applied in companies, which included only the product without defects, now the discourse was evolving towards quality management, which implied an integrated vision.
In Japan, TQM develops which "pays particular attention to the concept of quality in processes and products through the involvement of all individuals present in the organization, from top management to the worker".
In America, however, Armand Feigenbaum introduced the concept of "Total quality control", TQC, underlining how improving the quality within the company would also improve its financial performance. In essence, the TQC was a system designed for skilled workers, which did not provide for

direct involvement of managers in the development of quality projects, while the TQM system is based on the assumption that: "Managers of all levels must be involved in quality projects "(Juran 1954). The first quality management systems have been applied in Europe since the 1970s, marking a failure due to cultural and technical reasons (Camuffo). In Italy, the first implementations of quality management were based exclusively on the introduction of quality cycles, with the belief that this tool would have generated an improvement in company processes in the short term.

The first introductions of the quality cycles in Italy were recorded in 1972 and 1978 respectively in the factories of SNIA Viscosa and Ire Ignis. Quality circles were created by engineer Ishikawa, who defined them as: "a small group of people (8-10) in the same work area who have similar tasks, who meet regularly and voluntarily under the guidance of a coordinator, learning to identify and analyse the problems of their work, propose solutions, implement them, test them and measure the effects.

However, the application of quality circles has not produced the desired effect and the application of TQM began to spread in Italy only in 1989 with the "total FIAT quality" project

At the end of the 1980s, the market difficulties linked to the strong competition from car manufacturers all over the world, highlighted Fiat's strategic and organizational weaknesses. These factors triggered a profound restructuring process. The plan presented on this occasion included five years of structured work in interventions on three levels: the company as a whole, the functional areas, the microprocesses and the individual activities.

In 1991, with Paolo Cantarella appointed CEO of the Turin company, the five-year plan was divided into 20 macro-specific initiatives, to support this reorganization. The focal point of the first Fiat reorganization according to the dictates of Lean Thinking was the transition from a high automation factory to an integrated plant (IF) in the assembly plants (Camuffo and Micelli,1999).

According to the IF formula, the integration of processes and the governance of organizational interdependencies have been the engines of productivity. The key element was the Elementary Technological Unit (UTE), defined as the primary organizational unit that governs a specific segment of the process and operates as a self-sufficient team in the management of processes and resources, in monitoring productivity, costs and execution of the technology maintenance, continuous quality control and improvement. The main objective of UTE was to identify and solve production problems.

The organization based on UTE / team has allowed Fiat to reach the desired level of integration, has increased flexibility in processes and reduced production costs. Despite some positive results, many factors suggest that the first attempt at Lean transformation into Fiat was only partially successful. The main reason is that the changes in the product development, production and supply chain areas were not supported by a Lean evolution in the management area. However, the factories of Melfi and Marentino became points of reference for the other Italian companies that in the wake of Fiat began to develop TQM systems.

The first "lean" wave in Italy occurred in the early nineties, when several large Italian companies, including Merloni, Pirelli, SKF Italia and Zanussi-Electrolux group, brought within their factories some Lean tools (TPM, SMED, ...) and other aspects related to the organizational structure in their production units.

Since the early 2000s, Lean principles and techniques have been applied not only in large companies, but also in Italian SMEs. An important contribution to the diffusion of the phenomenon was given by the publication of some texts, such as "Toyota. Why the Italian industry is not progressing (2005, Galgano) "and" thinking lean, thinking in the Italian way "(2001, Bonfiglioli) which have inspired many Italian companies in applying Lean techniques and principles.

The spread of Lean Thinking however remained modest in size, a rough estimate indicates that only 1% of Italian companies belonging to Confindustria and the association of Italian Manufacturers, have adopted or tried to adopt at least one Lean tool (Camuffo 2014).
In the last decade, the Lean phenomenon in Italy has had a considerable growth which has mainly affected Italian SMEs influenced by institutional and economic changes:

- Relocation of production to countries with lower labor costs. The delocalization has produced cost advantages in the short term for the companies that have adopted it, only to see the benefits obtained eroded within a few years. (Cost of ownership of the product remained unchanged).
- Offshoring and Outsourcing.
- Competition with countries with a low labour cost such as the Asian and Eastern European countries.
- Economic and financial crisis of 2008: companies that started a Lean transformation process before the crisis reacted better than non-Lean companies or companies that adopted post-crisis Lean tools.

Moreover, the degree of understanding of the success factors has increased: Lean Thinking requires a profound review of the company organization and is applicable to all business areas and processes from product development to information systems to human resource management.
A true holistic vision of Lean thinking has developed, according to which the Lean transformation of a company must be pursued by leveraging on 4 dimensions: Lean culture, Lean concepts, Lean management and Lean tools.

Another innovation introduced by FIAT in Italy is World Class Manufacturing. The W.C.M was theorized by the Japanese H. Yamashina in the mid-2000s, it integrates some concepts of TQM and Lean Thinking such as kaizen or PDCA cycles but differs from them for the cost

deployment approach. According to the C.D approach, all business problems, whether maintenance, logistical, qualitative or organizational, must be addressed on the basis of their economic impact.
To implement the W.C.M system, Fiat called Yamashina and then tested some practices in the factories of Melfi and Tychy. In the plant between 2006 and 2009, operations that do not bring added value (errors, waste and inefficiencies) fell by 60%, As the WCM was gradually extended to Mirafiori and Pomigliano in Italy and Bielsko-Biała in Poland. In 2009 the program began to be gradually used also in Chrysler's American plants and was extended to suppliers, in 2014 over 60% of Fiat suppliers converted to WCM.
The W.C.M program has made Fiat one of the most efficient companies in the world, over the past few years Fiat has become an example model not only for Italian companies but for companies all over the world.

The Lean philosophy is a constantly evolving process, which has its roots in the production system implemented by Toyota in the early 40s: the TPS. The TPS is considered the precursor of Lean Production; between the two managerial systems we can observe several features in common, including the use of the same techniques and tools.

At the beginning, Lean Production had very few changes compared to TPS. Over the years, however, Lean thinking has evolved, and its boundaries have expanded: Lean Production has gone from being considered a production system (Like TPS) to a real management system[36]. Today, in fact, Lean production is applied not only to the entire "Gemba" but also in many other business areas: management of the value chain, relationship with suppliers and distributors, relationship with customers, management of the relationship with workers based on HR practices.
One of the main problems of Lean Production is that there is still no clear and unambiguous definition of what it is. What many authors agree on is that Lean Production is a managerial practice in constant evolution (Shah

[36] “Lean production is a managerial system that involves the entire firm” (Galeazzo 2018).

and ward 2007; Petersen 2009), whose boundaries are wider and wider and wider are the business areas that are involved.
From this perspective, the idea of considering Lean production as a set of practices (managerial tools) applied both in the plants and in other areas of the company takes shape and which over the years have gradually increased. However, it would be wrong to talk about Lean Production only like as set of practies because it is, a management system composed of both a technical part (Lean tools) and a methodological part (principles and objectives).

Lean production is the union of two different orientations that coexist and complement each other: the philosophical orientation and the technical orientation (Shah and Ward 2007).
The philosophical orientation is represented by philosophy and guiding principles, the technical orientation, on the other hand, refers to Lean practices. Lean practices are often grouped into more complex systems in order to better analyze the effect of Lean Production and a representation model based on the grouping of Lean practices in Lean bundles could be a valid tool for Lean Production studies. The representation model can in fact lead to the resolution of some specific problems:

- Preliminary work should no longer be conducted to identify practices to be used in the study.
- Using the same model, Lean Production performance studies can be easily compared, which is not currently the case.
- Studies that simultaneously analyze the effect of multiple Lean practices on the company can be conducted more easily.
- Studies that analyze the synergy between Lean helping practices can be conducted more easily.

There are many authors who have applied the concept of bundle to the Lean reality, but most of them have focused their attention on the definition of a specific group of practices, without looking at the system as a whole. The two authors who, on the other hand, were deeply interested in the

definition of bundles with reference to the Lean Production system are Shah and Ward who, with their two articles, published in the "Journal of Operations Management" respectively in 2003 and 2007, contributed to the creation of a solid methodological and conceptual basis regarding, on the one hand, the definition of Lean bundle and, on the other hand, the study of the relationship between multiple clusters of techniques and various performance indicators, without stopping at a technical analysis by technique .

With the purpose to better understand the level of adoption of the Lean Production instruments in the Italian SME firms, a Qualitative research was conducted. First the model of representation was built, the data collection was carried out through the Research Gate portal, where studies on Lean Bundles and Lean practise were identified. After I collected data from 21 Italian companies, the data was collected through interviews with companies (primary data) and through books, newspapers and specialized journals (secondary data). The interviews were conducted in a semi-structured way with a series of open questions, giving to the firm the faculty to deepen and detail the answers. Once collected, the data was analyzed to identify the Lean practices used by the companies. The practices were identified thanks to the keywords, namely:

- Explicit keywords: the practice was directly named
- Implicit keywords: an instrument or a technique related to the Lean practice has been named

Lean practices relating to each company have been included in the model of representation and the conclusions were made.

At the end of the Lean Production talk, the focus of the research shifts to another management system based on the good management the ZB approach in his modern application the ZBx and ZBR. Unlike Lean Production, which is applied as part of improving business production processes, ZB approach is used in administrative cost analysis. Both models are based on the principle of the centrality of measurement and

have as their common goal the elimination of corporate waste. Through the ZB companies redesign the organization and promote structured interventions called "evolution initiatives" that generate cost savings.

The history of the ZB originates in 1970 when Peter Pyhrr published an article in the Harvard Business Review in which he introduced the concept of Zero-based-budgeting (ZBB). Pyhrr's idea is simple: starting from scratch, gradually adding only the costs deemed necessary and functional. The ZBB approach is used in Budgeting operations and represents a completely new methodology compared to those used previously. In the first years of life, the ZBB is applied only for the analysis of administrative costs but it was not very successful. At the end of the years 80’ the ZBB began to acquire a certain notoriety, finding more and more space within companies. At the same time, the ZBB continues to evolve with the introduction of new concepts:

- Cost category ownership: create a positive organizational tension between the categories and the entity owner.
- Bad cost and good cost: in the early 2000s the ZBB approach becomes a "full-fledged management technique" that eliminates the bad cost of non-work by increasing the costs of good work.
- Closed-loop approach: closed-loop management to ensure that cost savings remain so over time. It is a capability that involves full-level visibility into all business units, categories and geographies, and exploring how to spend money wisely to add value and drive growth.

In recent years, the ZBB methodology has been applied in other business areas in addition to the administrative one. In 2016 Accenture divided the zero-based application into 4 micro-categories:

- ZBS (zero-based spend): zero-based application to reduce the general and administrative costs of the company.
- ZBO (zero-based organization): zero-based application to redesign the organization from scratch.

- ZBC (zero-based commercial): zero-based application to identify the "should-cost" of COGS and cost reduction opportunities across 3 level: price, performance and value engineering.
- ZBSC (zero-based supply chain): zero-based application to optimize costumer services and pricing to deliver superior costumer economics.

The ZBS, ZBO, ZBC and ZBSC are part of the zero-based mindset macrosystem, better known as ZBx. Through the ZBx, organizations apply a cost and process review process throughout the company.

The Closed Loop ZBx is a virtuous cycle through which the company continually renews itself and improves day after day. In the big zero book the closed loop is described as a secret sauce made up of six ingredients that makes the zero-based mindset sustainable:

1) Driving visibility: Through Driving Visibility, the company transparently defines the organizational structure trying to identify the exact place where the cost was generated. The costs are then divided into "Bad cost" (costs to be eliminated) and "Good cost". Thanks to Driving visibility, the company creates a "one version of truth".

2) Value targeting: Through Value targeting, the company finds the Gaps (opening the Gap) on cost or revenue performance, analyzes them (monetization of the Gap) and finally resolves them (closing the Gap). Value Targeting is a fundamental tool for developing an organizational culture based on continuous innovation in the areas of cost efficiency and revenue growth.

3) Category ownership: Through Category ownership, the company involves the business areas involved in the budgeting operation, thus creating a dual vision (Category and entity owner) of responsibility, cost and resource management. Category ownership inevitably leads to the creation

of a tension, which is however perceived as a positive and constructive element.

4) Zero-based Budgeting: Through Zero-based Budgeting, the company assesses the degree of consistency of the ZBx proposals with the corporate strategy and with the resources available.

5) Execute initiatives: Through the execute initiatives the company decides how to implement the newly created strategy.

6) Control and monitoring: once the operation has started, the company must monitor it and if there is a need to initiate corrective actions.

The second evolution of the ZB approach is the Zero-Based Review. With the ZBR, the organization adopts a new mindset and new behaviours around cost, continuously striving for maximum efficiency and greater savings through the integration of the organizational structure, governance, accountabilities and processes. Ultimately, the ZBR helps the organization to focus on the activities that fuel the competitive advantage and eliminate many of the ones that do not.
The ZBR is described in more detail during the chapter with a practical case within the banking institute where I did the internship will be reported.

The ZBR project is part, together with other corporate projects, of the industrial plan of the bank. The project provides for a "blank sheet" redesign of the operational and organizational model and of the main business processes, considered essential by the banking institution. Until recently, in fact, the organizational focus was more based on the provision of the service, which had to be punctual and available to all those who requested it, sometimes not maximizing cost efficiencies. The ZBR therefore represents a clear turnaround compared to the past, an important demonstration by the banking institution of wanting to eliminate organizational waste.

The bank launched this initiatives during the current year, with the aim of optimizing the entire organization over two years with the objectives of redesign the operating model making it efficient and aligned to the group strategy, Rethinking "ways of working" by developing new processes and approaches, take the opportunity of the redesign to reach the full digital potential.
The ZBR project will be implemented into two distinct phases:

- Foundation (ongoing): during the Foundation phase, the working methodology was defined considering the characteristics of the banking institution. In addition, 3 pilot functions were identified in which the methodology was "tested".
- Institute roll-out (scheduled phase): Once the work in the 3 pilot functions has been successfully completed, the ZBR approach will be patchily extended to the entire banking institution. The Institute Roll-out phase is the one that will require the greatest efforts both in terms of time and resources.

The three pilot functions under analysis are: Marketing, Back office and Digital Innovation. The process by which the ZBR is implemented is the same for each function and is divided into 3 operational phases:

- Granularity: During the granular phase, the activities are mapped (identification of the perimeter area) and the related costs associated with them. The reclassification of costs based on three cost drivers will then be applied: HR costs (personnel costs), ASA costs and indirect costs.
- Investment Posture: during this phase, the investment posture is defined with the involvement of top management on the operating model to aim for.
- Identification of ZBR levers: In the last phase, the intervention levers are identified for the optimization of the functions, useful business cases are prepared for estimating the costs saved and the investments necessary to carry out the intervention.

BIBLIOGRAPHY

M. Bevilacqua, F.E. Ciarapica, I. De Sanctis, *Lean practies implementation and their relationships with operational responsiveness and company performance: an Italian study*, International Journal of Production Research, 2016

Bonfiglioli Consulting, *Guardare oltre: pensare snello lean-thinking per recuperare competitività in tutto il sistema Italia*, Franco Angeli, Milano, 2006.

Bonfiglioli Consulting*, Pensare snello. Lean-thinking alla maniera italiana. Costruiamo l'impresa competitiva (più produttività-minori sprechi) 5 nuovi casi italiani di successo,* Franco Angeli, Milano, 2001.

A. Camuffo, *Lean Transformations for small and medium enterprises*, New York, Taylor & Francis, CRC-Productivity Press, 2016.

A. Camuffo, *Made in Lean Italy. Cambiare mentalità per crescere e sopravvivere*, in "Economia e management ", n4, 2013.

A. Camuffo, *Linee di sviluppo del Lean Italia*, 2011.

A. Camuffo, R. Secchi, *Rolling out Lean production systems: a knowledge-based perspective*, International Journal of Operations & Production Management Vol 36, 2016, 61-85

A. Cipriani, L. Erlicher, P. Neirotti, L. Pero, L. Campagna, *L'evoluzione dei sistemi di produzione e dell'organizzazione del lavoro nelle fabbriche: l'applicazione del World Class Manufacturing in FIAT*, 2015.

F. Colonna, *La fabbrica nera*, Nuovo Studio Tecna, Roma, 1993.

K.O.Cua, K.E. Mckone, R.G.Schroder, *Relationship between the implementation of TQM, JIT, and TPM and manufacturing performance*, Journals of Operations Management 19, 2001, 675-694.

E. De Simone, *Storia economica: dalla rivoluzione industriale alla rivoluzione informatica*, Franco Angeli, Milano, 2014.

H. Ford, S. Crowther, *My life and work- the autobiography of Harry Ford*, Success Oceo, 2016.

V. Fortunato, *Il sindacato snello: relazioni sindacali, organizzazione del lavoro e produzione snella: i casi Fiat di Melfi e Rover di Swindon,* Rubbettino, Soveria Manelli, 2002.

A. Galgano, *Toyota perchè l'industria Italiana non progredisce*, goWare & Guerini Next, Milano, 2017.

A. Galeazzo, A. Furlan, *Lean Bundles and configurations: a fsQCA approach, International Journal of Operations & Production Management*, 2018

J. F. Krafick, *Triumph of the Lean production system*, Sloan Management review 41, 1989.

J.M. Juran, *Juran's Quality Control Handbook,* Mcgraw-Hill, New York, 1988.

J.F. Liker, *The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer,* McGraw-Hill, New York, 2004.

B.Lyionnet, M.Pillet, M.Pralus, *Lean Manufacturing in the screw cutting sector: assessment of maturity level*, International Journal of Rapid Manufacturing Vol 1(3), 2010, 256-277

J.P.Macduffie, *Human Resource Bundles and Manufacturing Performance: Organizational Logic and Flexibile Production Systems in the World Auto Industry*, Industrial and Labour Relations Review Vol.48, No.2, 1995, 197-221

G. Maxcy, A. Silberstone, *The motor industry*, Routledge, London, 2019.

P.Osterman, *How common is workplace trasformation and who adopts it?*, Industrial and Labour Relations review Vol.47, No.2, 1994, 173-188

R. Panizzolo, Dispense del corso di Gestione snella dei processi, Università di Padova bibliografia, 2016.

J.Petersen, *Defing Lean production: some conceptual and practial issues*, TQM journal 21(2), 2009, 127-142

C. Roark, K. Timmermans, R. Abdalla,The Big Zero: *The Transformation of ZBB into a Force for Growth, Innovation and Competitive Advantage*, Penguin, Londra, 2019

J.P. Womack, T.D. Jones e D. Roos, *La macchina che ha cambiato il mondo*, Rizzoli, Milano, 1991.

J. P. Womack, D. T. Jones, *Lean thinking: Come creare valore e bandire gli sprechi*, Guerini next, Milano, 1997.

R.Shah, P.T.Ward, *Defing and developing measures of Lean production*, Journal of Operations Management 25, 2007, 785-805

R.Shah, P.T.Ward, *Lean manufacturing: context, practice bundles, and performance*, Journal of Operations Management 21, 2003, 129-149

Toyota Motor corporation, *Toyota a history of the First 50 years*, 1988.

Taiichi Ohno, N. Bodek, *Toyota production system, beyond large-scale production*, Productivity Press, 1988.

Taiichi Ohno, *Lo spirito Toyota: il modello giapponese della qualità totale*, Giulio Einaudi Editore, Torino, 1978.

C. A. Tisdell, *Efficiency and decreasing cost industries*, Australian economic papers, 1970.

Toshiro, *Strategic dualism: an alternative in industrial societies,* Ph.D. dissertation, Nuffield College, Oxford university, 1989.