Tampere University

Elena Gillardi

LEAN ORGANIZATION IN HEALTH SERVICES.

The Finnish case HUS

Faculty of Management and Business
Master's thesis
December 2020

ABSTRACT

Elena Gillardi : Lean Organization in Health Services. The Finnish case HUS.
Master's thesis
Tampere University
MGE
December 2020

The purpose of this research is to assess how Lean thinking, effectively used in manufacturing companies for decades, can be successfully applied to public services, particularly to the provision of health care. Changes in the functioning of the public administration are initially highlighted, thanks to the use of new concepts implemented in the management system. The Lean method is extremely innovative and focuses on detecting and eliminating waste and unnecessary activities so that all the work adds value and meets customer needs. To allow Lean principles to fully integrate, leaders need to work to create an organizational culture that is conducive to lean thinking. This assumption is based on the fact that this concept is a process that shapes organizations. The commitment to Lean must begin at the top of the organization and all staff should be involved in helping redesign processes to improve flow and reduce waste. It uses a variety of tools and techniques to consciously eliminate waste through the use of intelligence and creativity. These steps help to strengthen confidence in the public sector, while at the same time shaping adequate employee satisfaction in public administration.

The main focus is the management and development of patient processes and treatment. Although health care is different from production for many reasons, there are also unexpected similarities: building a car or providing health care to a patient, in both cases, workers have to face complex and articulated processes in order to perform their tasks to the best of their ability and to provide value to the client or the patient. Lean management is a potential methodology for developing management practices and strategies in the health sector in Finland. In this particular national context, the Lean concept is quite recent and is mainly used to achieve financial savings and refine processes efficiently. Positive experiences show that this is already a well-known methodology, even if it has not yet been fully implemented. As demonstrated by the presentation of the projects in the HUS hospital district. It is, therefore, possible to conclude that thanks to the demonstration of Lean's many positive experiences, the Finnish healthcare environment is ready to welcome the deepest implementation of Lean towards continuous improvement.

Keywords: lean organization, health services, development process, waste, efficiency, quality, change.

Table of Contens

Introduction

This work aims to address the issue of lean management applied to the healthcare context, with the aim of investigating how it can be adopted in this context. Although the Lean philosophy has developed in the automotive sector, over the years it has been possible to extend its concepts to different areas with very positive results. The subject matter of the thesis is particularly interesting to deal with because it allows you to demonstrate how it is possible to extend, once again, lean management and its basic principles to other areas; in fact, in recent years, this revolution has also taken hold in sectors that are completely different from the production one, such as in information management offices, banks or at the administrative level. Furthermore, since lean management is defined as a philosophy that aims to minimize and eliminate waste, it is obvious that the results it allows to achieve are in line with any company that intends to maximize efficiency and profit.

The first chapter presents the history of lean management starting from how it originated, that is, from the Toyota Production System. After a brief historical description of the production management methods at the beginning of the twentieth century, the basic concepts of this methodology are exposed and described in detail. Therefore, the five principles of Womack and Jones and the seven wastes defined by Taiichi Ohno are highlighted, to then introduce the House of Lean, which summarizes in a simple scheme the main techniques developed in Toyota. It also describes the application of the lean methodology and its results, the economic and performance control and the analysis of the effect of lean with the resulting benefits.

The second chapter illustrates their subsequent application of lean management in services and how this managerial philosophy widespread in the private sector can allow the creation of a simple, lean and fast PA that moves in the direction of revolutionizing relations between the State and the citizens, to reduce costs and to offer ever better services. Analyzing lean management applied to public services, a factor to which particular attention must be paid is customer satisfaction as it is profoundly different from the customer of the automotive industry: it presents, in fact, a greater degree of complexity in the measurement of needs and expectations, as well as in its very identification, like the citizen, who has the right to public services, is at the same time user and taxpayer of public services, being able to use them and being the main financier of the same.

After this general part, the third chapter deals with the introduction of lean thinking in the health sector, with its related peculiarities and specifications. First through the description of the origins of lean healthcare, its characteristics, and the concept of efficiency in healthcare, followed by the presentation of the care-intensive model, or a new organizational model designed specifically for hospitals that wish to take the lean path. Then, the analysis is focused through an in-depth analysis of lean healthcare which highlights the techniques for reorganizing healthcare processes by streamlining the structure and flow of activities. The last part of the chapter contains an analysis of the advantages and motivations that push companies towards the implementation of lean healthcare, the critical success factors, and the challenges that healthcare has had to face with the implementation of this model.

The fourth chapter continues with the illustration of the Finnish success story HUS. My curiosity in learning more about this northern European country arises following my double degree experience in Finland. Finnish healthcare is facing challenges: an aging population, a shortage of health professionals, economic threats, and growing patient demands. The need to change and develop operations is increasingly imminent. The analysis starts with a brief excursus on the history of the HUS hospital district and then focuses on the description of the values and strategies adopted, on the economic and financial aspect. It then continues with the presentation of various Lean projects applied in HUS and with the related analysis of the results obtained following the change. The goal is to examine the applicability of the Lean method for the development and management of quality in the district and evaluate its success. Therefore, by studying the Lean philosophy and its principles, it is possible to demonstrate its validity and adequacy in contexts other than the traditional one.

1. Lean Organization: history, principles and tools

1.1 Lean's journey: history and development

"Lean production" is a management methodology that considers expenditure on those resources used for any other purpose other than the creation of value for the customer as a waste. The term derives from an idea by John Krafcik, a former Toyota engineer, in an autumn 1988 article, "Triumph of the lean production system", to identify that series of production and management processes that translate the principles into operational terms lean thinking, subsequently brought to the fore by Womack et al. in the book "The Machine That Changed the World" (1990). Lean thinking is today an extremely current philosophy that is embraced by a large number of companies in different areas, but its origins are to be found in the automotive industry and, in particular, in Lean Manufacturing which began from the assembly line in motion implemented by Henry Ford and which became the model on which Toyota based its production system from the 1940s.

Until the early 1900s, the automotive industry was characterized by the artisan production of vehicles, which were built by craft companies following the needs expressed by wealthy customers who commissioned them. The attention, in this period, was placed on the craftsmanship of the craftsman and his ability to package a vehicle with the performance that lived up to the customer's requests and expectations and this was reflected in the very small size of the industry. This production structure was based, on the one hand, on the use of generic machine tools, and the other, on a highly specialized workforce for each phase of the production process. The artisan production led to the multiplication of the companies that produced cars in Europe and North America, but its weaknesses were evident. It entailed very high production costs and this meant that the car was a luxury item that only a few could afford. (Coriat B., 1991). These factors determined the transition to mass production; and it was from the second half of the 1900s that the first changes of thought in the industrial sector began to be seen. The crisis of the Keynesian welfare state, the oil crisis, the industrial conflict, and the costs of the rigid corporate bureaucratization determined the need to change the organizational model for large companies on the market. Thus, based on a production model that developed between the 70s and 80s in Japan, we started talking about lean thinking, providing for a production that was as flexible as possible and best suited to market demand.

The first company to introduce lean production was Toyota, as opposed to Ford's mass-production model in America, which led production models in the West until the 1960s. Toyotism represented a real revolution on the corporate organizational level, making a series of changes. This revolution starts from the Toyota Production System (TPS), a production system created by Taiichi Ohno (1912-1990) who first sensed the necessary change of mentality in factory operating modes, to cope with the change in global demand. [1] On his journey within Toyota, from the position of an engineer to that of vice-president, Ohno undertook a continuous fight against waste at all levels to bring out clearly the problems to be solved, always putting total satisfaction at the center of the end customer. (Womack James P., Jones Daniel T., 2006). In fact, this production system has as pillars the continuous search for waste aimed at continuous improvement, the full involvement of all subjects within the company, and the centrality of the customer and, by combining flexibility and productivity, which is the starting point of the "lean thinking ". In this regard, the mechanical engineer develops a model that is based not so much on the introduction of new technologies in the production system, but on industrial reorganization, re-evaluating the human contribution in terms of intelligence and responsibility. For many years, TPS and lean production remained a Japanese reality, while mass production inspired by Fordist principles continued to be widespread in the West Western society began to show interest in the Japanese vision only after the oil crisis of the 1970s, during which the superiority of the Japanese system in terms of efficiency and quality emerged. When this became evident, the TPS became the subject of study by the western industry, and, starting in the 1980s, the Toyota system established itself as a reference point for the entire world industrial system. Since then thousands of excellent organizations in the world have adopted the lean model, in the industry as well as in services, as it applies to all operational processes, therefore not only strictly productive, but also logistical, administrative, or product design and development.

Outside of the Toyota world, TPS is recognized as Lean Production or World Class Manufacturing. Over the years the lean production model has been refined, also taking on other names, such as lean organization, lean manufacturing, lean service, lean office, lean enterprise and even lean thinking, to indicate the nature of industrial "philosophy" that inspires all methods and techniques. The term Lean Thinking refers to the search for waste and its elimination to

[1] Tajichi Ohno in 1975 became vice president of the Toyota Motor Company, focusing particularly on the production aspect.

produce more with less consumption of resources. (Womack J., Jones D., 1996). Lean production is a set of principles, methods, and techniques for the management of operational processes, it is the philosophy behind the lean management of organizations; it aims to minimize waste and maximize the value perceived by the end customer. This is possible only with the involvement of people motivated to continuous improvement, and with the application of certain operating principles and techniques to the corporate reorganization. The term "lean" is intended to express the key concept of this production system, which aims to "do more, with less".

1.2 Basic concepts of Lean Organization

At the basis of this system are fundamental concepts that revolutionize the culture and the way of operating within the company:

- *Attention to the customer*. The centrality of the customer is the starting and arrival point of all the activities and actions put in place by the company in transferring, through its products and services, the value that the customer expects. The customer is not only the final customer, the "internal" customer is equally important. The flow of information starts from the customer up to research and development: dialogue with the customer is fundamental to identify needs and define value.
- *The contribution of people*. "Knowing how to do business", or knowing how to do things well (Monozukuri)[2], is possible only starting from the ability to manage people (Hitozukuri)[3]: the development and support of corporate competitiveness, with the achievement of significant and lasting results, is possible only with the continuous and constant alignment of management and all the people who work in the company towards a common goal.
- *Fight against waste*. Muda is the Japanese term that can be translated as waste. The muda consists of all activities, which commit resources and energies, which do not add value to the product or service and therefore do not give value to the customer. Recognizing waste is essential for the application of lean thinking.

[2] The Japanese concept Monozukuri literally designates "the realization of things", the passion or the art of doing things, which in the Toyota context implies the maintenance of the spirit of craftsmanship within industrial production, always trying to improve the quality and reduce costs through kaizen.
[3] The Japanese concept of Hitozukuri means "making people" - the passion and the art of developing people through an educational process, with an emphasis on lifelong learning. It is about developing people's skills in their area of expertise, as well as their ability to work with others beyond functional boundaries.

- *Continuous improvement*. Kaizen in Japanese means continuous improvement: no process is perfect but it can always be improved. All company staff, top management, managers, managers, up to the operators, must participate in the improvement process by sharing common and defined objectives. (Graziadei G., 2010).

Over the years, several books have been published that have tried to explain the concepts behind lean production. American scholars such as Womack and Jones have made an important contribution to understanding this system.

Five Lean Principles

A good starting point can in fact be provided by the Womack and Jones model ("Lean Thinking", 1997), which defines the five principles that underpin lean management.

1. Definition of value;
2. Identification of the flow of value;
3. Slide the flow;
4. Pull;
5. Perfection.

1. The first principle concerns the concept of value, defined by Womack and Jones as "the ability to offer the customer the product or service he wants, in the shortest possible time and at an appropriate price" (2003). The definition of value is the clear expression of the customer-oriented nature of lean thinking since it starts from the assumption that value is defined by the customer, identifying what the customer wants, or translating his needs into a product with specific characteristics. To identify, therefore, the value according to the customer's perspective it is necessary to carry out accurate analyzes to detect the needs of the customers and to be able to translate them into internal company specifications. (Mossman A., 2009).

2. Once the value has been defined, the next step is to identify the flow of value, the set of activities that start from the raw material, and arrive at the finished product optimized according to the end customer's point of view. To do this, all the activities necessary to conduct the product or customer service will have to be evaluated, and three categories of activities can therefore be identified (G. Graziadei G., 2006):
    - Activities that create value;
    - Activities that do not create value and that can be eliminated;

- Activities that do not create value but are currently necessary.

The purpose of the lean is to keep only the activities that create value in the flow and, on the contrary, to eliminate all the activities that do not create value and that are considered waste. A useful tool that allows you to identify the value-creating activities is the Value Stream Map, which allows you to go to map the entire process to be able to identify the inefficiencies at each stage and understand where the problems are located. The mapping of the flow of value is a method through which production plans or even entire supply chain systems can be reorganized and activities that do not generate added value can be eliminated. (Schmidtke D., Heiser U., Hinrichsen O., 2014).

3. Once the flow has been identified, it must be able to flow without interruption. This means identifying everything that hinders or disconnects it and eliminating it; means the elimination of "muda" or waste. (Imai M., 1997). For this to be possible, changes in the process will be necessary, such as a layout reconfiguration, line balancing, or production leveling. We must move from the traditional organizational model by function, where the company areas are rigidly separated and do not communicate with each other, to a model for processes, which is characterized by a collaboration between the different departments, by a sharing of tasks and knowledge and by a greater focus on the customer.

4. At this point, we should have a flow that is free of waste and capable of producing true value. The next step is to define who governs this flow and decide when and how to make the product.

   Therefore, the fourth principle foresees the implementation of a pull system, to make sure that the flow of value is "pulled" by the customer, thus allowing to produce exactly what he asks for, in terms of time, quality and cost.

   From a lean perspective, the downstream activity pulls the upstream one and this contrasts with the push logic traditionally used, where production is based on demand forecasts. A tool typically used to directly connect customer requests with production is the kanban, a tool born in Toyota and which is based on the use of tags that regulate the production and handling of materials.

5. The last principle is the heart of continuous improvement, it expresses one of the most important concepts of lean management, namely that of the pursuit of perfection. The idea is to be able to maintain the competitive advantage obtained from previous actions, trying to continuously reduce waste and increase value.

1.3 Lean tools

Lean thinking is the philosophy behind lean organization management; it aims at minimizing waste and maximizing value, objectives that are pursued through the application of certain tools and operating techniques aimed at corporate reorganization.

Value Stream Map

The Value Stream Map is one of the essential techniques when choosing to undertake lean transformation, as it acts as a starting point in identifying the flow of value. The Value Stream Map (VSM) is the technique developed by Toyota to identify the flow of value. The aim is to obtain a process map that contains all the operations, both value-added and non-value-added ones, which contribute to creating value in the goods or services sold to the customer. In this way, it is possible to identify where waste and inefficiencies are located, to understand how to make improvements. In fact, in addition to activities that create value, there may be activities that constitute waste, but some of these are necessary and cannot be eliminated under the current conditions of the company.

So the Value Stream is the set of all the actions necessary to create value in the product. These actions form two fundamental flows:

- the production flow, from the raw material to the customer;
- the design flow, from the idea to the product launch.

The Value Stream Map is a mapping technique that allows you to identify, represent, analyze, and improve the flow of value, which is composed of the flow of materials, information and people. (Rother M., Shook J., 1998).

Wastes - Muda

The concept of "doing more with less" expresses most concisely and clearly the key concept of the Toyota Product System, that is, the idea that the improvement of company productivity can

be achieved thanks to the resources that are already available to the company that operates in a lean perspective, without further expenditure of energy and resources. So, as already mentioned, lean management was born to eliminate waste, which in Japanese are called Muda. The term Muda in Japanese means waste and indicates any human activity that absorbs resources without creating value; therefore, proper planning of the activities, good management of employees and greater control in the operations carried out are necessary to be able to reduce errors and defects to the maximum, avoid the overproduction of unnecessary goods, unnecessary supplies, and equally unnecessary movements of the personnel. (Rosa A., 2017). Taiichi Ohno identifies different types of significant waste within companies, defining that the types of Muda can be attributed to seven categories:

1. *Overproduction*: produce or supply more than what is required by the demand, then produce a greater quantity than the market can absorb. It represents waste because it constitutes warehouse stocks and inventories.
2. *Excess of stocks*: the stocks of raw materials, semi-finished and finished products are all considered a waste because they do not produce profit and are of no value to the customer. In particular, those of raw materials when in excess have negative effects both from a financial point of view, as they absorb liquidity, and from a logistical point of view because they "take up space". Finished products and semi-finished products represent an obstacle for the company when there is a need to adapt to changes in demand.
3. *Unnecessary movements*: that is, the movement of human resources that slow down working activity, constituting a waste of time.
4. *Transport*: this type of waste is similar to the previous one but refers to the transport of the product, also, there is the risk of damaging it.
5. *Defects*: errors that lead to the production of out-of-specification materials and products, which must be reworked or discarded. This type of waste can cause an increase in production time, worse customer service, and an increase in costs. “The secret to keeping defects under control is to continue to research what causes them and use diligence to keep them from happening again. When problems arise, the root cause of the defect must be found and, therefore, try to work out its solution”. (Minardi R., 2017).
6. *Process losses*: the presence of unnecessary, expensive, and unnecessary activities, which can cause problems such as interruption of the flow or defects in the processed materials.

7. *Waits*: refers to all the time lost by operators who wait for the arrival of the material to be processed, waits to start the next activity, or that a machine is released.

The Three "M"

In lean management, in addition to the Muda, which are the physical waste and therefore the most visible, there are also two other types of waste, the Muri and the Mura, and it is important not to forget them because they are the ones that give rise to the Muda. (Southworth T., 2010). Muri indicates the overload of resources. The problems arising from this type of waste can be manifold: overloading people at work, for example, can lead to accidents, absenteeism in the workplace, and dissatisfaction with staff; in the same way, overloading a machine can lead to rapid deterioration or breakage of some component. Mura, on the other hand, refers to irregularities in the workload, which can cause walls when resources are overloaded, or Muda when there is underutilization (for example, waiting). Finally, these behaviors can only give rise to waste, or Muda. The correct order of the genesis of waste is, therefore: Mura, Muri, Muda. (Wakamatsu, 2016). Being able to stabilize and regulate the workload, therefore, can bring many benefits and lean management aims to combat this waste with just in time and heijunka.

Heijunka

A basic concept on which the construction of a lean company stands is that of Heijunka, definable as the leveling of production in terms of mix and volume for a defined period, dependent on the characteristics of the business, to obtain a constant flow of components. (Furmans K., 2005). Heijunka, or leveled programming, "is the practice with which the volume of material produced over time is leveled, so that production is always with the same takt". (King P. L., 2017). It is a vital technique in lean companies, and it is the basis for successfully applying many tools, including the kanban and it is the cure for irregularities (Mura) that generate waste.

The goal of the heijunka is to produce the goods in the upstream processes at a constant rate, to allow the same constant and predictable rhythm also for downstream operations. The leveled production allows to obtain a relatively linear and flowing flow, but can count on remarkable process flexibility, if the demand downstream requires it. (Slack et al, 2013). By keeping a small inventory of finished products at the end of the production process, demand for the entire production and also for suppliers can be leveled, thus making the use of resources more

effective along with the entire flow of value while satisfying the customer's requirements. Ideally, production can be easily leveled, if demand were stable and constant, but in the real world, we know it is not so.
To deal with the variability of demand, we act on production volumes to be able to better plan production.

- Production leveling by volume: the average of the demand is calculated to define the minimum production batch, with a minimum stock that allows covering any peaks. The advantage lies in keeping track of both the average demand and the initial stocks so that production can be leveled.
- Production leveling by product mix: most of the time the productions foresee a mix of products with as many processing phases. The game becomes more complicated, but not excessively so: there is a tendency to coordinate the production of the various products in a single set and minimum batches and stocks are organized according to the reference mix.

Kanban

The tool most used by lean companies to manage to flow the value flow is the Kanban, a Japanese term that means "sign" or "tag". The kanban is a visual signaling mechanism of what is needed, that is, of what must be produced to supply the materials taken from the customer, which can be the end customer or the next step of the process. (King P. L., 2017). The kanban has traditionally been implemented with systems with tags or marked containers that report information on the product and on the quantities necessary for production management. It is one of the most used methods since it combines simplicity and tangible results in reducing waste; thanks to the streamlining of the flow of information from downstream to upstream, the production is pulled by the final demand and this contributes to reducing excess production and the relative inefficiencies.

Kanban can be of two types:

- for picking or transport, if they meet the need to move components and materials towards a production process;
- production, if they are actual production orders authorizing the the upstream process to produce a component needed for a downstream process. By improving the information flow, the kanban method also contributes to the optimization of the production flow, pursued in a lean perspective through the application of the heijunka.

The use of kanban within this system allows you to start from the final demand to arrive at the definition of a production flow that has a constant rhythm and which is as far as possible from fluctuations. The strengths of a Kanban system are essentially three: it produces a reduction in information processing costs, the acquisition of data becomes at the same time faster, and, finally, it limits the production capacity of the phases further upstream, thus reducing the possibility of excess production. (Sugimori Y., Kusunoki K., Cho F. & Uchikawa S., 1977).

1.4 House of Lean

So far we have focused on the five principles of Lean thinking, as illustrated by Womack and Jones in the book of the same name, and on the seven wastes (muda) with the related concepts of overload (muri) and incompatibility (mura), identified by Taiichi Ohno. What is still missing for a more exhaustive treatment of Lean Production is the set of techniques, tools, and procedures that are necessary to implement lean production. Some of these elements have already been mentioned briefly in the previous pages without, however, receiving the attention they deserve. The set of techniques that will shortly be described are based on a common prerequisite: all operators and employees must be included in an active and full involvement in every operation, production phase or decision so as to be able to take full advantage of all the skills and knowledge spread within the company (and avoid incurring in what Ohno defined as muda deriving from underutilization of company staff).

The fundamental elements of lean production can be represented graphically as a "home", a system that works efficiently and effectively only if all the elements that compose it work well together. The figure can be understood as a metaphor, useful to represent all the characteristics of the lean philosophy and the techniques necessary to achieve the desired objectives. (King P. L., 2017). Just like building a good home, implementing a lean production requires not only to behave like a system[4], but also to be built from below it will be necessary to start from solid and large foundations to be able to support the rest of the building, passing through resistant pillars or columns to be able, in the end, to build a roof on it representing the result, the culmination of the efforts made [Figure 1]. This section, therefore, presents other fundamental

[4] And therefore as a set of elements that perform a function.

concepts and tools typically used in the application of Lean Thinking, and represented through the "House of Lean".

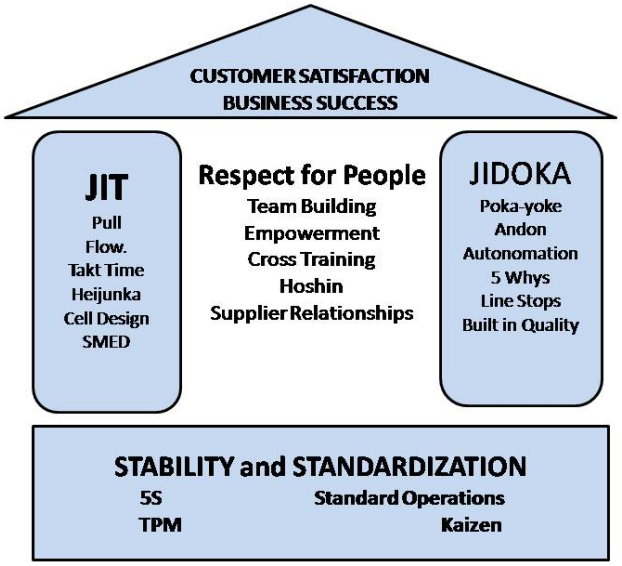


Figure 1: The House of Lean (The Toyota Production System "House")

1.4.1 The foundations of the house of lean

For a house to be solid and resistant, good foundations are important, a solid foundation that allows a successful implementation of the lean, with the consequent improvement in quality, delivery and customer satisfaction. The first part of the foundation certainly requires strong leadership, employee commitment, mutual trust and a clear goal. Furthermore, to guarantee and ensure that the work is done in the right way, standardization and stability are at the basis of everything. These two elements are indispensable to be sure that the work is always done correctly and to have stable processes, without which it would not be possible to achieve improvement. For a company to build these foundations, it will first have to define standard operations, which can always be carried out in the same way, so that uncertainties are reduced and fewer mistakes are made. The defined standards, however, can be changed over time, through kaizen improvement activities that involve the whole company. To effectively implement and support these concepts, two other useful techniques are 5S and TPM.

Kaizen

Kaizen is a Japanese word which means continuous improvement. The etymology of the Japanese term makes the idea it expresses well: composed of the two words *Kai* (change) and *Zen* (better), it literally means "change for the better" and is explanatory of that business philosophy that sees progressive change and continuous, which involves the entire company system, the essential element for achieving efficiency and therefore success. (Imai M., 1986). Kaizen is a work process in which all employees are engaged in the relentless improvement of all processes. Kaizen is a way of thinking, of behaving, a total philosophy that makes it the employees themselves who actually do the job, to eliminate waste, and to plan and implement more efficient processes. Kaizen events are short team activities, with a specific and well-defined purpose that serves to achieve improvement in a particular process. (King P. L., 2017). In fact, often the kaizen logic can be introduced in the company in the form of workshops, or by introducing an intervention aimed at a company area that takes place over a week; setting the team clear and quickly achievable objectives bring immediate benefits to the company, which encourage the pursuit of kaizen also in the rest of the company and beyond the single event. Aiming for improvement means, first of all, questioning oneself and recognizing the critical issues and resolving them as soon as they arise; for this reason, pursuing kaizen means, on the one hand, questioning what is happening in the company, and on the other, having problem-solving skills.

The "5 S"

The procedure called "5S" is a process improvement system based on a reduction of waste, cleaning of the workplace, and an increase in productivity with the aim of simplifying visual management. (Samuel K. M. Ho, 1999). The implementation of the 5S is the starting point that allows the improvement of production activities and future development. The 5s is the name assigned to a five-step process for the organization of the workplace, for the management of order and cleaning, and for the standardization of work. The name comes from the Japanese words for the five phases: Seiri, Seiton, Seiso, Seiketsu, Shitsuke. (King P. L., 2017).

1. *Seiri* (Sort): it is necessary to separate what is necessary from what is superfluous, and eliminate it, since what is not functional to the activity to be carried out disturbs the process, creates disorder and, consequently, waste of resources (Muda).
2. *Seiton* (Set in Order): after identifying the functional resources for the activity, it is necessary to arrange and order them by putting everything in its right place, making them immediately recognizable within the work environment.

3. *Seiso* (Shine): cleaning in the workplace, this logic requires that the workplace is always in order and clean, so as to minimize the risk of waste and damage; to do this, it is necessary to keep the attention on materials and resources in general high, and to identify damages, errors or inefficiencies when they arise to resolve them instantly.
4. *Seiketsu* (Standardize): define standard methodologies regarding the processes and rationalization activities of resources and workspaces, to maintain order and cleanliness in the workplace.
5. *Shitsuke* (Sustain): the fifth action is inclusive of the previous four since it provides that once the operational actions necessary for improvement have been implemented, they will be supported through standard monitoring, communication, and training; metabolized by the entire company system and become an integral part of the management of company activities. In this phase, once again, the involvement of the company's staff is fundamental so that the mindset of the entire organization is in line with management and lean principles.

Total Productive Maintenance (TPM)

Another tool used for the implementation of the Lean system consists of the TPM, a methodology that aims to improve the efficiency of the plants, reducing emergencies and unscheduled maintenance. In this perspective, maintenance is no longer seen as a separate activity, separate from production, but becomes a routine activity, which affects all the people who work in the plant. (King P. L., 2017). This tool actively involves staff in maintenance, equipment cleaning, inspection, and control; the monitoring of the efficiency of plants and equipment must take into account all possible losses and move towards the minimization of these, pushing the company to obtain greater productivity and less waste. (Rosa A., 2017). In this way, by reducing breakdowns and accidents, it is possible to obtain several benefits: increase production, make up for the time to solve other problems, improve quality and make employees more involved and satisfied.

The TPM brings a series of advantages such as more efficient use of plants and equipment; introduces a maintenance methodology spread throughout the organization based on historical data; requires the participation of design and development, production and maintenance; it involves management and operators and promotes and improves maintenance activities based on specific autonomous teams.

1.4.2 The walls of the house of lean

The purpose of the walls is to optimize production and quality. Optimizing production is essential to ensure economic and efficient operations, while optimizing quality ensures that your extended production is not wasted on bad results. The walls of the house are made up of what Ohno calls the pillars of the TPS: Just in time (JIT) and automation (Jidoka).

Just in time (JIT)

The first pillar is Just-In-Time (JIT), the definition may present subtle differences between the various authors. All of them, however, seem to agree that it represents "a general philosophy to reduce waste and improve product quality". (Brown K. A., Mitchell T. R., 1991). JIT indicates the set of principles, tools, and techniques that allows a company to do what is necessary only when it is necessary and in the exact quantity required. (King P. L., 2017). JIT is a production strategy that avoids overproduction that occurs when there is more production than is needed or in advance of when it is needed. It is aimed at minimizing the level of inventories by starting production only when the demand arises; it is thus possible to supply what is needed, exactly when it is needed and in the required quantity, to be able to maintain a continuous flow and respond flexibly to the market.

This concept was born in Toyota around the sixties, as opposed to the classic production method which involves going to plan each production phase independently of the others: with this model, in fact, there is no synchronization between the various phases, and this translates into an accumulation of intermediate stocks and a reduction in the company's profitability. Ohno tried to solve these problems "thinking backward": therefore, instead of considering production as a flow that goes from upstream to downstream, he reversed the point of view, conceiving the process as a downstream upstream picking operation. In this perspective, the different phases must be linked together and each must send the information relating to their needs to that upstream. (Symbols A., Taddeo R., Morgante A., 2014). The principle from which it starts is that the production must be organized in such a way as to supply the customer only with the product he wants, in the quantity and times congenial to it. The production management thus conceived is part of the pull system, in which production is not determined a priori by the company but, on the contrary, is driven by the needs of the demand which imposes qualitative and quantitative characteristics.

For all this to be achievable, however, some changes must be made to the process:

- Apply the SMED ("Single Minute Exchange of Die") technique to minimize machine retooling times. It is a methodology developed by Shigeo Shingo in Toyota, which is divided into several steps thanks to which it is possible to reduce the time spent on retooling even by 50%[5].
- Leveling production, or Heijunka, and reducing batch size, to produce at a constant rate and make the process more flexible to sudden changes in demand.
- Adopt a cell production to make the flow more visible, reduce the lead time of crossing the piece, and improve the quality. Cell means a unit of work dedicated to the production of a specific family of products that have similar characteristics and that require the same machinery to be processed. Each cell consists of the necessary equipment and a certain number of operators, who have the skills to carry out various activities and who can communicate quickly with each other, favoring team working.

The company that operates by applying the principles of JIT produces exactly what is required by the market and develops production along with a continuous flow, thus managing to achieve important results: on the one hand, overproduction is eliminated, and therefore the stocks that they involve high management costs; on the other hand, *lead time*[6] and *takt time* are reduced. The takt time is a time indicator that allows you to combine production with demand, and the pace of implementation with that of sales. Takt is a German word translatable with "rhythm": this parameter, in fact, measures the production speed at which the products must be made to be able to satisfy the customer's demand. (Angeli F., 2010). From the calculation of the takt time can derive a series of useful considerations to optimize the production, such as the number of ideal operators in each cell. Therefore time optimization is a complex activity that requires, in the first instance, an analysis of existing processes that allows identifying any anomalies and bottlenecks that need to be resolved and eliminated. The most immediate way to analyze a process is its mapping, which reports what the activities are step by step.

[5] Properly the translation of Single Minute Exchange of Die is "change the mold in a single-digit", indicating the fact that the use of this technique would lead to a retooling of the machinery in a single-digit timeframe, that is, in less than ten minutes.

[6] The lead time represents the time between the receipt of a product request and its fulfillment (it is the total time of realization).

Jidoka

The second pillar of Lean Production, attributable to Sakichi Toyoda, is the Jidoka. The term *Jidoka* identifies the concept of *autonomation*[7], and in Toyota, this principle was summarized in the saying "stop production so that production never stops": it provided that the production system was composed of machinery and workers who were able to stop production when they have detected anomalies in the product, to solve them instantly and gradually construct quality at each subsequent step of the production flow. (Monden Y., 1983). When a problem occurs, therefore, the machine must stop automatically, and the operators must correct the defect. This procedure allows improving the quality, since the production of defective parts is reduced to a minimum, as well as the times necessary for repairs decrease. (Porteus E. L., 1990). For effective development of this concept, it is important to train operators, who must be able to understand when a malfunction is taking place and how to remedy it. In this regard, various techniques are useful, whose primary objective is to make errors visible to anyone, and facilitate the search for possible solutions.

First, the Poka-Yoke method, a Japanese idiom that literally means "avoiding involuntary error"[8], responds to this need. This technique requires that the production process is constructed in such a way as to minimize the risk of workers from incurring involuntary or random errors. Generally, it is substantiated in the use of practices and tools that identify the error as soon as it occurs and can be used in the production area, as well as in the administrative one; reducing errors along the production process allows to eliminate the defects of the product deriving from them. (King P. L., 2017). The integration of the worker in the production process allows to untie his work from that of the machine, allowing the same operator to supervise multiple production stations, and to reduce, if not reset, the need for constant human supervision of the machines.

A useful method to make employees' intelligence grow, so as to further increase the value they bring within the company, is called the "Five Why Method". The "Five Why" technique consists of a series of questions that allow you to search for the cause-effect relationships that are hidden behind a given problem: faced with a specific problem, an operator should ask himself at least 5 times why and try to give himself a reply. (King P. L., 2017). According to this approach, if

[7] Contraction of autonomy and automation.
[8] Literally "monkey proof", error proof.

we stopped at the first because we would not actually be able to perceive the real problem and we would stop at the surface finding a solution that does not always solve it completely. Instead, asking the question at least 5 times because in the face of a problem it is possible to identify the actual causes of a given problem and, thus, be able to solve it completely and definitively.

The Andon method, on the other hand, is used to report problems: when the operator detects an error, he has the option of pressing a button, which through a light signal signals the problem, allowing production to be stopped, communicating the malfunction, so that assistance may intervene. Work is suspended until the fault is resolved. (King P. L., 2017). The fact that production is stopped every time an operator detects an error may seem counterproductive, because it leads to a reduction in productivity. However, from a lean perspective, these interruptions contribute to the continuous improvement of the company, because they highlight problems that would otherwise be neglected or not resolved definitively. Over time, there will be fewer interruptions, while quality and productivity will be greater. Jidoka is therefore a cardinal principle, in which all the people involved in the different business areas are an integral part of the continuous improvement process.

1.4.3 The heart of the house

Returning to the metaphor of the home, it is observed that at the center of everything there is respect for people: it is these, in fact, that determine the success of lean culture in a company. We have already mentioned that involving all employees and creating work teams may prove to be fundamental for the implementation of lean techniques, but care must be taken to exploit this potential correctly. In order to be efficient, a work team needs good coordination, so that each component knows at all times what to do, a precise division of tasks, and, of course, the management will have to provide the team with the resources and the appropriate tools to do the job. (Rosa A., 2017). Before focusing on the team, however, it is important to involve and develop individual people, so that everyone can independently contribute to improving the process. The management will have to define a framework of action, to establish the objectives that are to be achieved with these improvement activities and the limits within which the operator has the right to make changes independently. Ohno describes this concept by comparing it to the autonomic nervous system of the human body: just as the heart accelerates the beat when exercise is performed, without waiting for an order from the brain, in the same

way within the organization you should have the opportunity to make judgments autonomously already in the lower levels, without consulting the vertices, which in the analogy would be the brain. These changes may concern, for example, the interruption of production, the sequence of workmanship of the pieces, or the need for overtime. (Black J. T., 2007). Finally, another critical factor is the relationship with suppliers. For a correct implementation of lean management, in fact, deliveries of small quantities of material are required quickly, but in reality, the suppliers make deliveries in fixed quantities and times, and often late. In this situation, it is not possible for the company to keep the stock level low and the production flexibility high. We must, therefore, focus on improving the relationship with key suppliers, trying to integrate them into the system, and improving communication, extending lean thinking upstream of the supply chain.

1.4.4 The roof of the house

In the house of lean, the roof focuses on the customer. Always keeping the customer's specific wants and needs in mind at all times is what will protect the rest of the structure from running into problems. Optimization of the product is essential, but if this is done only for reasons of improvement, even if customers do not want or need the new functionality, it is a form of waste. It is also important to remember that all changes made, and which aim to improve the efficiency of the company, must always bring benefits to the customer[9]: it is from customer satisfaction, in fact, that success depends business and this is precisely the primary objective of lean management. To focus on the needs of its customers it is necessary, first of all, to consider and understand what they appreciate, including every function and option in a product for which they are willing to pay. Secondly, it is necessary to map the flow of value, a useful strategy that allows you to determine where value is needed in any product. (Womack J. P., Jones D. T., 2006). And create a flow, a properly flowing production line that will continuously deliver exactly what customers want. The flow of products through consolidated systems will ensure the efficiency of the systems and the utmost attention to the desired results for customers. Finally, it is useful to reduce the variation, as customers want a specific product and want it to be of predictable quality every time they place an order. So finding ways to identify the variation in production and eliminate it will help reduce the variation and improve customer satisfaction. These concepts help to form a protective barrier that can offer a guide for the rest

[9] (both internal and external)

of the other steps of the house of lean, in fact by focusing only on what the customers actually need, it is possible to carry out processes focused on achieving the right goals.

1.5 PDCA

Before they can be applied, all these techniques require a careful analysis of the company situation and an understanding not only of the methodologies, but above all of the concepts that underlie the lean culture. The planning strategy that guides the development of people and that aims to translate the business objectives, to make them known at all levels of the organization, is known by the name "Hoshin Kanri"[10]. The purpose of this strategy is to align all people towards a common goal, so that everyone is responsible for improving the company and more motivated to contribute. (Hutchins D., 2016). Companies that use hoshin kanri follow the PDCA cycle to plan medium-term improvement projects, and being two processes linked together, without the application of this method it would be difficult to solve problems and achieve objectives.

The process of continuous improvement follows, in fact, a virtuous circle called the "PDCA cycle" of Agostinetto (2006), or the "Deming cycle", as is also known, is a method of managing the decision-making process, that is, it is one tool that seeks to achieve a certain goal and objective, through continuous improvement in quality. (Marques R., 2017). It is a dynamic process of knowledge acquisition, the cycle is an endless process, each completion of a step, such data is used has been effective to plan again the beginning of the first phase, thus allowing the improvement of the process the analysis of successes and failures.

The cycle consists of four phases, which are: Plan, Do, Check and Act: (Werkama, 1995).

1. Plan - Plan the activity before starting it, define its objectives, detect and solve the problems and critical issues associated with it, taking into account the risks, costs, times and resources available. It is, in fact, the most complex phase and requires more effort.
2. Do - Perform and carry out the activity, respecting as much as possible the planning drawn up in the previous phase. For this to happen in the best way it is necessary, before the start of it, to educate, motivate and train the parties involved, in order of efficiency

[10] Hoshin Kanri literally means "reasoned control of direction". The Hoshin Kanri is an integrated management approach that combines strategic and operational management, linking the achievement of the objectives of the top management to daily operations.

and commitment on their part. If it is not possible to perform that was expected, it should go back to the previous stage and understand the reasons for the planning have failed.

3. Check - Check and check the correctness in carrying out the activity, the achievement of results and constant compliance with the schedule. The collection and evaluation carried out by the data takes place to compare that the execution was carried out according to the plans and identify the differences. To do this, you need to perform monitoring activities where errors can be detected so that they can be resolved in the next cycle.
4. Act - Act on the causes that interrupted the flow of activities and created critical issues; solve the latter through corrective actions, to improve the process, standardizing it where possible for greater quality and efficiency.

So through planning, putting into practice, checking and acting on defects, the PDCA cycle allows the search for continuous improvement, and involves high final quality of the service, which is directly proportional to customer satisfaction. (Marques R., 2017).

1.6 Application of the Lean method and results

After the exposure of the numerous tools that allow the application of the principles for the implementation of change, it is also important to underline some practical tips for applying the Lean method. The first is to think about the human factor, lean-to produces a radical change in performance must involve people, the way of thinking, the corporate culture, and therefore cannot be limited to activities and processes. Doing things well and making people grow (Monozuri and Hitozuri) are both essential to achieving lean goals. A lean company must therefore involve and raise awareness of all company staff, motivating them to achieve common goals. The second piece of advice is to focus on problem-solving; in order to find the correct solution to the problems it is necessary to fully understand the current situation and the best way to understand what is really happening is to observe it in person. Continuous improvement will thus consist of a series of positive transformations adopted directly on the spot where the problem was identified. The third is not to be afraid to try, precisely because we often worry about doing things that can have uncertain outcomes: sometimes this insecurity can lead to discussing and hesitating for excessively long times and thus postponing the implementation phase. Begin the journey, take the first step: observe and analyze, experiment, and collect data, learn, and improve the process. Subsequently, the fourth concerns obtaining ascertainable results. Eliminate evident waste immediately and communicate and share the improvement

obtained that can thus be immediately appreciated and verified even by those who are more resistant to change. Finally, a thorough understanding of the principles and techniques of applying lean. Understanding the theory and tools of lean thinking is the necessary prerequisite for leading the company towards lean change. It is also central to raise awareness and involve all staff in the project. With lean consulting services, expert figures are made available to accompany the company towards continuous improvement: they help to fully understand the principles of lean thinking and to guide and motivate company staff.

Results

Companies that embark on a lean transformation path, adopting lean thinking principles and methodologies, obtain results in terms of qualitative and quantitative efficiency and effectiveness that are difficult to obtain with other approaches. The typical results of applying lean thinking in the company are:

- reduction of delivery times (lead time): increased flexibility and availability of the product/service in reduced times;
- increase in productivity;
- increase in the quality of products and processes through a process of improvement, continuous improvement;
- reduction of product costs: greater efficiency;
- greater competitiveness: the elimination of waste in terms of time and resources used in non-value activities frees up resources to be reinvested in the present and in the future to increase the value of the product/service and generate more profits;
- development and motivational increase of personnel;
- change in the product or service: attention to customer satisfaction and an increase in perceived value but also greater quality, efficiency, and flexibility.

1.7 Economic and performance control

Lean transformation paths lead to a clear improvement in performance, in terms of: efficiency, customer service, lower stocks, reduction of lead times, increase in production capacity, etc. A fundamental objective of management control must therefore be to constantly measure and monitor the trend over time of the key performance indicators (KPI); this allows you to check whether the company is pursuing its performance objectives or not. One of the pillars of the

Lean transformation is the creation of “Value Streams”, or flows of value relating to substantially homogeneous families of products. The logic of the standard cost of a single product must therefore be abandoned because it is excessively complex and misleading; instead, a Value Stream Costing is considered. Then, all the actual costs and revenues pertaining to it are attributed to Value Stream. A summary of the performance indicators and the income statement is periodically prepared for each Value Stream. The Box Score, a term borrowed from American baseball, is the way in which they are highlighted. The set of indicators is specific to each Value Stream. Therefore, taking this logic into consideration and working on actual costs and revenues, excluding complex calculations of variances, the Box Score is much simpler and more precise than classic reporting. Some companies use it on a weekly basis. To process the corporate income statement, the costs of the corporate structures (eg the Administration) that are not directly attributable to them must be added to the economic results of the Value Streams.

As far as production capacity is concerned, it is interesting to note that Lean transformation reduces process losses (unproductive capacity); consequently, it increases the available capacity, which can be used as an increment for sales. Traditional management control systems were conceived and developed to support the mass production model and, for this reason, they cannot be adapted to an organization based on Lean principles. The traditional logic of management control collides with some key principles of Lean Production since, in the Lean paths, the concrete benefits obtained in the field are not accounted for. If the performance indicators are not measured in a timely manner, the reports with aggregated and mixed data (value + waste) inevitably lead to incorrect choices and decisions. It is extremely important to align the language in the company through a consistent vision, creating a virtuous circle of correctly measured improvements and economic benefits.

1.8 The analysis of the effect of Lean and the benefits

In order to assess the impact that a Lean path generates within an organization, even the administrative processes need to be redefined that allows quantifying the impact on the income statement, according to the following guidelines. All control activities, not being value assets, must be progressively reduced and, if possible, eliminated; this is possible through the analysis and structuring of processes that, through anti-terror systems (in Japanese: Poka Yoke), prevent

the onset of errors at the origin. To optimize administrative processes, it will be necessary to carry out a mapping of all activities, which has as its objective the identification and subsequent elimination of waste. The analysis is conducted through the Value Stream Mapping tool which will bring out all the pockets of inefficiency (errors, waiting, a reworking of documents, unnecessary movements, etc.). The roles and activities of administrative employees will subsequently be reviewed and reorganized, in order to speed up the process and reduce downtime.

With the advent of lean production, in Japan, in the United States and, subsequently, in Europe, the performance of the operations area has progressively improved over the years: double-digit efficiency recoveries, a drastic reduction of inventories, a net improvement of the level of service and lead time of delivery to the customer. Despite the undeniable benefits, the systems of calculation and distribution of costs prevent their quantification and netization in the income statement. For this reason, controllers and administrative functions have advanced numerous criticisms regarding the fact that all in all, Lean Production can only be useful at a production level, but not at a global level, for the real finances of a company. In reality, the real problem is that, often, the management control system of most companies is set up on criteria that belong to the past, with the basic evaluation of standard costs and the redistribution of indirect costs on the finished product, often with the help of coefficients and incorrect allocations. Traditional accounting systems do not consider non-economic performance measurement systems, which are delegated to individual functions and are based on analytical surveys of the final balance sheets, many of which are linked to production orders.

2. The lean public administration

2.1 The changing public administration

The lean concepts and tools illustrated so far lay the foundations for the implementation of lean thinking in the company; and as is clear from what has been explained so far, the principles of lean thinking have been designed for application in the producing and manufacturing sector. Nonetheless, the culture of lean thinking has spread over time also in areas that go beyond the exclusive production of goods. Over time, alongside the traditional and now widespread lean manufacturing, numerous branches of lean thinking have emerged: starting from the more generic lean service up to more specific branches in which the approach is adopted.

The economic scenario, characterized by the globalization of markets, the unceasing development of new technologies and the ever-increasing weight recognized for intangible assets, involves deep attention towards the company and its need for change. The urgency and inevitability of change affect the private enterprise to be competitive in the global competitive market and the public enterprise to make the welfare state accessible, through efficient and effective management of services. (Leone A., 2006). The public administration is rapidly evolving, we are witnessing a change that affects the institutional, legislative, social, and economic spheres. In fact, the PA issue is not just a problem of containing resources, but rather the need for efficiency recovery that leverages a new vision of the user citizen as an absolute priority. To support this vision, new references and organizational and management models are needed: today, more than ever, it is necessary to rethink the functions of the public administration and to acquire skills capable of supporting the new challenges that await all administrative bodies of the government. (Perrella G., Delli Cocili G., 2009). Governments around the world want to offer a better education, better health care, better pensions, and better transportation services. Citizens are impatient and expect to see change quickly, but the funds to meet those needs are huge, particularly in the many developed economies where the population ages and the productivity of the public sector have not kept pace with the private sector. The need to obtain good value for money from governments at all levels is therefore in the spotlight.

The inefficiencies present in the PA were not foreseen in Max Weber's idea of organization, which first provided a precise definition of bureaucracy, intended as the organization of people

and resources destined to achieve a collective goal according to criteria of rationality, impartiality, impersonality. (Giddens A., 2009.) In the model, the division of labor is strictly determined by laws and regulations that facilitate coordination; the office hierarchy determines the areas of authority and the communication flows, generating a rigid system of subordination, with verification and control powers. From a historical point of view, however, the introduction of an administrative system divided into numerous offices and based on somehow unified procedures dates back to the emperor Claudius in the first century AD, who entrusted the various offices to his freedmen. So far from the impersonal idealization of righteousness developed many centuries later, but perhaps not too far from our reality. Looking at more modern times, the industrial revolution and political revolutions of the eighteenth and nineteenth centuries promoted a culture of public intervention, which had not even been contemplated before. The social changes resulting from the industrial revolution are known and enormously important: urbanization, the rise of the bourgeoisie, the strategic importance of factory production, new values. Political revolutions, for their part, replaced the absolute monarchy with forms of state more suited to the socio-economic transformations of the time. On the one hand, democratic ideals asserted that provide for certain equality not only in civil rights but also in living conditions; on the other, the "virtuous circle" of the "Fordist" economy, by increasing incomes and therefore taxable wealth, favored the development of the welfare state, the purpose of which is to guarantee, through the State and its agencies, social protection and living conditions acceptable to citizens. (Fedele M., 2002). But all this had a cost, and it became difficult for the state to maintain high levels of public spending; therefore redesigning the administrative organization became an obligation for many governments. It, therefore, led to the failure of the classic bureaucratic model devised by Weber: a system considered perfect in terms of effectiveness and efficiency. The only ideal nature of the model is, in fact, demonstrated not only by the general dissatisfaction with the performance of bureaucracies, but by the very fact that "bureaucratic" is today a highly negative term, synonymous with "inefficiencies", "obtuse". (Cerase F. P., 1998).

The "New Public Management" (NPM) model was created to provide answers to the unexpected consequences of classic bureaucracies, which concern the activity of Public Administrations at 360 degrees. We are faced with a completely new philosophy with respect to traditional bureaucratic administration, a global change of perspective that on the one hand invests the final result (result administration), on the other hand approaches a culture of private enterprise that puts at the center the consumer rather than the procedure or rule. The

transformation process focused on the development of innovation strategies and processes aimed at improving the quality of services and public policies, based on the enhancement of knowledge and human capital and on the creation of context conditions conducive to a more transparent and effective management of the Res publica. (Dente B., 1999).

The continuous process of modernization of the public administration shows that at the basis of the continuous changes still in progress there is the undeniable need to implement a more efficient and effective use of collective resources, however the search for efficiency in the management of the public administration is an objective complex. The watchword is to simplify. Simplify to grow, to measure, to evaluate, to act: remove the slowness of processes, lighten structures, provide more efficient services with fewer resources, clarify the work of institutions, improve the quality of life, facilitate the development of businesses and therefore of the country. The public sector is increasingly close to the private sector: at the base there is the idea according to which the principles of the management of the private sector can increase the productivity of public administrations thus overcoming the bureaucratic structure to ensure management flexibility, efficiency and effectiveness of services rendered. As a result, this work is part of the line of studies on public managerialism which goes beyond the Weberian bureaucratic model by promoting the management of the public sector through principles of the private sector. The activity of any administration is now part of a dense network of contractual relationships, woven with other public administrations, with private subjects or with third sector organizations. (By Carlo S., 2016). Citizens are clamoring for the improvement of the quality of life: they ride the wave of the new values that emerge in today's societies and the growing schooling; people want to feel gratified by their job role, pursue acknowledgments and enhancements of their merit and trust in an ethically correct entity. (Marra A., 2006). In support of the change in Public Administrations it is necessary to develop an organizational support model, capable of responding promptly, and efficiently, to the new needs proposed by the evolutionary context to which we have referred.

2.2 Lean Organization at the base of Public Administration

The best answer to the needs of the PA is represented by the lean organization: a widespread managerial philosophy in the private sector that is believed to allow the creation of a simple, lean and fast PA that moves in the direction of revolutionizing relations between the state and

citizens, to reduce costs and offer ever better services. The application of Lean thinking to the "world" of services takes the name of Lean organization, where the central objective continues to be customer satisfaction through the provision of quality services. The Lean organization, like the other systems of management of excellence, is based on the continuous improvement that affects all the processes of each organizational function leading to an improvement in performance and the achievement of good economic and financial results. (Rosa A., 2017).

The principles of the Lean Organization can prove useful in facilitating the expected changes, triggering processes to improve efficiency that sees people more involved and participate. The PA, like any other company, can obtain improvements by subjecting all organizational processes and routines to analysis with the aim of eliminating everything that does not generate or destroy value as envisaged by lean thinking. Its applications in the public sector have given way to a real waste hunt, which ended with a remarkable and unthinkable recovery of dispersed resources. In addition, an organization of this type favors important productivity increases and ensures rapid time to make any changes, through strong involvement of the staff. The aim of the lean approach, however, is not to make the staff work faster, but to make the work faster. (Radnor Z., Walley P., 2008).

The key thinking of the "lean" philosophy is to do well with much less: less effort, less space, less resources, less time. "Work better and work less", maintaining productivity and consequently wages, but increasing the perhaps poorest and most important asset that people possess: time. This means abandoning a strictly regulatory organization as far as possible, relying on the creativity of human capital to achieve better results. Simple and fluid processes, which aim to eliminate waste, to break traditional patterns, and to focus on value for the customer. It is an organizational model now typical of private companies, in which it is seen as a necessity to improve the functioning of the company, while in the public it remains poorly achievable due to economic difficulties, bureaucratic obstacles, and obsolete mentality. (Perrella G., Delli Cocili G., 2009). Furthermore, in the public sector, the notion of a customer is difficult to determine: in the services sector, it is not always clear, in fact, we have to deal with private citizens, businesses, public bodies, with different needs, unlike the private sector, in which customer satisfaction surveys and other analysis tools are more immediate and manage to study, directly, the benefits of using an organizational model. Savings, speed, and involvement are therefore the keywords of a new management model, which accompanies and underlies the evolutionary process of a modern and computerized PA, in the search for value.

In concrete terms, in an economic situation where bureaucracy and waste reign supreme, there is an approach that allows you to recover productivity, efficiency, effectiveness, and time.

2.3 Improvement towards excellence

The Japanese management system has been widely used by organizations around the world, and its range of action has also expanded to the service delivery sector. Such a tool, simple but effective, could be of immediate and great help in streamlining and improving work, in fact, the model of the lean organization finds perfect application in Public Administrations, as different pressing needs are becoming more and more pressing: the first is the recovery of resources, due to the need to contain costs in the face of increasing quality and level of service needs, the second is the speed that the organizational change taking place imposes on Public Bodies, and also the growing request for simplification and de-bureaucratization that inspires even the most recent legislative measures. (Perrella G., Delli Cocili G., 2009). Although resistance to change, a real obstacle in all organizational evolution processes, is much stronger in the public administration, in this context, the Lean is a tool for introducing changes and triggering processes for improving efficiency. To contribute to achieving the efficiency objectives, it is necessary to organize training initiatives to spread the principles and approaches of the lean organization, involving general managers and officials to create groups of people-oriented towards innovation and change, and to start implementing small projects improvement and provide results quickly that consolidate the change of approach and mentality in the face of effective, participatory and lasting results. (Romaniuk P., 2018). In other words, the strategies for implementing change should not be understood as something superfluous concerning quality tools: their relationship is, on the contrary, complementarity. In this regard, we speak of Total Quality to mean that type of approach to work no longer based on old models, but rather oriented towards the improvement, on a global level, of the internal and external results of the organization. Ultimately, in order not to risk compromising the final result, the use of tools to implement organizational change must follow the dictates of Total Quality, i.e. a concept of raising standards that are no longer limited to a single moment of the production cycle (usually that of the final check), but distributed over each of the phases leading to the provision of the service. Total Quality is the adoption of a model of approach to work, a mental attitude rather than a series of processes or methodologies. In a nutshell, we can say that it is based on the following factors: improvement of quality as an element of long-term

competitiveness; customer orientation, external and internal; strong tendency to enhance human resources at all levels.

This planning process requires a strategy with medium-long term objectives to be achieved and developed through a short-term development process. Part of the mission and vision can materialize in strategic plans. The mission represents the raison d'etre of the company, which usually must be as concise as possible and must motivate staff by directing them towards behaviors that create values for the company. The vision, on the other hand, represents what the company vision and perspective is in the long term, therefore it must represent an image of the future of the company, it must stimulate the strategies to be adopted by the staff. To be able to introduce the principles of Lean Thinking, there must be basic elements that allow their implementation. When you decide to adopt or put this organizational model into practice, you must not forget that a change is taking place that involves company actors and organizational procedures. The organization must operate in a logic of creating value and reducing waste, it must create an internal system in which the exact units required by customers are produced. (Perrella G., Delli Cocili G., 2009).

2.3.1 Customer-oriented service

The experiences gained in the field of Total Quality demonstrate how customer satisfaction is a factor to which particular attention must be paid, especially for the new perspective of value for the customer. It consists of the administration's knowledge of customers' needs and expectations, the expected level of service, the maximum tolerated and desired response times, as well as the overall value that the customer attributes to the service. To improve quality, it is very important to start from the knowledge of its customers, as it is highly uneconomic for the administration to use its own resources to produce what the customer does not recognize or whose price he is not willing to pay. The customer must therefore remain the center of all the activities carried out by individual employees, as it is his satisfaction that, in the long term, ensures the success of the organization. The end customer of the PA is, however, profoundly different from the customer of the automotive industry: it presents, in fact, a greater degree of complexity in measuring needs and expectations, as well as in its identification, as the citizen, who is entitled to public services, is at the same time user and contributor of public services, being able to use them and being the main financier of the same. (Perrella G., Delli Cocili G.,

2009). With the term "customer" the philosophy of Total Quality is not limited to describing the final consumer of a product or service, but also the internal customer, that is to say any person who, in the office, participates in the production cycle, providing the own contribution in terms of work activity. All customers, external and internal, have expectations and needs that must be anticipated and satisfied. This is the reason why management must ensure that customer expectations are known to all staff. The Total Quality strategies aim at a qualitative increase in the result, in the awareness that it is not enough to affect only the final result, but that, before that, each member of the production chain must do his or her job well, to satisfy their own internal customer. Inevitably all this will have a positive impact on the external impact of the result.

Equally important for quality-oriented management is to retain their customers, as empirical research has shown that looking for a new customer costs six times more than keeping an old one. It is clear that there is a strong link between customer satisfaction and his loyalty, as a satisfied customer will most likely return to request the service. It is a fact that in modern markets the customer is more aware, not only of what his real needs are, but also of his "life or death" power towards companies, he is more informed, more selective and above all has multiple alternatives. Therefore, if he is not satisfied, he changes. On the other hand, the sign of novelty is that this attitude is about to occur also concerning the Public Administration, which has always been protected from these dangers. In companies that provide services, and in the Public Administration in particular, the number of customer interactions is very high. The relationship between the service provider and the user of the service itself is much more complex than the relationship between the seller and the buyer of tangible goods. In fact, very often the service must be "tailored" to the customer, and requires his active collaboration. The high number of moments of contact between the provider and the user entails not only the difficulty of guaranteeing the quality of the service constantly on a pre-established standard, but also a greater probability of generating errors. This is why the concepts of quality and customer satisfaction must be closely linked to continuous improvement, since when answers to user requests are given, new and more complex ones arise immediately to be addressed and satisfied, implying a continuous process of innovation and improvement of services. (Bhatia, N., & Drew, J., 2006).

It is precisely the diversity between the end customer of the Public Administration and that of private companies, which consolidates the common vision of PA and lean thinking, since the

customer is considered by both of them as "person", not as a consumer. At the same time, the PA must deal with stakeholders, businesses, other state bodies, suppliers, consumer associations, etc. and also for this reason it fits perfectly with the lean goal of creating value. The hunt for waste is the primary tool of an efficient public organization, aimed at eliminating unnecessary and outdated processes, which do not create value for the customer, taking into account that public services cover primary and inalienable rights of the citizen, vital importance and social interest. Consequently, the elimination of unproductive activities constitutes a non-cost for the institution, but also saving for consumers, in terms of a better use of the financial resources to be allocated, to the benefit of a better service. The old push logic does not allow due attention to the needs of citizens: it is the administration that regulates the quality expected by the citizen, based on forecasts often taken from incorrect and misleading data, which alter the reality of the needs downstream and determine upstream, a service attentive to compliance with regulations and respect for bureaucracy, rather than to the actual opinion of citizens, penalizing speed and clarity in the provision of services. The pull approach promoted by the lean organization places the citizen, its needs and expectations as the foundation of the public building: it is no longer the public administration that creates the demand, but the citizen who chooses where, how and how much. Even those services for which demand cannot be determined "downstream", for example for citizen security services, can however be provided in pull mode. (Rosa A., 2017). Yet a pull service can be considered efficient only if produced and provided through continuous and flexible flows of value, typical of lean production, which guarantee the prevention of inefficiencies and the continuous improvement of the PA's activity.

2.3.2 Enhancement of human resources

The public administrations have so far been structured according to a hierarchical-functional organizational model, of tayloristic derivation, which multiplies the hierarchical levels, the indirect functions, the distance of the decision-making levels from the end-user, limits the involvement and personal responsibility, making so the proliferation of control structures is necessary. On the contrary, from the advent of the Motivational School onwards, the importance of dedicating attention to human resources, the decisive lever of change, has been understood. In fact, these constitute the main reserve of the administration, which must pursue staff motivation as its own objective. The employee must not feel rigidly anchored to a hierarchy, but valued because he knows his job and because the administration needs his skills

and professionalism. (Negro G., Ozzello S., 2010). With this in mind, private companies that use Total Quality tools use the so-called "suggestion system" according to which every employee of any hierarchical level can provide advice to the management, who, after examining them, decides whether to welcome them or less, sometimes even rewarding those who have been able to give useful indications. This practice has the considerable merit of installing trust and a sense of respect for oneself in every worker, showing that everyone is an important member of the organization, with effective ideas about how it works. In this way, benefits are obtained both from the improvements implemented as a result of the suggestions received and from the morale of the workers who feel part of a rewarding system.

The motivation of the staff must therefore also be valued at the Public Administrations, through the use of factors responsible for the work, or by allowing employees to participate in periodic and decisive meetings for the development of the organization, or even by putting the staff in a condition of working for workgroups. Responsibility in fact leads to self-control, that is, to the fact that each employee is responsible for himself: ultimately this method should push the employee to pay more attention to attention to detail. People only put their souls into change actions if they feel emotionally involved and have a precise sense of the mission and purpose of the organization they work for. The truly unique contribution that the manager can give consists precisely in guaranteeing this emotional participation.

On the other hand, the setting up and implementation of a Quality System is first and foremost a cultural and organizational problem that transversely involves public structures, from the top management, who have the task of defining and documenting their quality policy, up to those in charge of implementing the provisions of formalized procedures. The commitment of all and effective collaboration, spread at all levels, through group activity, allows us to carry out the process of continuous improvement. (Cernigliaro D., 2000). The prerequisite for this continuous improvement of the processes and the system is the full involvement of human resources through training and training aimed at the moral and cultural growth of the worker. The recruitment of staff is also fundamentally important, especially those assigned to tasks that directly impact the users. In the public sector, where in most cases organizations provide services, front desk staff play a crucial role. In fact, the quality of the service rendered depends largely on it. Employees who are in contact with customers are continuously observed, evaluated, judged, pursued, especially during the moment in which they intervene operationally in the relationship with the customer. Furthermore, the front-line operator is often in the

situation of making decisions of considerable importance for the success of the service, in a totally autonomous way; it, therefore, has a much greater responsibility and margin of a decision on its shoulders than in the sectors that supply products. Hence the importance of choosing suitable, qualified people, their education, and training. To facilitate the management of change, the Public Administration can also forfeit new professional figures, specialized in the culture of quality: we refer to the figures of the project manager, quality experts (in this regard, a significant contribution can come, as well as from the private companies of consultancy, universities), statisticians, organization analysts, trainers and communicators.

2.3.3 The role of computer science

The organizational problems that are emerging in a public context cannot be solved without looking at the technological resources. Indeed, the use of advanced technologies, such as IT, can make the transition from traditional mechanical bureaucracies to professional bureaucracies viable. In the former, the most consistent operating core is made up of personnel assigned to repetitive and discretionary tasks. Consequently, the prevailing form of coordination is based on the standardization of processes. Conversely, in professional bureaucracies, the operational core is made up of professionals who are able to operate with wide margins of discretion, and ample space is left to the initiative. Here coordination is based on professional enrichment and on the enhancement of individual skills, obtained through the elimination of tiring and routine tasks. In fact, due to the availability of IT technologies, from pre-established and limited tasks (and therefore of a merely operational type), we move on to problem-solving tasks, to tasks related to innovation because they are oriented towards objectives and results. (Agnetis A., Bacci A., Giovannoni E., 2015).

In the public sector, the information system is a crucial area: since, as has been said, in most cases public administrations deal with the provision of services, they mainly process and transform information. It is therefore easy to understand how they need a reliable information system, in its two hardware and software components. To date, public offices are dealing with large volumes of paper documents. This is due to the fact that service companies process and transform information, and not material, as it happens for manufacturing companies; in order to be conveyed, this information requires support which in the vast majority of cases is paper (certificates, declarations, forms, bills, sentences, receipts, contracts, policies, receipts, receipts,

bank statements, debt securities, etc.). Although information technology is producing an improving trend from this point of view, by providing new and more practical information to the media, paper documents are still predominant in the information processing processes. This situation favors human error which is therefore an important aspect to monitor for the quality control system. The solution that has been found consists in adopting an information system that is as homogeneous as possible among all the Administrations and Public Bodies, flexible enough, easy to use, quickly learnable. Information technology is therefore abundantly involved in the overall innovation path of the PA and indeed appears to be able to largely determine its success.

2.4 Wastes in public administrations

As previously mentioned, the waste hunt allows us to identify and eliminate activities that do not create value for the customer, and to focus attention on those activities that instead appear efficient and profitable. As far as the service delivery activities are concerned, to the waste identified by Ohno in the TPS, more were added, to better classify the activities involved:

1. Inefficiencies and errors, when the activities are not carried out properly the first time and need to be corrected;
2. Oversizing, for example, excessive production compared to market demands;
3. Pending work, not yet carried out: it happens when certain activities are being worked on or have yet to be delivered, due to delays in supplier deliveries, malfunctions of the necessary equipment (maintenance times), a slower process than the next, disorganization;
4. Transportation of goods and transfer of information: unnecessary movements of materials, products, documents, information and people;
5. Unnecessary work, which could be eliminated and simplified;
6. Moving people;
7. Processing of unnecessary information;
8. Expectations of people, internal staff or citizens;
9. Design of services that do not meet the needs of citizens, which go beyond market demand;
10. Not optimal use of people's potential, little attention to staff;
11. Lacking or excessive citizen involvement.

In general, all activities that "allow to fulfill the primary function for which the citizen turns to the institution" are considered to be value-creating activities for the citizen "(Negro G., Ozzello S., 2010), usually concerning controls on security or provided to facilitate and speed up certain operations; on the contrary, activities that slow down the delivery of the service, impose the repetition of processes already carried out, hinder the decision-making steps, use obsolete methods (for example on paper) for more efficient and faster operations if carried out in another way. Like the lean organization, after identifying the flow of value, it is necessary to reorganize the existing procedures, monitor the flow ensuring continuity by focusing on the service, and change the internal and external organization of the work, keeping faith with the logic of the just-in-time, which favors organizational flexibility. In public administrations, the continuous flow lies in the ability to put in place only what is necessary, nothing more and nothing less.

3. Lean Healthcare

3.1 The Origins of Lean Healthcare

The term lean healthcare identifies the application of the principles and tools of lean thinking to the healthcare sector, to achieve efficiency, reduce waste, and create value for the patient. Although in theory lean thinking applies to any area, it is necessary to underline how it assumes particular connotations when it is applied to the healthcare sector, which in terms of logic and purpose differs substantially from other contexts.

The date of the first application of Lean in Healthcare is uncertain. First use of the Lean principles in Healthcare dates back to the late 1980s, when some US hospitals such as the University of Michigan School of Medicine began experimenting in their sector of those principles that until then had only belonged to the manufacturing world. Steven Spear was the first to systematize, disseminate, and make known the advantages that this technique could bring to the American health system. In fact, in some of his publications, he showed how the number of deaths and infections generated by poor hospital management and detected at the Institute of Medicine at the Center for Disease Control and Prevention could be reduced. Following these publications, a series of applications of Lean Thinking was also implemented in other US hospitals such as Boston, Pittsburg, Appleton, Wisconsin, Salt Lake City, and Seattle. The push to embark on a path of Lean change in these organizations arose mainly from the need to cope with financial deficits, waiting list problems and general organizational malaise. The first applications of this technique in Europe are in England, since the late 90s, thanks also to the work of Dan Jones and the Lean Enterprise Academy. Hospitals such as Birminghan Heartlands Hospital, Boston Hospitals NHS Trust, Wirral Hospital NSH Trust and Caderdale and Huddersfield NSH Fundation Trust, applying these principles, have made significant improvements in their performance. In Italy, the first companies that moved with the inclusion of the Lean principles were the Ospedale Maggiore in Milan, the Humanitas Clinical Institute in Rozzano (Milan), the "Ospedali di Galliera" hospital in Genoa and the Healthcare company of Florence; and in 2012 an important Lean experience also began at the University Hospital of Siena. (Burroni L., Biancardi C., Guercini J., Bracci L., 2014).

3.2 The Health context

3.2.1 The characteristics of health services

Healthcare is a particular area in which the services provided also take on particular characteristics due in part to the object of exchange on the reference market and in part to the characteristics of the user who uses them. Health services have all the typical characteristics of services but here, compared to other areas, intangibility, perishable nature, contextuality of consumption and delivery and difficulty of standardization, are more accentuated. One of the reasons that make healthcare a particular context is the high level of information asymmetry, present at every stage of the patient's journey. Already starting from the phase of recognition of the symptoms that determine a type of need, the patient is in difficulty because he is not competent in the matter; whether or not to rely on the care of a doctor is already a first decision to make. Once the need to consult a professional has been defined, the patient is faced with the choice of the structure and type of service to rely on: he can choose between private or public structures, between different specializations, and between different doctors; subsequently, after having framed his state of health and any critical issues, he must make decisions relating to the treatments that are proposed to him. These choices, to be optimal, should be made considering the quality evaluated at each stage and rationally; often, however, these conditions do not occur: it is probable that the patient, being in conditions of physical weakness, will not be able to make decisions by rationally evaluating each alternative; moreover, even if he were in the psychological condition to do so, he would not be allowed by the partial information at his disposal. Although today's information tools are increasingly within everyone's reach (word of mouth but also reviews, comments, news on the web), the characteristic that there is an imbalance between patient and doctor is inherent in the complex nature of the medical practice. information about quality, which cannot be filled even by the experience of others. The information asymmetry involves a situation of doctor-patient dependence, known as the agency relationship, in which the decisions made are still based on partial and uncertain information. Furthermore, the information advantage held by the doctor exposes him to the possibility of opportunistic behaviors, which can only be avoided through the good governance of the information available to patients.

A second element characterizing the health sector is the presence of externalities, of a positive type if certain performances have a positive effect on the community (eg herd immunity created by vaccinations), or negative. Since they are not translated into monetary terms through the

price system, they are incentivized or not by public intervention, which plays a primary role in health care. Regarding the object of exchange, consisting of health services, it should be emphasized that they present a high degree of heterogeneity, deriving from the heterogeneity of the consumer and the inherent variability in the medical context. Starting from the assumption of Nuti and Panero that "there is no health service that can be effective if not tailored to the needs of the individual patient" (Nuti S., Panero C., 2011), in the formulation of the health offer it is necessary to keep remember that each individual differs from the others not only for the pathology that affects him and the course of the same, but also from individual needs not strictly dependent on it. Furthermore, although it is incorrect to say that clinical activity and the demand for healthcare services are completely unpredictable, it is true that the healthcare context is characterized by a high degree of variability, which can have a highly negative impact on the efficiency and timeliness of the healthcare offer. For these reasons, one of the elements that characterize the healthcare sector is the need to integrate the strategies for customizing the offer and standardizing the processes that make it up. Personalization allows you to build the health service on the specific needs of the individual patient, considering their individuality both in the purely clinical phase and in the one that involves organizational, bureaucratic, and structural aspects.

Standardization, on the other hand, makes it possible to align care pathways with scientific evidence and best practices, guaranteeing their appropriateness both on a clinical level (suitability of care and assistance) and on an organizational level (adequacy of the setting and use of resources); moreover, the adoption of standardized procedures allows to reduce the artificial variability (which contrasts with the natural one, linked to the unpredictability of the object of health services and therefore unavoidable). Standardization is, in fact, able to consistently limit the variability of patient flows, whose accesses can be divided into programmed and non-scheduled, and that relating to clinical-care behaviors, eliminating the dependence on skill levels or different approaches to treatment by professionals; if the standardization of the procedures is carried out correctly, the only type of variability that remains capable of influencing the organization of the healthcare path is the clinical one, depending on the pathology treated, its severity and related therapies and therefore coinciding with the natural variability. Acting on variability means responding to a management need of the healthcare company; however, the definition of standard procedures not only allows us to respond to the interests of the company, but also acts as a guarantee of quality for the patient

who needs a specific service, reducing the probability of error and defining the appropriate and ideal characteristics. Standardization involves the use of three types of indicators:

- *of structure*, which identifies the types and quantities of production factors necessary for a certain procedure;
- *process*, which defines the procedures for making decisions and the behaviors to be adopted in specific activities;
- *results*, which show the observable and measurable outcomes that contribute to the formulation of an opinion on the quality of a given performance or service.

Taking these elements into account, it is possible to plan the details of the path that the patient needs, which must be integrated with the personalization needs and with the decisions taken in compliance with medical autonomy.

From this brief contextualization, it emerges therefore that, despite the health sector is characterized by peculiarities that risk exposing it to criticalities and inefficiencies, the integration of the right strategies and the correct organization of the offer allows to mitigate them, contributing to the definition of high-quality health services. quality. This need to adopt a strategic vision, providing the consumer-patient with a qualitatively valid, efficient, and sustainable offer over time, is what has led to a progressive process of the corporatization of public health; this trend, which has developed strongly in recent years, has resulted in the application of some typical business management tools to companies in the healthcare sector as well.

3.2.2 The concept of efficiency in healthcare

The need to introduce the concept of efficiency in the health sector appears to be a fully shared idea, both within the governance of health organizations and in international literature. Nevertheless, the relationship between the economic concept of efficiency and health care is still not fully defined, or rather what should be the right interrelation relationship between the two spheres. From a business economic point of view, it would be simplistic to entrust the healthcare sector to a reorganization guided by purely economic principles, applying the same concepts as any industrial production sector. On the other hand, it is certainly not possible to lead the health sector without setting spending limits and without considering the economic aspect. It is clear that it is essential to mark the boundaries within which the concept of

efficiency must be inserted as an objective at the head of the interventions in health structures to improve their performance, assistance and economy.

The efficiency of healthcare processes is not sufficient if not strictly linked to the concept of effectiveness, which can be defined as the ability to achieve a predetermined goal or improve a result thanks to an intervention undertaken. Efficiency, on the other hand, indicates the effort made to achieve the goal, measured through the inputs used. The creation of value is obtained through the delicate synthesis of efficiency and effectiveness and a series of factors including:

- The company's ability to be market-oriented and consumer needs;
- The presence of efficient processes capable of creating the products/services required by the market with the minimum expenditure of resources;
- Dynamism, as the environment in which the company lives, develops and operates, is continuously in flux.

Although the medical profession is often reluctant to govern health facilities and pursue clinical innovations with regard to purely economic aspects, the current situation requires the necessary control of spending. Improving care is independent of budget control, as the condition of scarcity has become permanent. Resource demands for health services will always be greater than the resources available. It is necessary to distinguish which are the items of expenditure and therefore the objectives to be achieved, of lower priority from those extremely important, in order to allocate resources in the best possible way. The control of spending and the correct allocation of resources are not the only efficiency strategies in the management of the health system. The control of spending is an a posteriori maneuver, when the well-established management highlights the insufficiency of resources. Efficient management would involve preventive maneuvers, without restrictive limitations on activities, rather oriented towards a broader concept of economic, social and acceptable sustainability for citizens. Efficiency becomes preventive, shifting the focus from expense management to improving health. An in-depth study of this aspect of efficiency leads to the affirmation that the trend in demand for services is directly related to a series of factors which, in part, are outside the healthcare offer. The interventions to improve these factors would decrease the use of hospital services, in turn causing a decrease in public health expenditure and a simultaneous increase in efficiency.

3.2.3. Approaches to the implementation of Lean in healthcare

In the literature, approaches to the implementation of Lean in healthcare have been classified by (Radnor Z., Walley P., Stephens A., & Bucci G., 2006) into two macro-categories:

1) rapid improvement events (Rapid Improvement Events or Kaizen Events), ie the cases in which Lean is limited to being used as a mere operational tool reduced to some specific company areas[11];
2) long-term strategic approaches, which refer to cases in which Lean assumes dominant importance in corporate thinking, characterizing itself as a guiding logic in the decisions and actions that determine the creation of value in operations at every level of the company.

Rapid Improvement Events (ERM)/improvement islands are short-term events (typically one week), aimed at reducing waste and improving quality in some specific business areas. The ERMs are preceded by a short planning phase, during which groups of representatives of the various skills involved in a process come together to photograph the process and create a map of the ideal state, that is, of how the process could be organized for "perfect" functioning. In the event that the identified changes cannot be implemented immediately, the team leader takes charge of their implementation in the medium to long term (Jones, Mitchelle, 2006). This approach is applied both to primary processes and to support and technical-administrative processes. For example, the former include cases in which, through ERM, it has been possible to improve patient flows in emergency departments, obtaining a reduction in total travel time (Dikinson E., Anguelov Z., Vetterick D., 2010) of the expectancy (Ng D., Vail G, Thomas S., Leppa C., 2010) and the percentage of patients who leave the PS without being visited (Eller A., 2009); (Ng D., Vail G, Thomas S., Leppa C., 2010).

3.3 The concept of lean healthcare: from theory to practice

Healthcare represents a sector that absorbs a lot of public financial resources: a production system such as the one proposed by lean thinking proves to be more suitable than ever for optimizing these resources and at the same time solving the critical issues due to waste.

[11] "Islands approach for improvement"

3.3.1 Operation Management in healthcare

However, it is necessary to take a step back: first, we must understand how this is possible, and to do so we introduce the concept of operations management. Operations management is the corporate discipline that deals with efficiently managing the production plan, as well as organizing and controlling all the activities necessary to produce a good / service that meets the tastes and needs of customers (Waller D., 2003). This definition can very well be applied to the healthcare context, as the provision of a service is the core business of this specific category of companies. In Healthcare Trusts, operations management is responsible for organizing the logistical flows of goods[12] and people[13], as well as efficiently planning the entire intra and post-patient care phase: by appropriately exploiting operations management, you will be able to create a flow (as the lean approach requires) in which there is no room for any kind of waste (Villa S., Bensa G., Giusepi I., 2010).

Similarly to what happens in the manufacturing sector, the supply chain management aims to manage the flows of materials that flow into the care processes to guarantee their efficiency and timeliness; allows you to expand the boundaries of the company by entering relationships with the upstream chain (suppliers) and the downstream chain (customers or patients). The supply chain is necessary because it is not enough that the Healthcare Company alone is managed efficiently, but all those who interact upstream with it must be an integral and coordinated part of the processes. It is therefore due to supply chain management if operations management can broaden its range of activities and be effective at 360 degrees (Womack, Jones, Roos, 1998). Patient flow logistics, on the other hand, deals with managing patient flows within the healthcare facility and the various production areas that he crosses along his path of care, from first access to post-acute management. With OM, management, programming and control do not take place, therefore, only concerning the goods involved in the route, but also and above all, about the flow of people. Patient flow logistic is aimed at optimizing the patient's path to acting on those aspects, such as the expectations and availability of tools and personnel which, if not optimally organized, have negative feedback on the quality perceived by the patient (Villa S., Bensa G., Giusepi I., 2010).

[12] goods logistics, *supply chain management*
[13] patient logistics, *patient flow logistics*

Although it may seem irrelevant, a first aspect to be taken into consideration in organizing the patient's journey is the physical distribution of the spaces within which he will have to move; if some architectural constraints are impossible to modify, it is instead possible to act on the layout and arrangement of environments, materials, and tools, optimizing their organization based on the function, not only adopting the patient perspective who will have to use them, but also the staff who will have to use them. The change in the patient's physical path, in fact, also affects the organization of the production units, falling within that type of intervention that is defined as macro-organizational; less revolutionary are the interventions of a micro-organizational nature, which act on the organization of the individual phase of the patient's journey (such as acceptance, discharge, waiting for the service, etc.).

A fundamental aspect to be taken into consideration in patient logistics is the production capacity, which must be programmed to align supply and demand over a given period. It is not uncommon that the demand for services by the community is not met in suitable times and that therefore, dysfunctions and inefficiencies are created that affect the citizen; this may be due to an undersizing of the offer compared to the demand, therefore being of structural origin, or to a lack of planning and the high variability in access to services. Programming and standardization, today, are increasingly adaptable approaches also thanks to technological innovations and information systems that allow the collection, integration, and sharing of information relating to patients promptly and that simplify the management of processes and flows of goods and people. The use of technologies and optimization in the organization of spaces constitute a connecting element between patient flow management and supply chain management. Just as information systems play an important role in the recovery of performance in the logistics of goods, where they contribute to the reduction of errors and stock levels, to the optimization of the workloads of nursing and pharmacy staff, and savings in management costs. , also the efficient organization of the lay-out of warehouses, corridors, and hospitalization areas allows an efficiency gain in the management of goods. However, to achieve the complete improvement of the logistics of goods it is necessary to act on two further fronts: the organizational model and the operational service model. The organizational model refers to the level of centralization and the degree of outsourcing of logistics functions. A centralized system provides that there is a service center that takes care of the logistics for all production areas, while decentralization requires each area to manage its goods independently. In practice, the system does not necessarily have to be so clearly defined, but on the contrary hybrid models are frequent that allow the integration of the advantages of centralization

(economies of scale, space, and specialization, greater standardization and control, easier management of stocks, reduction of the workload for nurses and pharmacists, reduction of the number of steps and errors) and those of decentralization (creation of a point of care, reduction of physical movement of goods, greater involvement of professionals).

The further aspect on which to intervene concerns the operational choices that characterize the service, such as, for example, the frequency of deliveries and the number of references to be kept in the department, the traceability and control of goods, the methods of checking stocks and reorganization, etc.; all these aspects, if carefully evaluated, allow to avoid a huge waste of time and resources. Obviously, the prerequisite for the proper functioning of the OM is the quality of the clinical assistance offer, which must be based on scientific evidence, appropriateness and cutting-edge care, combined with the skills of professionals who can respond to the multiple needs of the patient. The analysis of how the operation management aims to plan, manage and control the activities in the health sector, makes it clear how, even in this context, the flows are managed by applying industrial logic and the company by adopting the strategic vision and the typical systems of business management. In line with these trends, OM leads the healthcare company to develop collaborations with extra-corporate subjects, which allow it to obtain competitive advantages and economies of scale, to enhance roles and offices with specific skills, which allow healthcare professionals to recover the time previously dedicated to logistics to perform the care function, and to apply principles and tools that guarantee efficiency and productivity recoveries, such as those typical of lean thinking.

3.3.2 Care-intensive model

The health sector is subject to continuous evolution, as it is strongly influenced by the social, demographic, and epidemiological dynamics of the context to which it refers. The numerous and changing trends that persist in the health sector require a rethinking of the structures and organizational models that coexist within it, in order to respond to an ever-increasing complexity of management and organization and to the need to provide an ever wider range of care. and differentiated. The first step is to rethink the entire hospital system: it should no longer be seen as many separate departments but as a set of processes linked together. Process reasoning requires a new vision of the company: in this regard, a new organizational methodology called the care-intensity model, also known as healthcare redesign or Business

Process Reengineering (Bianciardi C. et al., 2014) has been devised. The care-intensive model was born under the concept "... that the hospital must be seen as a resource to be used appropriately, conceived and organized in relation to the needs of the patient, with his need for diagnosis and treatment and his needs of assistance " (Baragatti L. et al., 2009).

The goal of the care-intensive model is to revolutionize clinical-care models in order to improve the quality of services provided to the patient; in particular, the model focuses precisely on the patient who represents the center around which the specialists move, in such a way as to favor the coordination of different skills. A first objective of the care-intensive model is therefore that of satisfying the needs of care in an optimal way, which, however, does not coincide with the need for care; the terms assistance and care, in fact, are not synonymous, but identify different needs whose levels can go hand in hand, as well as increase or decrease in an indirectly proportional way.

To define the optimal setting it is, therefore, necessary to frame the patient's needs for both care and assistance, which the model in question classifies into three levels:

- *high intensity*, i.e. intensive and sub-intensive therapy; patients are characterized by high clinical instability, require variable hospital stays and high use of resources; for these reasons, access to this level takes place on the basis of pre-established criteria and only for the time actually necessary;
- *medium intensity*, coinciding with hospitalizations for functional areas and therefore including ordinary hospitalization, week surgery or one-day surgery; it involves the majority of patients who do not have particular medical and nursing complexity, whose hospital stay is not well defined in duration but can be easily planned;
- *low intensity*, for low care patients and in post-acute therapy; patients are not complex and require a low level of care that can be managed with short hospitalizations or on an outpatient basis, ensuring any continuity with the local area.

The attribution of the level of care takes place following an assessment of clinical instability and care complexity by a medical and nursing team. Furthermore, assistance by the intensity of care requires the patient to be welcomed in areas that meet his clinical care needs and be treated with a multidisciplinary approach, which provides for integration between different medical disciplines and beyond. The creation of interdisciplinary teams constitutes, in fact, a pillar of the new approach to a healthcare organization, since it allows a change in the culture of the

system in which the phases of assistance and care are strictly interdependent and integrated, both functional and necessary for taking charge of the patient, which contributes to the achievement of his well-being. This change also affects the introduction of new roles and new perspectives for traditional roles. This is the case of the role of the case manager or of medical and nursing tutors.

3.3.3 The concept of value and waste

Since the ultimate purpose of lean thinking is the creation of value for the customer, the starting point for analyzing a specific specification in the health sector is to understand how the concept of value is defined in the same context. The commonly accepted definition is that formulated by Michael Porter (1985), according to which the value of a given care path or a health service emerges from the relationship between its outcome for the patient and the resources invested to obtain them, which include management costs, capital, personnel, etc. The outcome, which can be positive or negative for the patient, can include several factors: some interpretations believe that the evaluation of the outcome derives from purely clinical parameters, such as the efficacy and safety of the treatments to which the patient has been subjected, the reduction of complications, the improvement of the course of the disease and the quality of life, the reduction of symptoms, etc., while a more extensive interpretation also takes into account aspects related to the experience lived by the patient during his journey, such as 'organizational efficiency, waiting times, perception regarding the treatment received, etc. This last view, which considers value not coinciding exclusively with the clinical result but also with the individual evaluation of the patient, embraces a second definition of the concept of value, formulated by Sir Muir Gray, according to which it is divided into three dimensions: allocative, technical and individual.

The *allocative dimension* of value in health considers the allocation of resources and the impact they have on the health of the population; in a context of limited resources, understanding how resources are distributed can highlight any disparities or waste and contribute to the efficient reallocation of them in different programs or paths. The *technical dimension*, or efficiency, measures the return in terms of health from resources invested in health, taking up the definition of value originally formulated by Porter; this dimension distinguishes performance in low or high value activities: the former require a huge use of resources which does not translate,

however, into an improvement in patient outcomes, therefore health care should recognize them and reallocate resources in high value activities . The *individual dimension*, on the other hand, supports the interpretation of the meaning of outcome that takes into account the personal dimension of the individual, therefore the preferences, values and individual expectations of the patient, to ensure that his path is built by putting them at the center. The individual dimension of value, in fact, constitutes the fundamental prerequisite for the personalization of the service rendered to the patient, in which every decision about his life is shared taking into account not only the clinical evidence and his health conditions, but also his needs and expectations.

Understanding what are the key factors in creating value for the patient leads to an understanding of the meaning of value-based medicine and makes it clear that introducing the notion of value also in medicine, while drawing inspiration from the manufacturing sector and for objectives and methods appears completely different from health care, it is not synonymous with economic quantification of performance, but on the contrary it means focusing attention on the patient, placing at the center of the offer not only his health but also his individual needs, which form the basis for to start with for the clarification of value-based activities and for the correct allocation of resources. The maximization of value, in fact, is not only synonymous with improvement in the eyes of the patient, but is a common goal for all stakeholders in the health system: if from the patient's point of view it translates into positive health outcomes and experiences, for professionals, companies, politics and taxpayers, it translates into an efficiency gain. Value and efficiency are two sides of the same coin: to obtain the first, it is necessary to act on the second and to do so, not only theoretical notions are needed, but also the appropriate operational tools, which can be those of lean thinking.

The American expert Don Berwick, in a recent essay (2012), has classified the waste affecting American healthcare into six categories: failures of care delivery, failures of care coordination, overtreatment, administrative complexity, pricing failures, fraud and abuse. If it is possible to act on waste without negatively impacting the patient's health outcomes, a reduction in costs related to health practice could easily translate into a cut in the resources available for public health and, consequently, for the patient. In fact, it is always necessary to keep in mind that, if in the manufacturing company the goal is profit, to be increased also through the reduction of costs, in the healthcare company the aim is to safeguard the patient's well-being, to be pursued regardless of the necessary costs. upon its achievement. Nonetheless, to be able to meet the

demand for healthcare with services that match the patient's needs, the healthcare company must offer high quality services by trying to use only the resources they need and reallocating those in a useful way. "Wasted". Optimizing the management and flows of patients, doctors, nurses, materials, etc., in line with the intent of operation management, can contribute to the construction of procedures standardized as far as possible that allow, on the one hand, to meet the needs of the users, and on the other, to stabilize the consumption of resources.

3.3.4 The advantages and functioning of the Lean system in Healthcare

What has been illustrated so far constitutes the prerequisite for the application of lean thinking in healthcare; although it is not the only approach that can be adopted to improve the quality of services offered to the patient, empirical evidence indeed demonstrates its effectiveness in various hospital settings. Lean healthcare allows you to act on five dimensions that are critical areas for most healthcare facilities:

1. the management of waiting times;
2. cost rationalization;
3. the distribution of beds;
4. the management of clinical risk;
5. the appropriateness of care.

To introduce the lean model and expand it in the healthcare sector, it is necessary first of all to train and educate management groups about what is meant by the lean system, and then develop the model within hospitals by supporting training on all staff. As can be understood, the design of an action plan, managed by an adequately trained task force, could introduce lean principles and intervene directly on the most common problems, reducing their impact. In any case, the reorganization of the processes will have no positive effect if at the same time the staff attitude is not adapted to daily tasks, through the common adoption of the lean culture.

Several recurring reasons emerge that usually push the health departments of the structures to redesign their activities by adopting this methodology and which, with different declinations, fall within the areas mentioned above; between these:

- growth in the demand for health services to be satisfied;
- need to meet high clinical-care standards of services;

- pursuit of the economic sustainability of the system, paying attention to the issues of patient flow management, logistics and process optimization;
- seeking the balance between flexibility and standardization, to achieve greater competitiveness;
- pursuit of higher quality at lower cost;
- reduction of the variability of demand, which harms the working climate, on the efficiency and appropriateness of care;
- maximization of utility for the patient, which can be pursued by providing him with the appropriate service in adequate times.

Responding to these needs, lean thinking in the healthcare context aims to bring benefits in three distinct areas:

- in *the medical-clinical area*, consisting of improving the methods and timing of the provision of services, therefore the quality and appropriateness of care and assistance;
- in *the social area*, consisting in the reduction of the discomfort of patients, family members and caregivers, thanks to the reduction of waiting times and stay in the health facility;
- in *the economic area*, consisting in the reduction of costs with the same service provided.

Lean techniques allow, if applied correctly in the healthcare sector, to create an organizational system based on widespread accountability and a clarity of the role of each individual operator within the activity and of each service rendered, to increase the value of offer and reduce waste (worthless activities). It is a new way, therefore, of managing processes in a lean way, characterized by a reduction in time, money, space, effort and defects, to the advantage of greater efficiency and quality of the services offered.

3.3.5 Critical Success Factors of Lean Implementation

For a long time, the Lean implementation process was difficult, costly and time-consuming. Many articles have identified the problems that can arise during the process and how to make it successful. There are many factors that have a positive effect on the implementation process such as management leadership and commitment, skills and competences, employee

engagement, financial capabilities, and culture of the receiving organization (Achanga et al., 2006).

First of all, Leadership, commitment and management support are important factors in the Lean implementation process. Management has the ability to influence, reorganize and encourage employees to provide quality work (Delgado et al., 2010). The skills and expertise of employees and the management team are also relevant; the importance of this factor lies in the difference that the most skilled employees make to the process flow. With skills, workers innovate and add differentiated advantages to the process. Furthermore, no skill or low skill level of workers is a threat to the process (Achanga et al., 2006). In addition, Employee Engagement and Recognition are also two important factors in the lean implementation process. Improving the level of communication between employees, involving them in the process and empowering them with keywords and recognition are different ways to improve the working environment in any organization (Delgado et al. 2010). Financial capacity is a crucial factor that controls the success of any project. Funding is important to cover expenses such as material resources, human resources, technical services, employee consulting and training (Achanga et al., 2006). Finally, the culture of the organization is an important platform for the implementation process. Achanga et al. (2006) discussed the importance of having and specifying culture in an organization, whether it is a sustainable continuous improvement or a high level of communication, organizations must choose one and commit to it. To have successful lean implementation experience in any organization, a high level of communication within the staff is a favorable cultural model.

3.3.6 Lean Implementation Challenges

The fundamental principle of the lean concept, as analyzed so far, is to reduce waste. Lean thinking has evolved from a tool designed to improve operational performance in manufacturing to a management approach with both operational and sociotechnical aspects. However, there are some challenges that any business faces when implementing Lean strategies in their systems, some of them such as physical layout, process flow, and employee collaboration.

First, the Lean implementation can face a challenge in the layout of the organization: the layout of the workplace is an important and challenging part, changing the physical layout is

expensive, time-consuming and requires more workers (Dennis P., 2002). Soriano-Meier et al. 2011 discussed the role of physical layout in hospitals in the lean implementation process and introduced some layout ideas for hospitals. Firstly, the reduction of the walking distance that employees travel, this means positioning the staff station close to the care unit where the patients are located, so as to allow doctors and nurses to not waste time walking long distances. And according to the creation of separate paths for patients, staff and the movement of materials by changing the layout of the hospital making it more practical and functional. These changes are actually a huge challenge for any organization, almost impossible to implement once the construction of the hospital is finished, as redesigning a building is very demanding both in terms of time and cost. That is why the physical layout should be designed right before the actual building of the hospital (Soriano-Meier et al. 2011).

Another challenge that organizations may face during the lean implementation phase is the standardization of the process. Sarkar (2009) defined service processes by its characteristics, such as:

- The process is not visible: observation is enough to identify wastes in the manufacturing organization due to their visibility. However, in-service organizations the customer judges the execution of the activities
- The process is broad and complex: improvements are always seen in end-to-end processes. Service organizations are large and complex, so it is difficult to see and control improvement along the way
- The process depends on the technology: technology is an important utility for companies. Communication would be the first and most important feature that the company obtains when using advanced technology. The challenge here is when the system malfunctions, it negatively impacts the entire implementation process.
- The process cuts through vendors: vendors are suppliers or customers in the company's supply chain. Implementing lean requires including these vendors in the system and to see the supply chain as a whole. The communication level must be high between these vendors. This is the challenge for many organizations lack of the willingness to share information with other companies is difficult to overcome.

The last and third challenge for the lean implementation process may be employee engagement. Sarkar (2009) also discussed the fact that the implementation of Lean depends on people, in fact, the involvement of employees is an important and stimulating tool. Engaging, empowering

and persuading employees to change their thinking about customer value and identifying waste is a challenge for any organization.

3.3.7 Criticism of the lean concept

“Lean can improve safety and quality, improve staff morale and reduce costs, all at the same time” (Jones D., Mitchell A., 2006). Such an overly positive conclusion does not take into account the variety of issues surrounding the application of lean thinking in healthcare. Due to the difficulties that arise when implementing lean thinking, some issues and criticisms emerge. At the operational level, there are several standard organization tools such as 5S and value stream mapping, the application of these tools seems reasonably simple. Their use in hospitals has reduced waste, waiting times, and in some, these process improvements have contributed to improved quality and increased productivity. But the application of lean thinking may initially focus on improving a single process, and a well-known consequence is that problems shift to adjacent processes.

Another aspect of criticism concerns the ways of dealing with variability: this concept was developed in the automotive industry with a stable level of demand. Lean's ability to manage variability was questioned; develop and improve the organization's existing resources, manage variability, and create more volume to meet customer needs. However, demand variability is an obstacle to implement lean thinking, these sectors have chosen to implement agile thinking for the different solutions offered to control and cope with the variability of customer demand (Hines et al. 2004). Operationally, improvements are achieved primarily by reducing unwanted variations in processes. Variation is the degree of difference in the same process when it is repeated. Some variation is needed: surgical procedures are never done exactly twice; psychologists never have exactly the same consultation with a patient twice. This is called natural variability. Natural variability is needed to effectively address individual differences between patients and their needs and to provide patient-centered care. Artificial variability, on the other hand, is related to controllable factors in the design and management of health systems (Berwick D., 1999). The lack of discussion of strategic thinking is another point considered critical to the concept of lean. Isolated strategic goal thinking can cause a gap that leads to unsuccessful change for many organizations (Hines et al. 2004).

A final point that has raised a lot of criticism for the concept of slenderness concerns the human aspect. Lean interventions have the potential to make jobs simpler and repetitive or turn them into jobs that require more thinking, planning, and accountability; and these changes affect those who carry out the processes. The criticisms have centered on the question of how a technical system that explicitly promotes standardized repetitive work can still be attractive and motivating for workers. It is commonly believed that even though lean organizations have some practices that seek to promote worker well-being (e.g. comprehensive training, internal promotion, and pay for performance), 'respect' for humans is just a pleasant by-product alongside higher productivity and quality (Pil F., Fujimoto T., 2007). Standardization, for example, makes jobs easier and repetitive. These jobs may no longer be challenging for highly skilled doctors. At the same time, this reduced complexity could make it possible for less qualified professionals to perform these jobs, thus allowing doctors to care for more complicated patients. This simple example shows that, without taking into account these dynamics and also redesigning responsibilities, lean interventions will actually have negative effects on the characteristics of work. According to the concept, employees would experience a lot of pressure, especially those working on the production line. The concept has been described as a dehumanizing concept. Many articles have discussed Lean as an important factor for long-term sustainability in any organization, but some have also argued that the concept should consider human resources as another dimension and not use a holistic view of the organization as a whole. of mechanical, hard and technical tools (Hines et al. 2004). Hence, organizations must evaluate before embarking on such a journey, or worse, superficially implement lean thinking, adding existing resistance and making it more difficult to improve long-term health care.

4. The Finnish case HUS

4.1 Finnish health context

The aim of Finnish health policy is to extend the active and healthy life of citizens, improve the quality of life, and decrease health differences between population groups. Finland is divided into about 450 municipalities, and each municipality is responsible for organizing health care for its inhabitants. However, although municipalities play an active role in planning and organizing health services, the powers of the state in matters of health care policy are strong. The Finnish health system depends mainly on public funding. Although until the end of the 1980s the public system was predominant and the private presence was almost non-existent, in a more recent period, health policy in Finland has begun to change direction. Major health reforms began to be enacted with various different types of regulated market models gradually acquiring political support. Finland has been successful in centralized health planning, but the big picture now reflects the same underlying economic pressures underlying health policy reforms as other Northern European public health regimes.

The Finnish hospital network was developed mainly in the '50s and '60s, originally managed by the state, it was then transferred to the municipalities. The municipalities were grouped into about 100 municipal federations, with the task of managing general and psychiatric hospitals. In 1991 the municipalities were grouped into 21 hospital districts, each of which manages one or more hospitals, and provides specialist advice and assistance to its population. (Hihnala S., 2017). In Finland, there are 5 university hospitals, which provide advanced medical care, including specialized surgery and treatment for rare diseases. University hospitals are also primarily responsible for the clinical training of medical students and medical research. Therefore, assuming a typical region, with about 1 million inhabitants, this has a university hospital, about 5 central (regional) hospitals, 5 areas (district) hospitals, and 40 health centers (often with some beds).

In Finland, to obtain hospital treatment, the patient must have a request from a general practitioner of a health center, although a significant number of hospitalization requests now come from the private sector. There has also recently been a proliferation of small private surgical clinics, generally founded by specialists and located in major cities. Public hospitals also maintain a small number of paid beds. Compared to other countries, Finland still has a

rather high number of beds. Although the trend was to reduce the number of beds, thanks to the classification of care: milder cases are treated directly in the clinic and in health centers and short-term postoperative treatment.

As for private healthcare, in Finland private medical care is provided by municipalities and the state, especially in cities, many doctors, dentists, and physiotherapists offer private care. There are also small private hospitals, but the percentage of Finnish doctors who earn their living exclusively as a private practitioner is very low. However, around a third of doctors, in addition to working in hospitals, run private practices. In Finland, health services are available to everyone regardless of their economic situation, as public health services are mainly financed by tax revenues, partly municipal and partly state. The central government's contribution to municipal health care is determined by population numbers, age structures and morbidity statistics, and a number of other factors also influence its calculation. The primary health care law of 1972 created public health centers and assigned municipalities the responsibility for primary health care. This law promoted an extensive network of municipal health centers across the country and the health insurance law continued to provide financial assistance for the use of private services. Private doctors have multiplied in recent years and cover about 20% of total primary care. In addition to this network of health centers, employers are obliged to organize preventive services for their workers. The employer is compensated (by the social insurance institution) for the costs of assistance for occupational diseases and other health care provided by the company itself.

Recent reforms have sought to improve the continuity of care for patient and staff satisfaction, and to increase the productivity of health centers. The concept of continuous specific assistance to a patient (family doctor system) has also been accepted as part of the national plan to improve primary health care. Since 1993, municipalities have been allowed to charge for certain services at certain public health centers. Lean management is a potential way to develop management practices and strategies in the healthcare environment in Finland. However, more research is needed to find out how the lean management model manifests itself in Finland and how the model develops for this particular national context.

4.2 History of HUS

The HUS consortium was founded by the municipalities of Uusimaa on January 1, 2000. The hospital district established had a usual experience, because it included, on the one hand, the legacy of a university hospital since the 1830s, and on the other hand, the care of patients both in 19th-century urban hospitals and in several rural hospitals. The HUS Hospital District, the largest in Finland, was created on the basis of the 1991 Special Nursing Act, and combines the Uusimaa Hospital District, the Helsinki Hospital District, and the Helsinki University Central Hospital (HUCH).

The central administration of the hospital district was merged with that of the administration of the new group, and the hospitals of the old district of Uusimaa moved into the new organization. Some functions of the abolished hospital district of Helsinki have been transferred to the city's primary health care, such as most psychiatric activities and many other operations. Midwifery College, Hesperia and Maria hospitals have been relocated from hospital complexes to HUS. The HUS district has inherited from history a total of 21 hospitals, as well as other operations in two hospitals in Helsinki and numerous smaller units serving local residents. Most of the hospital buildings were built in the 1960s and renovations and construction of new hospitals are still ongoing; instead, the oldest of the hospital buildings, treated the sick until the end of the 19th century.

From the outset, the HUS was administratively divided into the domain areas of the central hospital of the University of the Helsinki region, which were the hospital areas of Hyvinkää, Lohja, Länsi-Uusimaa, and Porvoo. Initially, the university hospital included HUS hospitals in the Helsinki area, but since the beginning of 2001, the Jorvi and Peijas hospitals have also been integrated into the university hospital. Until the end of 2005, the hospital areas had their own councils, and the HUS council served as the HUCH council; but starting from January 1, 2006, the HUCH hospital area and its board of directors and management were set up on the model of the other hospital areas. The HUCH hospital area was made up of four separate profit areas: Hyksin Helsinki Hospitals, Jorvi Hospital, Peijas Hospital, and a service center providing support services; on May 1, 2006, the new hospital area began its practical operations. This solution provided the tools to improve the development of integrated specialist care in the Helsinki metropolitan area and enabled a chain of organizational changes to be initiated to eliminate duplication of effort by centralizing and strengthening skills.

Support services for medical care were organized in municipal enterprises owned by the consortium of municipalities, furthermore, the organization of support services was centralized and the operational area of each enterprise was expanded in stages to cover the entire HUS. The first to be organized as corporate establishments in 2004 were HUS-Röntgen (HUS-Imaging since 2012), the company HUSLAB and Ravioli, which provides catering services. In 2008, other support services such as the one that produces procurement, logistics, and ambulance services (HUS-Logisiikka), the pharmaceutical supply manager (HUS-Apteekki), and the one that provides plant and equipment maintenance services (HUS- Desiko) were organized incorporate factories. Following in 2009, the provider of documents, transactions, personnel, and financial services (HUS-Servis), the provider of information technology services (HUS-Tietotekniikka), and finally the provider of medical services (HUS-Lääkintatekniikka), they also operate as commercial enterprises. In 2012, HUS-Medical Technology merged into HUS-Imaging. Instead, they have become part of the administration of the HUS-Tietotekniikka group, and also HUS-Tilakeskus which manages the customer's role in the construction. Initially, each company had its own board of directors, in 2012 it was decided to reduce the number of boards to two. For this reason, in 2013, the two corporate boards of directors are: the Board of Medical Support Services, which is the decision-making body of HUS-Pharmacy, HUS-Imaging and HUSLAB, and that of non-medical commercial enterprises providing support, such as HUS-Desiko, HUS-Logistiikka, HUS-Servis and Ravioli, which have a joint board of directors.

4.3 Values and Strategy of HUS

“Every day, for every patient, ever better care” this is the promise that HUS makes to each of its patients and customers. This promise is made concrete with the services and operations that are carried out; it is not enough to maintain a good level of services, but to be the best you have to evolve day by day. HUS, together with the Faculty of Medicine of the University of Helsinki, is Finland's largest specialist health worker, is by far the largest scientific player in the field of health care. This position gives them the opportunity and also the obligation to solve health care challenges and act as leaders, they want all Uusimaa residents to be proud of the work they do. Their vision is to lead the way in health care.

The values of HUS are equality, encounter, and pioneer. First of all, through equality, the HUS wants to ensure equal access to care for all patients, who they receive according to their medical needs. Furthermore, employees, staff, and interested parties are also treated equally, and they also guarantee parity of services at a regional and linguistic level. The meeting is another fundamental aspect for the operations carried out by the HUS, in fact at the center of health and medical care, there is the meeting and the genuine presence of the patient and client. The overall quality of the service, in addition to the clinical aspect, lies in the encounter and interaction; a good meeting is grateful, individual, and respectful. Finally, as the leading health care provider and research organization in Finland, HUS has the opportunity and even the obligation to be a pioneer. The large hospital district can in fact guarantee high quality and effective care only through continuous research and development. HUS's vision is therefore to be a world-class hospital that produces new knowledge to provide its patients with timely, safe, high quality, and customer-oriented care and exams. HUS is competitive in the production of services, and wants to provide prompt treatment. Through continuous and streamlined cooperation between specialist medical care and primary health care, it seeks to achieve further improvement in its treatments.

The strategic objectives of HUS are multiple and on different fronts, but whatever the perspective, the attention is always focused on the patient, with the aim of providing the best and most efficient care possible with the support and guidance of their professionals. Over the years, the strategic objectives of the HUS have slightly changed, expanded, and modeled, but it is possible to summarize them with the following five:

1. Better timely and patient-oriented care
2. Best research and high-quality teaching
3. Responsibility towards the common good
4. Effective, efficient, and competitive operations.
5. Customer-oriented digital change

The strategic objectives also include the quality of services and patient safety. The assistance provided to patients must be of a high level both in terms of availability and content, precisely because patients are their main responsibility. However, it is difficult to reduce the strategic objectives to just five points, for example, in 2014 the objectives also included the application of uniform procedures across the board to HUS; in 2016 they were extended and the waiting times of patients for examination and treatment were expected to be reduced year after year.

In the spring of 2019, the HUS district began planning the new strategy for the years 2020-2024, and initially, the committee and the executive group discussed and defined the main policy lines to be adopted and put into practice. The strategy they used was to use inclusive methods, meaning employees actively participated in the development of the strategy, together with internal and external stakeholders. The findings impacted HUS operations and the analyzes resulted in a shortlist of targets identified as important to them. In the months of June and August, a survey was released among the staff, and the strategic survey was also expanded by involving other units and stakeholders of HUS, and through social media also to the general public.

The new strategy adopted therefore included, in addition to the three values, the five objectives, the vision and the promise of HUS already mentioned above, also other key and relevant aspects for the district. Are the following:

- HUS is the most desirable place for treatment
- HUS is an innovative and competitive operator in the chain of social and health care services
- HUS is a professionally managed workplace for the best in the industry.

The achievement of the objectives was monitored by the HUS, in particular those of 2019, and are contained in the following table which indicates the details of the objectives, the indicators, and their achievement.

1. Key goal: HUS is the most desirable place for treatment

Goal	*Metric(s)*	*Target value 2018 and 2019*	*Actual 2019*	*Goal attained?*
1. Patient care is correctly timed and effective	1a. % of patients waiting for treatment for fewer than 31 days out of all patients waiting for treatment, end of month (elective activities)	2018: – 2019: at least 80%	44.9%	No
	01b.1. Patient lead times in emergency services, general practice	2018: 95% of discharged patients stay less than 4 h at the emergency clinic 2019: 90% of general practice patients stay less than 4 h at the emergency clinic	86.3%	No

	01b.1. Patient lead times in emergency services, other specialties	2018: 95% of other patients stay less than 8 h 2019: 95% of patients in other specialties stay less than 8 h	84.3%	No
2. Patients recommend HUS as a place for treatment	02. FFT (customer feedback, recommendation of place for treatment)	2018: 97+% of patients recommend HUS as a place for treatment 2019: 97+% of patients recommend HUS as a place for treatment	82.3%	No
3. Activities are of a high quality and safe	03a. 30-day mortality (from the end of hospitalization)	2018: Decreased on previous year 2019: Decreased on previous year	1.4%	No
	03b. Incidence rate of pressure ulcers in treated patients	2018: Incidence rate of pressure ulcers (grade ≥2) less than 1.9% of patients treated 2019: Incidence rate of pressure ulcers (grade ≥2) less than 1.9% of patients treated	0.3%	Yes
	03c Number of falls resulting in injuries per 1000 patient days	2018: Number of falls and falls from heights resulting in injuries per 1000 patient days is less than 0.8 2019: Number of falls and falls from heights resulting in injuries per 1000 patient days is less than 0.8	0,02%	Yes

2. Key goal: HUS is an innovative and competitive operator in the social welfare and health care service chain

Goal	*Metric(s)*	*Target value 2018 and 2019*	*Actual 2019*	*Goal attained?*
4. Activities are efficient	04a.1 Productivity of somatic care, cost per DRG point	2018: Improvement of 2% in productivity at the Joint Authority level on 2017 to 2019: 4a. Improvement of 1.5% in productivity at the Joint Authority level on 2018 (before the non-recurring costs and productivity impact of the introduction of Apotti)	1.2%*	No
	04a.2 Productivity of psychiatric care, EUR per treated patient	2018: Improvement of 2% in productivity at the Joint Authority level on 2017 to 2019: 4a. Improvement of 1.5% in productivity at the Joint Authority level on 2018 (before the non-recurring costs and productivity impact of the introduction of Apotti)	-2.6%*	Yes
	04b Share of outpatient care of overall service production (specialist medical care)	2019: 4b. Share of outpatient care increases by 1 percentage point on 2018	87.6%	No
	05a Total number of new research permits granted	2019: 5% more than in 2018	728	Yes

5. HUS is an active and influential research community.	05b Total number of EU project applications	2019: 5% more than in 2018	15	Yes
6. increased cooperation between specialist medical care and primary health care	06 Realization of projects related to cooperation between specialist medical care and primary health care	2019: Planned municipal cooperation projects are implemented	83.0%	No

*) Values of 04a indicators deflated using the cost index of public expenditure for each month.

3. Key goal: HUS is a professionally managed workplace for the best experts in the field				
Goal	***Metric(s)***	***Target value 2018 and 2019***	***Actual 2019***	***Goal attained?***
7. Personnel are committed to their work	07a Total exit turnover of permanent personnel	2018: 2019: 5.5%–6.5%	8.3%	No
	07b Exit turnover of permanent personnel (excluding retirements, etc.)	2018: 2019: 5.5%–6.5%	5.5%	Yes
8. Personnel recommends HUS as an employer	08 Employee Net Promoter Score (%) HUS as a whole	2018: 85+% recommend 2019: 85+% recommend	70.0%	No

The strategy therefore aims to provide a roadmap for the day after tomorrow, although the challenges are innumerable, HUS must prepare for continuous and responsible growth in the coming years.

4.4 Economic and Financial aspect in HUS

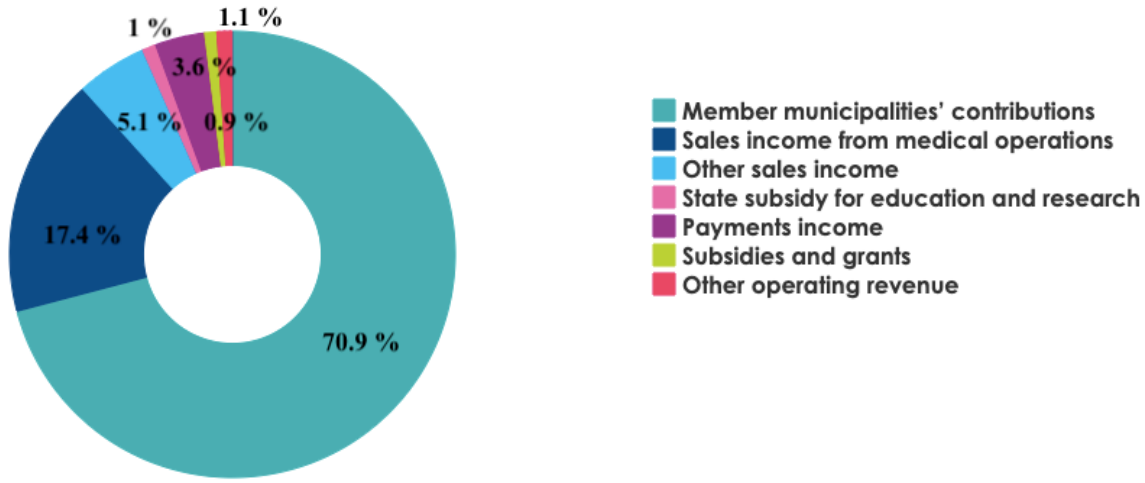
“Despite the financial challenges, we need to prepare for growth in the coming years. This growth must be responsible, however. In addition to environmental and social responsibility and good governance, we must especially consider economic responsibility. As local government finances are in a state of poverty they are in, we need to be particularly careful and innovative in the way we use taxpayers' money” says Juha Tuominen, CEO of HUS. Every organization must provide for its basic function in the best possible way, the basic function of a hospital is to take care of patients precisely because they are the customers of the hospital. In public sector health care, most of the costs of care are paid on behalf of the patient by a local authority, insurance company, or other institution, which are therefore also in some sense the

hospital's customers. A customer-oriented organization will respond to customer needs in the best possible way and for this reason, the organizational structure must be reviewed regularly. The reorganization and introduction of the lean method, favor flexibility and allow to better respond to the care needs of patients, and in particular, the financial management must support the operations. In fact, the hierarchy of accounting units and accounts has been revised precisely to adapt to reorganized operations and finances. The new accounting structure allows for better monitoring of changes in the use of services, and the department heads believe that this reorganization will increase the ability to sing. The Director of HUH Psychiatry, Matti Holi, and the Director of HUH Children and Adolescents, Jari Petäjä, say that cost efficiency is an advantage of the reorganization. “We continue to keep a tight rein on costs and to manage our finances. I believe that the rearranged nursing management and the redistributed areas of responsibility for head nurses will further improve our financial management,” says Petäjä. “Patient group specific processes and tighter treatment chains will result in more effective and more cost efficient treatments,” says Holi.

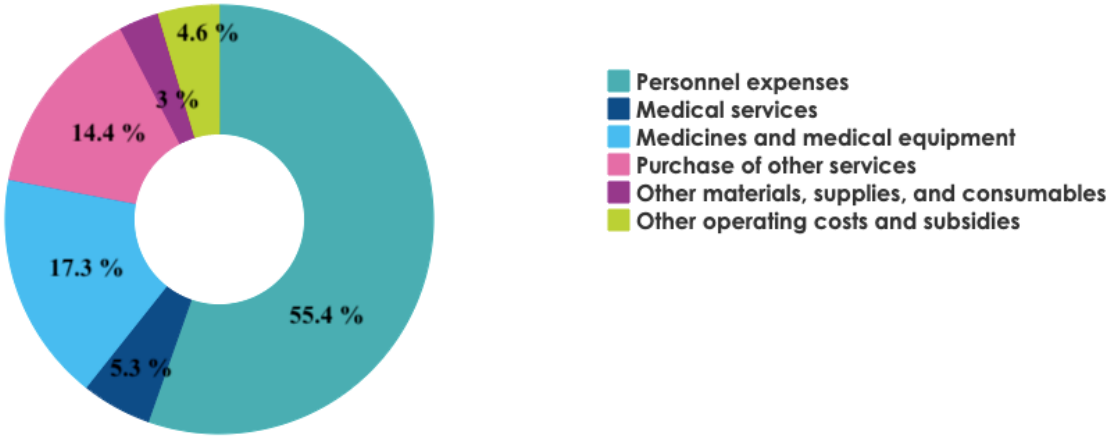
In 2019, HUS's finances showed a deficit of 15 million euros, and the net binding costs exceeded the expected amount of 16 million euros. The volume of operations exceeded the budget by 3.3%. The number of patients treated increased by 10.8% compared to the previous year, totaling 680,621 patients in 2019. The number of health center patients treated at joint emergency clinics in 2019 was 191,214, an increase 70.6% in 2018. The comparable number of referrals for non-urgent care was 330,189, an increase of 4.7% over the previous year. Nearly one in three of the residents of member municipalities used specialist medical care services provided or organized by HUS in 2019. The costs of specialist medical care of HUS member municipalities per resident averaged EUR 1,057 in 2019.

As for HUS operating costs, these exceeded the budget of 131 million euros, equal to 5.8%. Operating costs increased by 223 million euros, or more than 10%, compared to 2018. Net of the functions transferred from the member municipalities to HUS, operating costs increased by 6.4%. This increase is mainly due to rising costs of pharmaceuticals, nursing supplies and ICT services, outsourced medical services and facility costs. Personnel costs also exceeded the budget of 21 million euros. Personnel costs increased by 100 million euros compared to the previous year. The numerous transfers of functions that took place in 2019 increased HUS's operating costs by approximately 79 million euros. Among other things, this contributed to the increase in personnel costs.

Distribution of operating income 2019



Distribution of operating costs 2019



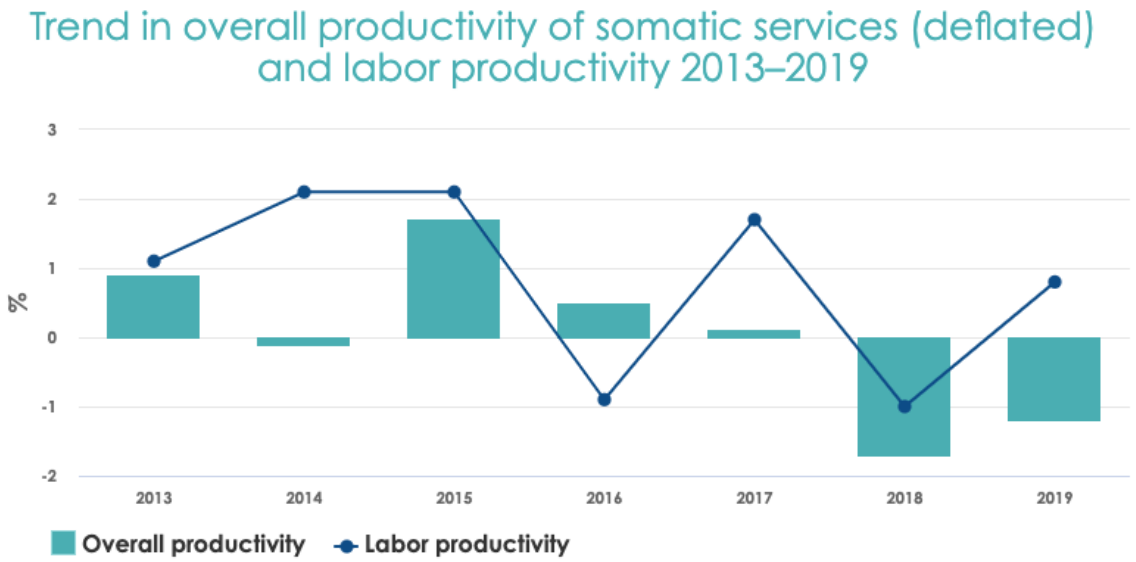
Income statement, EUR 1000	FS 2019	Budget 2019	Deviation % FS 2019 / Budget 2019	FS 2018	Change % FS 2019 / FS 2018	Forecast 2019	Deviation % FS 2019 / Forecast 2019
Operating revenue, total	**2,512,142**	**2,376,883**	**5.7%**	**2,307,546**	**8.9%**	**2,469,660**	**1.7%**
Sales income	2,370,508	2,265,419	4.6%	2,148,095	10.4%	2,346,762	1.0%
Member municipalities' contributions	1,782,108	1,681,975	6.0%	1,584,394	12.5%	1,761,056	1.2%
Other income from services	435,920	438,547	−0.6%	424,486	2.7%	435,646	0.1%
Other sales income	128,037	120,392	6.4%	114,609	11.7%	125,555	2.0%

State subsidy for education and research	24,443	24,506	−0.3%	24,605	−0.7%	24,505	−0.3%
Payments income	91,282	91,283	0.0%	83,423	9.4%	91,329	−0.1%
Subsidies and grants, total	22,943	9,571	139.7%	24,907	−7.9%	20,537	11.7%
Other operating revenue, total	27,410	10,610	158.3%	51,121	−46.4%	11,031	148.5%
Operating costs, total	**2,408,948**	**2,277,810**	**5.8%**	**2,186,175**	**10.2%**	**2,387,220**	**0.9%**
Personnel expenses	1,333,841	1,312,842	1.6%	1,233,827	8.1%	1,327,504	0.5%
Purchased services	473,914	407,511	16.3%	400,900	18.2%	465,668	1.8%
Materials, supplies and consumables	489,184	449,055	8.9%	462,192	5.8%	483,880	1.1%
Subsidies, total	5,704	4,159	37.2%	5,301	7.6%	5,627	1.4%
Other operating costs	106,305	104,243	2.0%	83,955	26.6%	104,540	1.7%
Operating margin	**103,195**	**99,073**	**4.2%**	**121,371**	**−15.0%**	**82,439**	**25.2%**
Financing income and expenses	12,921	13,052	−1.0%	11,746	10.0%	13,095	−1.3%
Annual margin	**90,274**	**86,021**	**4.9%**	**109,625**	**−17.7%**	**69,344**	**30.2%**
Depreciation and reductions in value, total	105,296	106,021	−0.7%	109,625	−3.9%	105,229	0.1%
Extraordinary items	0	0	0.0%	0	0.0%	0	0.0%
Financial performance	**−15,022**	**−20,000**		**0**		**−35,884**	
TOTAL OPERATING COSTS AND DEPRECIATION	2,514,243	2,383,831	5.5%	2,295,800	9.5%	2,492,449	0.9%
BINDING NET COSTS	1,797,130	1,701,975	5.6%	1,584,394	13.4%	1,796,941	0.0%

Through 2019, productivity was measured at HUS using the DRG point cost[14]. As of 2020, productivity is measured as a cost per patient. The productivity of HUS, in 2019, decreased compared to the previous year, the goal was that the cost in DRG points decreased by 1.5%, while the cost in DRG points increased by 1.2%, showing a decline in productivity. This decrease in productivity was determined by the increase in costs more than the total in DRG points. In fact, costs increased by 10.2%, while the total of DRG points increased by 7.2%.

[14] The cost in DRG points is calculated by dividing the actual costs by the number of DRG costs accrued from production. As the DRG point cost decreases, productivity improves, and consequently, when the DRG point cost increases, productivity decreases.

Deflation was calculated using the price index for local government spending, multiplying the costs of the previous year by the coefficient 1.016.



The reason why costs have risen depends, for example, on rising IT system costs, large facility projects, rents and function transfers, rising medical and pharmaceutical costs, rising wages and additional staff, from employee training and lean coaching. Regarding personnel costs, these represent approximately 62% of HUS 'operating costs, and the reorganization will make human resource management more efficient and more cost-effective. The lean method plays an important role at this stage of the process because it focuses on continuous improvement. To achieve millions of euros in savings through improved operations, the new departments will implement lean projects. The goal is to achieve a high level of safety and quality through smooth economic operations.

Instead, for example, as regards the productivity of psychiatry, the trend is measured by dividing the actual total costs in the psychiatry ward by the number of patients treated. And the result shows that productivity in psychiatry has improved, because costs have decreased by 2.6% compared to the previous year. As for the cost per patient, in 2019, productivity was also measured by changes in cost per patient and by changes in the ratio between costs and operating volume. Cost per patient (deflated) decreased by 2.2% compared to the same period in 2018, but costs related to operating volume (deflated) increased by 9.4%.

The following table presents the coati of the production of the somatic service with respect to the number of patients treated.

Profit area	Cost per treated patient (somatic care)			Cost per treated patient (somatic care) (deflated)
	EUR Jan–Dec 2018	EUR Jan–Dec 2019	Change %	Change % *)
Helsinki University Hospital Area	2,680	2,646	−1.3%	−2.8%
Helsinki University Hospital Children and Adolescents	2,679	2,395	−10.6%	−12.0%
Helsinki University Hospital Emergency Medicine and Services	799	802	0.3%	−1.3%
Helsinki University Hospital Head and Neck Center	861	842	−2.3%	−3.8%
Helsinki University Hospital Internal Medicine and Rehabilitation**	822	1,246	51.6%	49.3%
Helsinki University Hospital Heart and Lung Center	2,945	2,937	−0.3%	−1.8%
Helsinki University Hospital Gynecology and Obstetrics	1,850	1,874	1.3%	−0.3%
Helsinki University Hospital Comprehensive Cancer Center	4,412	4,581	3.8%	2.2%
Helsinki University Hospital Musculoskeletal and Plastic Surgery	2,672	2,856	6.9%	5.2%
Helsinki University Hospital Inflammation Center	876	836	−4.5%	−6.0%
Helsinki University Hospital Abdominal Center	2,962	3,024	2.1%	0.5%
Helsinki University Hospital Neurocenter	2,421	2,489	2.8%	1.2%
Hyvinkää Hospital Area	1,721	1,785	3.8%	2.1%
Lohja Hospital Area	1,737	1,754	1.0%	−0.6%
Porvoo Hospital Area	1,553	1,612	3.8%	2.2%
HUS level	2,293	2,277	−0.7%	−2.2%

*) Coefficient for price index of public expenditure, municipal finances, health care (Statistics Finland, October 29, 2019. **) The data for Helsinki University Hospital Internal Medicine and Rehabilitation are not comparable due to reorganization.

The table presented instead shows the ratio between operating costs and depreciation and weighted volume based on the billing quota (calculated for specific billing quotas per unit).

Profit area	Costs / Change in volume weighted according to billing share			Costs / Volume weighted according to billing share (deflated)
	EUR Jan–Dec 2018	EUR Jan–Dec 2019	Change %	Change % *)
Helsinki University Hospital Area	2,045	2,252	10.1%	8.4%

Helsinki University Hospital Children and Adolescents	2,296	2,496	8.7%	7.0%
Helsinki University Hospital Psychiatry	672	720	7.2%	5.5%
Helsinki University Hospital Emergency Medicine and Services	3,532	2,817	−20.2%	−21.5%
Helsinki University Hospital Head and Neck Center	1,250	1,365	9.2%	7.5%
Helsinki University Hospital Internal Medicine and Rehabilitation**	1,362	2,181	60.2%	57.7%
Helsinki University Hospital Heart and Lung Center	4,789	5,121	6.9%	5.2%
Helsinki University Hospital Gynecology and Obstetrics	1,675	1,712	2.2%	0.6%
Helsinki University Hospital Comprehensive Cancer Center	944	1,097	16.2%	14.3%
Helsinki University Hospital Musculoskeletal and Plastic Surgery	2,901	3,226	11.2%	9.5%
Helsinki University Hospital Inflammation Center	1,263	1,279	1.2%	−0.4%
Helsinki University Hospital Abdominal Center	1,860	1,982	6.5%	4.9%
Helsinki University Hospital Neurocenter	3,109	3,390	9.0%	7.3%
Hyvinkää Hospital Area	1,669	1,852	10.9%	9.2%
Lohja Hospital Area	1,936	1,862	−3.8%	−5.3%
Porvoo Hospital Area	1,492	1,607	7.7%	6.0%
HUS level	2,302	2,558	11.1%	9.4%

*) Coefficient for price index of public expenditure, municipal finances, health care (Statistics Finland, October 29, 2019. **) The data for Helsinki University Hospital Internal Medicine and Rehabilitation are not comparable due to reorganization.

Improving the production of services

The HUS hospital district produced a higher and higher volume of medical care services than was expected for 2019. In fact, the volume of service production exceeded the budget by 3.3% and grew by 4.7% compared to the previous year. However, if we exclude the functions transferred from member municipalities to HUS in early 2019, the comparable growth in service output was only around 0.8%.

Medical service production	**FS 2018**	**Budget 2019**	**FS 2019**	**Deviation %, FS 2019 / Budget 2019**	**Change % FS 2019 / FS 2018**
Service production					

– Change in volume weighted according to billing share				3.3%	4.7%
– Psychiatry treatment days 1)	162,073		160,184		−1.2%
– NordDRG products	751,257	744,296	774,719	4.1%	3.1%
DRG groups	151,136	155,613	166,371	6.9%	10.1%
DRG-O Groups	159,876	161,657	167,766	3.8%	4.9%
Endoscopy	31,800	31,397	32,731	4.2%	2.9%
Minor procedures	110,818	103,379	109,316	5.7%	−1.4%
900 group	296,438	292,071	297,541	1.9%	0.4%
Cost-based period	1,189	179	994	454.1%	−16.4%
– Outpatient products, somatic care	1,424,473		1,484,126		4.2%
– Outpatient products, psychiatric care	527,699		534,398		1.3%
– Health center emergency clinic visits	150,552	301,929	261,302	−13.5%	73.6%
– Billable transfer delay inpatient days	1,312		1,331		1.4%
– Visit products	2,730,677		2,932,553		7.4%
Emergency clinic visits (including DRG billing)	250,396		297,865		19.0%
First visits	263,639		264,061		0.2%
– Treatment day interim performances	809,592		860,125		6.2%
– Surgical operations	91,558		91,972		0.5%
Ambulatory surgery procedures	36,897		37,032		0.4%
– Births as at December 31, 2019	15,858		15,549		−1.9%

1) Excluding residential care days

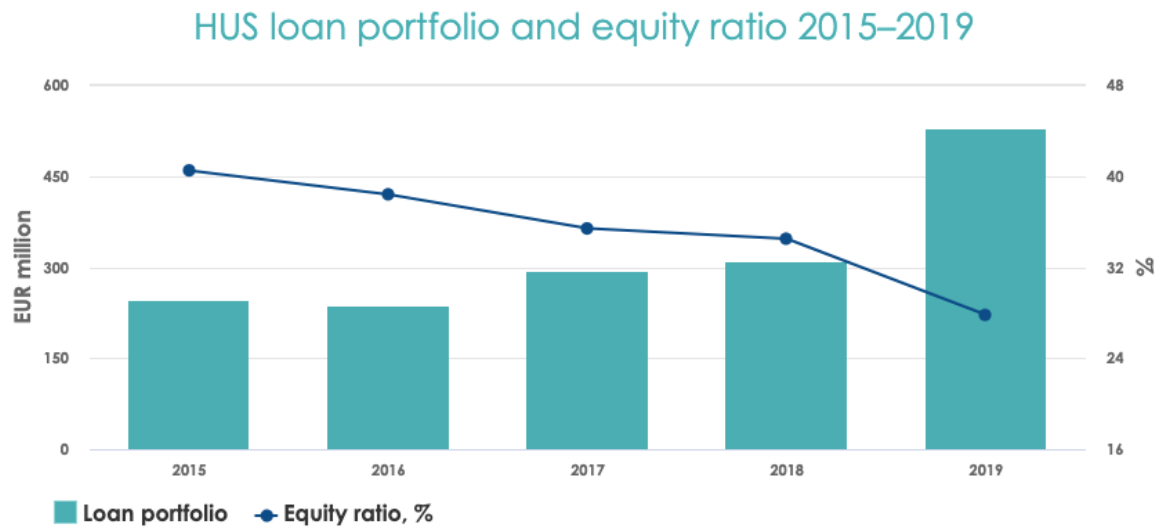
Outpatient care billing accounted for 46.6% of all HUS service production, ie specialist medical care and primary health care; and 45.6% of HUS's specialist medical care billing in 2019, remaining nearly the same as in 2018. Outpatient care accounted for 87.6% of the amount of service products in specialist medical care and 88.5% of total service output. The number of outpatient DRG products delivered (Diagnosis Related Groups, an international system of patient grouping and product definition) increased by 1.6% compared to 2018, while the number of DRG inpatient care products delivered increased 8.8%. The actual average price of DRG outpatient care products increased 0.7% from the previous year, while the actual average price of DRG inpatient care products decreased 1.8%.

The largest increase in outpatient DRG products was observed in the DRG-O groups, this increase can be explained by a substantial increase in the number of skin or subcutaneous tissue

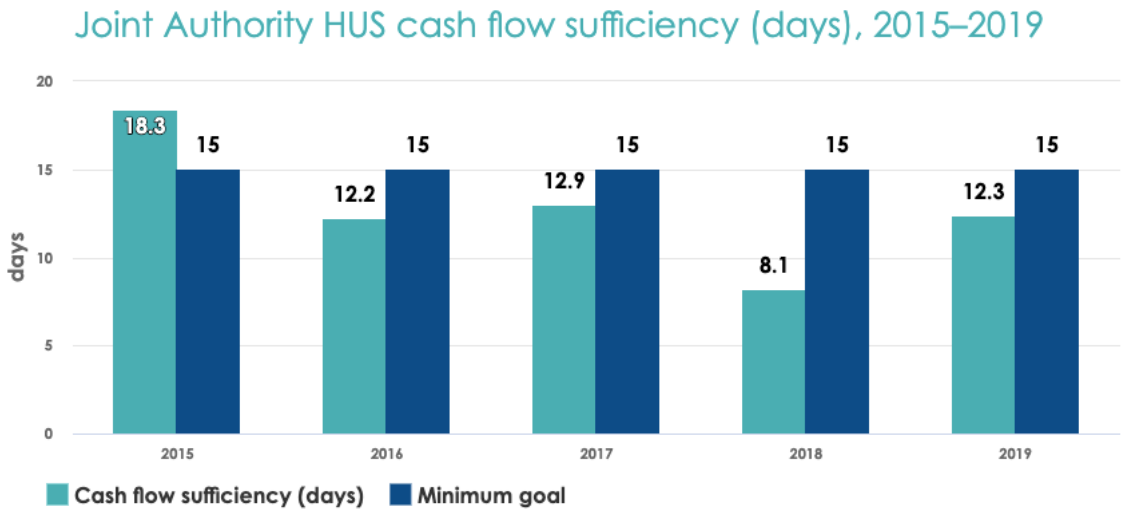
procedures and dialysis treatments. The increase in the number of products for visits is explained, for example, by the growth of emergency clinic visits and assistance calls. The number of daily care products delivered was 2.7% higher than the previous year. This growth is explained by an increase in the number of neurological and physical rehabilitation products delivered daily. The city of Helsinki has transferred its neurological and physiatric rehabilitation activities to HUS since the beginning of 2018. The number of days of psychiatric care decreased by 1.2%. In 2019, HUS performed a record number of organ transplants, 453 in all. In 2018, in comparison, only 393 were performed.

Financing

In 2019, HUS's loan portfolio grew, with HUS taking out long-term loans of € 160 million in accordance with the budget during the year. Almost € 15 million of loan capital was paid off. At the end of 2019, the loan portfolio amounted to € 527 million, of which € 75 million of short-term debt. Receivables for loans to subsidiaries amount to 32 million euros; cash and cash equivalents amounted to almost 89 million euros. The cash flow was 12.3 days, the target was 15 days. The HUS hospital district had an equity ratio of just under 28%, with the target of 30%.



At December 31, 2019, 75 million euros of the loan portfolio were in short-term debt.



As regards net financial charges, they decreased; in fact, the net financial costs were almost 13 million euros, 0.1 million euros less than the original budget. The average effective interest rate on the HUS loan portfolio in 2019 was 0.20% and the average interest rate earned on assets was 0.05%. At the balance sheet date, 57% of the interest rate risk in the long-term debt of the Common Authority was covered. Approximately 63% of the interest rate risk was hedged in the net loan portfolio, calculated by combining the long-term debt with the cash reserves of the Common Authority, the loans granted and the short-term debt.

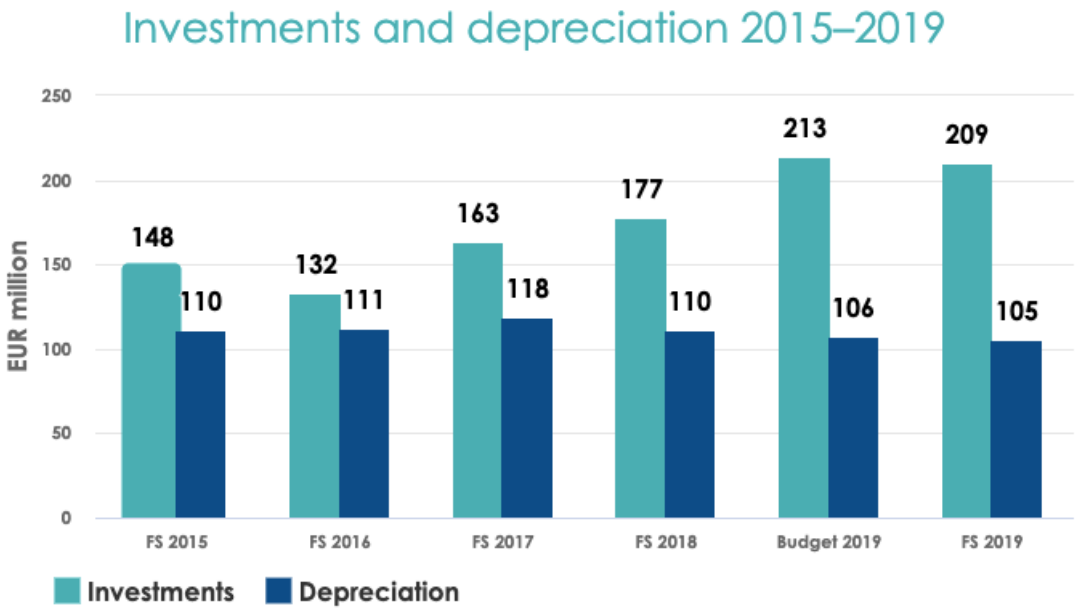
4.5 Investments in HUS

HUS has invested in improving its procedures and practices in many ways, in fact, it has invested not only in large construction projects such as the Meilahti Tower Hospital and the expansion of the Jorvi hospital, but also in new medical equipment and IT, ERP systems, basic patient care equipment, hospital modification work, repairs related to water damage and other causes, and development of support services. The poor condition of hospital buildings and the resulting operational risks, together with major repair needs, complicate the improvement of production and productivity of services.

The investments of HUS in 2019 amounted to 209 million euros. The largest part was allocated to investments in construction and renovation projects, in fact, 138 million was spent on investments in construction. In 2019, 38 major construction projects were underway or planned, most of which involved the hospital areas of Meilahti, Jorvi, and Hyvinkää. By far the largest

and most demanding project is the Bridge Hospital under construction in Meilahti, for which costs amounted to 63 million euros in 2019. Also in Meilahti, renovations are underway for the Women's Hospital and the Park Hospital. In Hyvinkää, a new surgical ward was completed at the end of summer 2019, with a new recovery room and multipurpose rooms, and 10 new operating rooms. In Jorvi, the short-term surgery department was completed and construction of the new premises for the hospital pharmacy continued. It was also incorporated into the HUS investment program, the planning for Oak Hospital, to be built adjacent to the Meilahti hospital campus. The Oak Hospital will host ophthalmology functions with the possibility of hosting other specialties as well, it will be completed in 2023. They have also invested in new examination and treatment equipment, including several new radiation therapy groups.

The procurement of the equipment respected the planned plans, the expenditure was 22 million euros for the procurement of equipment at the Helsinki University Hospital and 16 million euros for investments at the HUS Diagnostic Center. For a total figure of total investments of 43 million euros for all hospital areas and for the HUS diagnostic center. In IT management, the main investments were the development of the data pool and storage, the reconstruction of the IT network, and the provision of IT systems for the new surgical ward of the Hyvinkää hospital. The systems supporting management reporting have also been improved. Investments in IT management amounted to 24 million euros. HUS IT and expert resources have also been leveraged in the Apotti project, which is not a HUS investment but is managed through a separate company, Apotti Oy.



4.6 Lean in HUS

The HUS hospital district is a group of public health organizations that treat approximately 500,000 patients annually. HUS is responsible for specialist medical care for residents of the 24 member municipalities, the 22 hospitals that are part of it provide treatment to 1.6 million inhabitants in the Finnish capital and its surroundings. In addition, they offer centralized care nationwide for many rare and serious diseases. Being a very large organization, it employs nearly 27,000 professionals (of which 3,000 doctors and 12,000 nurses) to ensure the best interests of all patients.

The experience of HUS is recognized and accredited internationally, being the largest healthcare provider in Finland, they constantly develop, study, and update their treatment methods and activities. HUS has invested heavily in improving its procedures and practices in various ways, numerous development projects have been launched at the organizational level to improve quality management, but the largest is certainly represented by the implementation of the Lean method. The journey that HUS has undertaken began around 2010, this transformation towards Lean is unique due to the size of the district, but despite this difficulty, the deals are evident and in a few years they have already been able to cover many of the hospitals that are adopting this methodology. Interestingly, the first Lean experiments did not take place in their clinical departments, but in the laboratory and imaging department. At HUS, the adoption of lean has been gradual, and initially, there were many discussions regarding the application of lean in healthcare, and many sought information about examples of lean hospitals around the world[15].

The first step was to introduce pilot projects, to test and verify that this method was suitable for the Finnish district, when the pilot projects started giving results, about three years later, the word got out and the clinical side of the organization quickly became intrigued. The main challenge that HUS wanted to face with the implementation of Lean was to make the most of the resources they had available and be able to do more with less. As in most healthcare organizations around the world, the HUS budget does not grow at the same rate as patients' needs. By introducing and conducting lean experiments across divisions, HUS needed to better organize itself and to begin with, a Lean Transformation Plan was developed in 2013 and presented to the Board of Trustees. To start the second phase, some resources were provided to

[15] from Virginia Mason to ThedaCare

HUS, and it was then that a contract was signed with the local university for the training of lean coaches in 2014 and 2015.

4.6.1 Training for the lean method

In 2014, the executive committee of HUS took an important step by deciding to launch lean method training for HUS staff. The key to the success of the projects lies precisely in the appointment of an expert Lean coach[16], who has the task of taking care of the description of how the processes are carried out and directing employees to carry out their work in the best possible way and treat patients most appropriately. Identifying and developing Lean coaches is a rigorous process, most of them are highly qualified doctors and nurses. For HUS it is important to have a pool of cross-functional coaches, because it allows them to improve the organization, and when the coaches return to their units they start projects there. The multi-professional nature of the group makes it possible to spread the culture and lean practices throughout HUS[17].

The goal of HUS is to acquire experience and internal expertise on the lean method, so that employees are sufficiently autonomous not to have to request more external assistance for the application of the lean method. 28 people were selected by the department directors to train as lean method instructors, however, HUS's strategy for people development does not stop only at coaches, larger training courses are organized regularly for managers, another 1000 employees they received a one day course, plus they gave all staff an hour briefing. The Lean Academy was also launched, a way to execute the development plan, a mix of classroom and on-the-job training is in fact a winning one. Success is proportional to the motivation of the employees, most people if they feel involved, and in this case in Lean projects or training, they are willing to continue to actively participate. “Senior management is committed to the lean method and the underlying principle that a good manager is both humble and bold. We are already the leading hospital in Finland in implementing the lean model, and we are applying it more broadly and more thoroughly every day” said Visa Honkanen, Chief Development Officer.

[16] Usually from your organization
[17] This must be accompanied by the active support of the area management teams

4.6.2 Internalization of Lean thinking

The results of the pilot projects have been excellent, in HUS these projects have been successful and concrete results. Without significant additional resources, the reported results of 15-30% of production increases are significant, and clear cost savings have also been reported and their total amount exceeds € 2 million. HUS has invested heavily in improving its processes by applying the lean method, and has since been adopted with great effectiveness in various departments. You can actually use the lean method to develop any kind of activity, but it is particularly well suited to an expert organization: in the lean model, the development efforts are undertaken by the people who do the actual work being improved. The lean principle suits HUS down to the ground" says Honkanen.

Another step forward in the lean path of HUS was taken in 2015, when the board of directors set a goal for 2016 to introduce day-to-day management in at least half of HUS's units. Although they started with the implementation of techniques such as 5S, hoshin kanri, the main goal is to build a functioning lean management system, because it is considered the only way to improve communication between different levels of management, a necessary step to improve the treatments that are offered. To correctly implement the lean model, the first thing to do is to bring together all the staff involved in the activities to be developed, especially in a complex organization such as HUS. Honkanen states: "First we need to establish together what it is that we're actually doing. Then we need to find out which stages in our processes produce added value for the customer and try to eliminate everything else. The result is that we're less busy but get more done."

The lean method is a very systematic and concrete approach that asks five simple questions: what are we trying to do? what's the problem? what will we do with it? how do we measure change? and when will the results be ready? "You can take up a new topic for the lean method in the department every week, say a work procedure or how a tool is used, and set a goal for it. At the end of the week, you would then consider whether any change has been achieved in that matter and whether the change is a significant one. If the answer is yes, then the new procedure should be adopted permanently," Honkanen explains. For example, larger lean method projects may involve examining an entire chain of services, but whatever the size of the project, the point is to find solutions together - everyone can participate, not just the project team. "Measuring is the crucial thing. You measure how things are, you try to make improvements,

and then you measure again. I believe that positive experiences will predispose the entire organization towards the lean method," says Honkanen.

The Lean method is therefore considered to be suitable for quality management, resource allocation, increasing productivity, improving patient safety and production control. Based on available research results and practical experience, the Lean method is an excellent method for developing process-based operations at HUS. The application of the new operating model to other HUS units would bring significant economies of scale to the entire organization. The ultimate goal must be the transformation of the entire organizational culture, which requires years of systematic work and determined management.

4.6.3 Slope in different stages

Within HUS, the different specialties and functions are not proceeding in parallel, but some are advancing very quickly along the lean path, others are slightly slower. This disparity is completely normal, and it is indeed important to disseminate knowledge and best practices to help areas that are struggling to catch up and incentivize even more those who are already doing well to do even better.

Speaking concretely, among the most successful stories in HUS we find the Oncology Center[18], the anesthesiology department, the women's hospital and the pediatric hospital. The success of each of the HUS organizations is obviously different and manifold: for example the Cancer Center already had a solid quality system and the standard work was further defined, while the Children's Hospidal aims to become the best pediatric hospital in the world. A common element is the presence of solid and progressive leadership that allows you to move forward more quickly.

It is leadership that makes the difference: things go well where there are very clear improvement objectives, and what the organization needs is explained, and where these objectives are translated into actions that individual roles can perform. The power of a lean management system lies precisely in this, an evident commitment to improve communication at all organizational levels, consequently a better work environment and faster transformation. HUS

[18] Boasting an international reputation

leadership has created “Lean Task Force Groups” in several departments that are tasked with following and monitoring the smooth progress of Lean projects. It is important that top leaders also support these groups, in fact when they take part in meetings or any other streamlined activity, they always have very positive feedback. In fact, as the management begins to be more and more gemba[19], the transformation will receive a greater impulse. Lean task force groups are measuring the results of different projects, but are still working towards a global and broader plan, and are trying to figure out how to monitor progress and assess what level of lean adoption different parts of the organization have reached. As already mentioned, it's important to understand what stage of the journey the different divisions and departments of HUS are at, as some are still in the lean planning phase, while others are already on track for a lean transformation. Just to ensure a continuous update on the situation, ideas and best practices spread throughout the hospital system, Lean coaches participate in a quarterly meeting in the Lean Academy to share what they have learned, and are also asked to participate in the meetings of other units to see outside how things are evolving.

In HUS hospitals, the lean method is progressing at a steady pace and is slowly becoming a culture. The change is particularly evident in the growing cross-functional collaboration: doctors, nurses and support staff work together to drive change and improve the care that is offered to patients. The formerly present distance that saw professionals, from doctors to nurses, come together separately, is gradually disappearing.

4.7 Lean projects in HUS

The lean projects implemented in HUS are numerous, projects have recently been started and implemented in clinical units such as the Hospital Emergency Department, Internal Medicine Department and the Orthopedic Prosthesis Department. Others are the ophthalmological outpatient project and the design project for a new pediatric hospital. But most of these projects were done in HUS-Imaging and HUSLAB, that is, in the medical support service units. Some projects with their results in summary form are presented below.

[19] Gemba is a Japanese term that means "the real place", it is a management technique used mainly by Japanese managers to deal with everyday problems more effectively. The objective of the tool is to cultivate the systematic development of an organization by verifying live the abilities of its members, to recognize the potential of the actions that appear in everyday life and the predisposition to identify ideas for improvement.

4.7.1 Lean projects in Jorvi's ER

Jorvi's emergency room visits a large number of patients every day with varying degrees of severity of symptoms, injuries or illnesses, and urgency of treatment, and the number of patients varies considerably during the day at different times. More than 160 different general practitioners work in the emergency room, more than 100 special medical care specialists, and much other staff. Unfortunately, the problems within an emergency room are many, for example long waiting times, processes that are often unclear, often insufficient staff, and patient dissatisfaction (Holden R. J., 2011). For example, to correct the long wait times, it was proposed to increase the staff during peak hours, but this proved too expensive because the service is active 24/7, 365 days a week. year. All these issues, however, were reviewed using the Lean method, through collaboration with the mentor, the staff, and with the commitment of the emergency room management who was strongly motivated and committed to the project. In the assessment and reorganization, the first aspect to consider is that relating to the patient's access to an assessment of treatment needs. Each patient must receive the right attention and assessments from the nurse who takes care of this precisely for the safety of the patient, and thanks to the use of Lean methods this aspect has greatly improved. In fact, the results confirm the improvement, because over 90% of patients are evaluated within 10 minutes of their arrival. Without additional resources, the working conditions of the staff have been developed to be more and more appropriate and the whole process has been improved to be customer-oriented. According to research and experience, emergency services are well suited to be developed using Lean methods (Chiodo A., Wilke R., 2012). The elimination of waste allows you to reduce unnecessary work and increase the time dedicated to the necessary activities and meetings with patients. Timing also improves thanks to faster and more critical action, always guaranteeing quality and safety for the patient. Therefore, the HUS Jorvi Hospital Emergency Lean project was successful thanks to the fundamental assumptions, namely a competent external mentor, motivating management, and the rest of the staff enthusiastic.

4.7.2 Lean projects in the Peijas department

The main objective for the Lean project in the internal medicine department of the Peijas hospital was an early patient repatriation process but with high quality, and this allows to relieve the pressure of the emergency room and the workload of the department. In fact, the patient's

early discharge is precisely centered on the patient himself and contributes to the economic implementation of departmental activities. The internal medicine ward in question has 35 beds, where patients come mainly from the emergency room and the intensive care unit. Among the operational challenges are also the success of teamwork, the adequacy of communication and the change of doctors with greater specialization. The analyzes found that only 10% of patients return home before 13:00, while 50% of patients are discharged after 15:00. Later, with the introduction of the Lean method, a project was started, starting from a Lean team composed of a ward doctor, a ward nurse, an assistant ward nurse, two nurses, a ward secretary, a planner, spokesperson and development manager competent for Lean coaching. The project plan was as follows: observation, conception, piloting, implementation, repairs and continuous improvement. After mapping the value stream and analyzing the core metrics, the following operational changes were made:

1. The block of the team division (3 x 3SH + drug team, before doctors and nurses "mix") and a monitoring table.
2. Measurement of activities on a weekly basis (every 4 months), withdrawal times, specification of role instructions.
3. The division of the medical cycle into two parts will be repatriated first, the others later, and this will allow the early start of repatriation activities.
4. Predicting returnees and setting priorities.

Following the successful application of the method, an observational study was conducted, the results of which were discussed in a multi-professional team which then decided to change the operating model. The changes in roles and planned changes were communicated to the staff in advance, allowing them to continue to carry out their jobs smoothly, and early resignations were found early. The introduction of effective rotation and team role changes, situation monitoring and prioritization of return laboratory tests further improved the situation significantly. The project was successful and the results were concrete and comparable with international results (Chiodo A., 2012). And thanks to the Lean method, the permanence of changes and positive effects was ensured. In addition, the 5S operation was launched, according to Lean principles, which allows to keep the assistance stocks in order. With the introduction of the operating model and the tools for continuous improvement, discharge times have improved significantly: now about 30% are discharged before 13:00 and 20% after 15:00 [Figure 2].

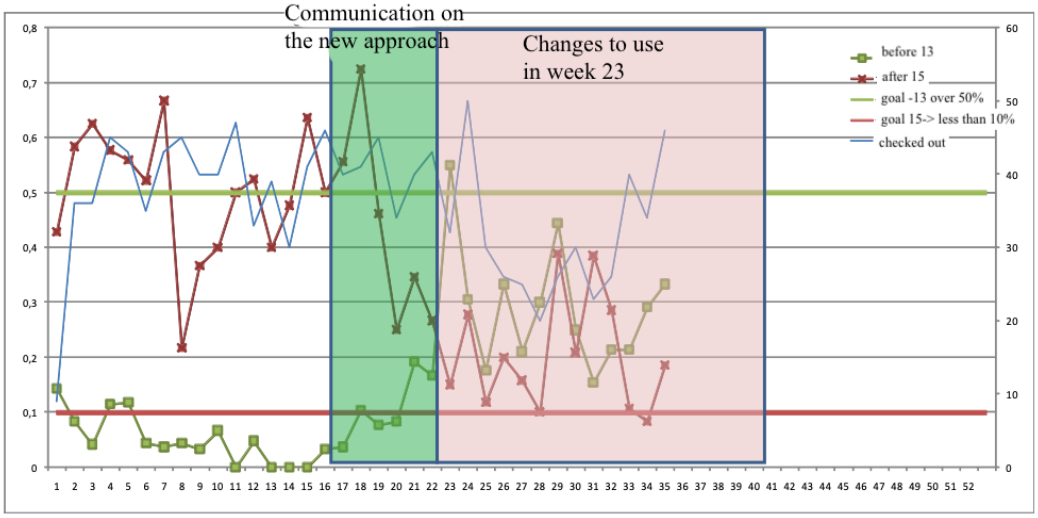


Figure 2: Modification of the operating model of the Peijas internal medicine ward with Lean method, the discharge of patients has been significantly anticipated.

The application of the new operating model to hundreds of other HUS bed departments would bring significant economies of scale to the entire organization. Furthermore, it is important to assess the effects of the new operating model on the quality of care and patient safety, as well as cost effectiveness.

4.7.3 Lean projects of HUS-Imaging

In 2011 the Lean projects of HUS-Imaging began with the streamlining of magnetic research; as the search queues were long and the growth in search demand was consistently 10% year-on-year. Furthermore, the increase in the number of research equipment was limited, due to the high price of such equipment, exceeding 1.5 million euros. The lean project was started in the MRI unit of the Jorvi hospital. Thanks to the start of the project, the number of studies was quickly increased by 10% with the same amount of equipment, the number of nurses was increased, and all other expenses remained unchanged. Nursing staff costs are 32% of costs, the increase in nurses' work has increased total costs by approximately 3%, the average cost of producing the study is 272 euros, and the annual number of studies has increased by 582, so the annual financial savings in the MRI unit of the Jorvi hospital was 158,000 euros. Subsequently, other magnetic resonance imaging units were also examined using the same methodology. With the use of the Lean method for the new operating model, it is possible to perform up to 6,000 more surveys per year, and it is estimated that this leads to savings of over 1.6 million euros

per year. Through the implementation of the Lean method, there are further advantages in the MRI project, starting from lower research costs and better research availability, availability for urgent and emergency exams has also increased.

In addition, HUS-Imaging sought to further improve the process, for example through smoother research processes that save on the number of equipment, the number of staff, and space costs. Lean projects have been successful and integrated well into the culture and organization of HUS-Imaging, based on international research and practical experience, the imaging processes are very suitable for development using Lean methods (Kruskal JB, 2012). One of the factors that have favored this success is the commitment of top management in Lean projects, and also the presence of experts.

4.7.4 Lean projects in HUSLAB

HUSLAB is a FINAS accredited laboratory company that is looking for new ways to develop its operations to improve cost efficiency and, in particular, the agile operation of the entire supply chain. For the new HUSLAB commercial headquarters, the project plans to streamline processes and the efficient transfer of laboratory functions, and also includes the possibility of expanding the production volume with the growth of the Meilahti campus area. The new premises of HUSLAB have immediately adopted the Lean method for the planning and development of processes, for design, they are therefore set up and have very high quality and efficiency requirements, and with the aim of convenient and flexible operations. The Lean method has been found to accelerate the design process and reduce the amount of corporate space required (Grunden N., 2012).

Initially, external coaches were selected to support the development and implement the appropriate development tools in the organization, but the actual development work was then carried out by internal staff. The implementation of the development work with the Lean method was started with the introduction of 9 process groups, each consisting of about 6-8 people. Under the guidance of the development manager, the group leaders participated in 3 days of Lean training, while the other group members received 2 hours of training and orientation. First, the process flow mapping of current values was performed [Figure 3]. Next, the process improvements made possible by the new building - a completely new commercial

space - were devised. Finally, it was evaluated which of these process improvements could already be implemented in the existing premises.

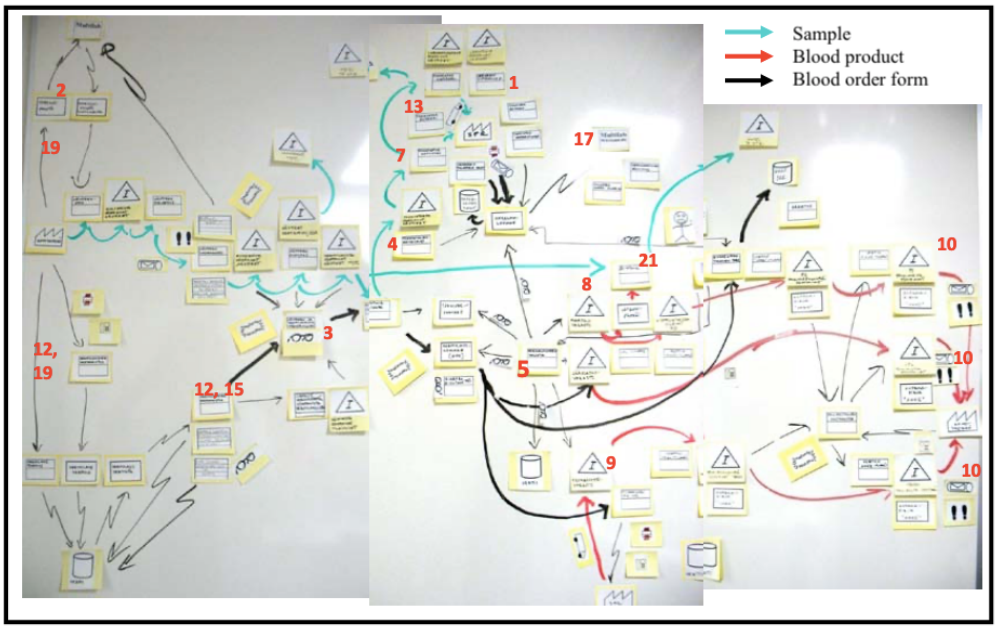


Figure 2: An example of how a Value Stream Map can be different from a simple four-step process.

In conclusion, the main objective of the project for the planning of processes relating to commercial premises was successfully achieved. The new commercial premises have been reduced compared to the previous number, but have maintained the level of services and improved the flexibility of conversion and the ability to respond to both the growth in demand and possible future changes in the demand profile. In addition, operational procedures have been planned to be implemented in the new headquarters precisely to improve response times and reduce duplication of work. An example of the success and benefits of applying the Lean principles is the HUSLAB sampling development project, in fact, in the clinic and in the hospital ward, operations have been streamlined and are more efficient. In the pilot project, outpatient sampling and client satisfaction improved, and queues shortened.

As for the expansion of the lean method in HUSLAB, this has mainly focused on Meilahti for the commercial premises project, but the aim is to extend it to outside operations as well, with the desire to create a real unified lean development culture for the entire HUSLAB. The implementation of the Lean method in HUSLAB has been a real success, and has also proved to be an excellent way to develop laboratory activities.

4.8 Well-being improved

The efforts that contribute and allow to increase well-being are many, starting from customer satisfaction, with high quality, safer, and more effective treatments, up to the satisfaction of employees for the work and tasks they perform every day. The concept of occupational wellbeing includes occupational safety, work capacity, the ability to cope with work, and the defined goals and measures for work wellbeing. As anticipated in the previous paragraphs, customer satisfaction and needs are the basis for the operations that are carried out in HUS. The patient and his interests are always at the center of the system, which is why patient satisfaction is monitored through surveys and surveys.

In addition to patient opinions, HUS receives positive feedback in a number of contexts regarding well-being at work. For example, the good results are manifested in the reduction of invalidity pensions, in the reduction of accidents at work. When looking at workplace injuries, the most common causes are falling and skidding, both in the workplace and on the way to and from work. In 2014 the number of accidents at work decreased by 10.4% compared to the previous year, and of 843 accidents that occurred, 321 occurred during the round trip. To improve occupational safety and consequently well-being, it is important to focus on improvements in safety processes, by adopting the main risk assessment measures: work safety shifts, training in personal safety, fire safety, and first aid. emergency and various occupational safety and health campaigns.

Beginning in 2006, HUS's hospital department systematically analyzed its staff's views on the organization's operations, leadership, interaction, and personal well-being with a job satisfaction survey called the Working Life Barometer. The development points for the survey concern the usefulness of development discussions, support for the work supervisor, and staff participation in particular in changing circumstances. Employees' perception of participating in planning changes affecting their work is a key aspect, and contributing their feedback remains a clear point of development. The results of the Working Life Barometer show that employees believe they have the skills and knowledge necessary to perform their job duties; key practices in work capacity management, such as early support and cooperation with supervisors, contributed to an improvement in a work capacity. In the program prepared by HUS relating to “well-being at work”, the objectives include a well-functioning working community and quality in the work of supervisors.

With the implementation of the lean system, HUS also wanted to make improvements in work practices, with the aim of identifying changes in work practices that save time for employees and use it in vital tasks, improving the quality of assistance. and patient satisfaction. The purpose of Lean development was to ensure that the right people did the right things, at the right time. Despite numerous changes, HUS has managed its operations well, the workload has been reduced and awareness of the big picture has increased and processes have been unified. Good results have been achieved in patient care, financial performance, and employee evaluation of the organization's functioning, leadership, interaction, and well-being.

4.8 Things are changing

The ever-increasing pace of change and good examples of lean improvement appear day after day and underline the result of a change in the organization and culture. The most successful improvements have been in hospitals that have used lean management on a daily basis, where work transfers have been reduced and where morning delays in operating rooms have been almost eliminated.

The transformation of HUS is accelerating, and it is right now that it is bearing fruit, thanks also to the techniques and ideas that have allowed and ensured the district to always guarantee the requests of people and patients. It is also important to guide the transformation internally because the help of external consultants is always welcome, but the real turning point must take place from within; in fact, a key element is the greater involvement of top management and department heads, aware that the real transformation must take place in their minds. The Lean implementation process is not one and only, but every organization must find its own, understand it, and apply it in the correct way. Initially, it is difficult, but the benefits to be reaped will be in the medium and long term. Even more so in an organization with the size of HUS, with so many different functions, departments, hospitals, it is more difficult and it takes years to fully introduce a lean culture.

Conclusion

Over time, the Lean approach, referring to the model adopted by Toyota exclusively for production, has extended to involve the management and administrative processes of companies of different nature: a real Lean Thinking encoded in Lean Management techniques. This is not a cost reduction program, but a managerial strategy applicable to all organizations because it is done through process improvement. All organizations, including Healthcare, have within them a series of processes or a set of actions designed to create value for those who use them or depend on them (customers/patients). Lean management is embodied in the identification of processes, in the mapping of activities, and in the continuous research and elimination of waste in order to produce more value with less consumption. Generally, the principles underlying the Lean approach in redesigning business processes are a constant analysis of waste to be eliminated and added value to be circulated.

Very often those who are skeptical of lean thinking applied to healthcare say that healthcare work is different from a factory, that healthcare workstations are too complex, or that it is just a matter of putting their hand to the work area. This is not the case, it represents a starting point for improving the quality of assistance and to do this it is inevitable to start from an ad hoc and adequate working environment. Wasting less time on activities that do not add value and therefore allowing more time to direct patient care can only be a positive and useful thing. Quality health care is the right of every citizen and has become a priority, especially in this historical moment that reveals a situation of extremely limited resources and global economic restrictions. Employees, but not only them, should be able to seize the opportunity provided by this model to demonstrate that they are ready to contribute with strength and creativity to the transformation. “Human resources are something above all measurement. The capabilities of these resources can be extended as each person begins to think” Taiichi Ohno.

In this context, the customer is identified in the patient, for whom the value is made up not only of the personal satisfaction of their expectations but also of the outcome that the services they received will have on their health. If the clinical outcomes of a given pathway are a purely medical matter and cannot be evaluated here, the individual dimension of value for the patient is the result of a series of factors on which the organizational change inspired by lean thinking can act. International experiences have shown how organizational methods with a certain

degree of autonomy guarantee greater economic efficiency and better clinical and qualitative effectiveness for the patient.

In this thesis, it was underlined how the introduction of the lean method within the Finnish department of HUS represented a total structural and organizational change. This transformation was received and accepted by the staff with great enthusiasm and participation, and the proof is given by the success and excellent results. The increase in production without significant additional resources, the cost savings, the improvement of safety and well-being are clear signs of the successful implementation of the lean system. Furthermore, the keys to success at HUS have been multiple, starting with experienced coaches, motivated employees, and committed management. The Lean philosophy starts with people and doing, and every organization must find its own way to adopt the Lean method and shape the culture accordingly. Management and leaders play an important role in this process of change through continuous improvement and their role is to encourage and engage employees to work together for a common goal.

Bibliography

- AA VV, “Dimensionamento di massima e bilanciamento”, in Bonfiglioli Consulting (A cura di), Il Lean Thinking dalla produzione alla progettazione: Pensare snello in ufficio tecnico per innovare la progettazione e diventare più competitivi, Franco Angeli, 2010, pp.56.
- Achanga, P., Shehab A., Roy, R., Nelder, G.,Critical success factors for lean implementation within SMEs, Journal of Manufacturing Technology Management, 2006, Vol. 17 Issue: four, pp. 460 – 471.
- Agnetis A., Bacci A., Giovannoni E., Riccaboni A., Lean thinking nelle aziende di servizi, IPSOA, 2015.
- Baragatti L., et al., Organizzazione ospedaliera per intensità di cure e per assistenza: proposta di un metodo per la stima del fabbisogno di unità di assistenza nelle aree di degenza e correlazione con la complessità assistenziale, 2009.
- Berwick D., Controlling variation in health care. Med Care, 1999.
- Berwick D.M., Hackbarth A.D. Eliminating waste in US health care, JAMA, 2012.
- Bhatia, N., & Drew, J. (2006). Applying lean production to the public sector.
- Bianciardi C., et al., Lean thinking in sanità: da scelta strategica a modello operativo. 1° ed. (s.l.): Società Editrice Esculapio, 2014.
- Black J. T., “Design rules for implementing the Toyota Production System”, in International Journal of Production Research, Vol. 45, No. 16, Ago 2007, pp. 3639-3664.
- Brown K. A., Mitchell T. R., “A comparison of Just-In-Time and batch manufacturing: the role of performance obstacles”, in Academy of Management Journal, 1991, Vol. 34, No. 4, pp. 906-917.
- Burroni L., Biancardi C., Guercini J., Bracci L., *Lean Thinking in Sanità*: *Da scelta strategica a modello operativo,* Società Editrice Esculapio, 2014.
- Cerase F. P., Pubblica amministrazione – un’analisi sociologica, Roma, 1998, p.86.
- Cernigliaro D., Il cambiamento organizzativo della pubblica amministrazione nell’ottica della qualità totale, 2000.
- Chiodo A., Wilke R., Bakshi R., Craig A., Duwe D., Hurvitz E., *Using Lean principles to manage throughput on an inpatient rehabilitation unit.* Am J Phys Med Rehabil, 2012.
- Coriat B., Ripensare l’organizzazione del lavoro. Concetti e prassi nel modello giapponese, Dedalo, Bari ,1991.
- Delgado, C., Ferreira, M., Castelo Branco, M., The implementation of lean Six Sigma in financial services organizations, Journal of Manufacturing Technology Management, 2010, Vol. 21 Issue: four, pp. 512 – 523.
- Dennis, P., Lean production simplified: A plain-language guide to the world´s most powerful production system, Productivity press New York, 2002.

- Dente B., In un diverso Stato, Bologna, 1999.
- Di Carlo S., Il lean thinking: una possibile innovazione organizzativo - gestionale nelle amministrazioni pubbliche ammodernate, Research Proposal, Janury 2016.
- Dikinson E., Anguelov Z., & Vetterick D. e., Use of lean in the emergency departement: a case series of 4 hospitals. Annals of Emergency Medicine, 2010, pp. 504- 510.
- Eller A., Rapid assestment an disposiztion: applyng Lean in the emergency departement. Journal of Healthcare quality, 2009, pp. 17-22.
- Fedele M., Il management delle politiche pubbliche, Bari, 2002.
- Furmans K., "Models of Heijunka-levelled Kanban-Systems", in 5th International Conference on Analysis of Manufacturing Systems-Production and Management, pp. 243-248, 2005.
- Giddens A., Capitalismo e teoria sociale. Max, Durkeim, Weber, il Saggiatore s.p.a, Milano 2009.
- Graban M., *Lean hospitals: Improving quality, patient safety, and employee en- gagement*. Second edition. CRC Press 2012.
- Graziadei G., "Identificare il valore nel prodotto", in G. Graziadei, Lean Manufacturing: Come analizzare il flusso del valore per individuare ed eliminare gli sprechi, Hoepli Editore, 2006, pp. 30-40.
- Graziadei G., Lean Manufacturing, Hoepli, 2010.
- Grunden N., Hagood C., *Lean-Led Hospital Design: Creating the efficient hospital of the future*. CRC Press 2012.
- Grunden N., Hagood C., *Lean-Led Hospital Design: Creating the efficient hospital of the future.* CRC Press, 2012.
- Hihnala S., Kettunen L., Suhonen M., Tiirinki H., *The Finnish healthcare services lean management: Health services managers' experiences in a special health care unit,* 2017.
- Hines, P., Holweg, M., Rich, N., Learning to evolve: A review of contemporary lean thinking, International Journal of Operations & Production Management, 2004, Vol. 24 Issue: 10 pp. 994 – 1011.
- Holden R. J., *Lean thinking in emergence departments: a critical review*. Ann Emerg Med, 2011.
- HUS, Annual Report 2014.
- Hutchins D., *"Hoshin Kanri*: *The Strategic Approach to Continuous Improvement"*, CRC Press, 2016.
- Imai M., Gemba Kaizen, Mc-Graw Hill, New York, 1997.
- Imai M., Kaizen: The Key To Japan's Competitive Success, McGraw-Hill, 1986, pp. 259.
- Jones & Mitchelle, Lean Thinking for the NHS: a report commissioned by the NHS Confederation, 2006.
- Jones D, Mitchell A. *Lean Thinking for the NHS.* Londra: NHS Confederation, 2006.

- Jorma T., Tiirinki H., Bloigu R., Turkki L., *LEAN thinking in Finnish healthcare*, Leadership in Health Services, 2016.
- King P. L., "Strumenti Lean che necessitano di piccole modifiche: Gestione a Vista", in P. L. King, Lean Thinking per le aziende di processo: Gestire la complessità senza sprechi per essere più flessibili e veloci, Hoepli, 2017.
- King Peter L., Lean thinking per le aziende di processo: gestire la complessità senza sprechi per essere più flessibili e veloci, Hoepli Editore, 2017.
- Krafcik, John F, Triumph of the lean production system., in MIT Sloan Management Review, vol. 30, n. 1, 1988.
- Kruskal J. B., Reedy A., Pascal L., Rosen M.P., Boiselle P.M., *Lean Approach to Improv- ing Performance and Efficiency in a Radiology Department*. Radio Graphics, 2012.
- Leone A., L'organizzazione sociale al servizio dei cittadini. Il caso Inps di Verona, Sistemi & Impresa, n. ½, gennaio-febbraio-marzo 2006.
- Mäkijärvi M., Perttunen J., *Lean healthcare at a large hospital district in Finland, Case study,* 2016.
- MARQUES, Romena Andreia Charchar Campos. Prova di strumento PDCA sulla risoluzione delle Coating Service. Rivista scientifica multidisciplinare Knowledge Center. Numero 9. Anno 02, Vol. 01. pp 64-70, dicembre 2017. ISSN:2448-0959.
- Marra A., Etica e performance nella Pubblica Amministrazione. Strumenti e strategie per una gestione efficace e trasparente della Res publica, Franco angeli, Milano, 2006.
- Minardi R., "Muda: The 7 Deadly Wastes, eliminating common sources of unnecessary excess", in Lab Talk, Sett/Ott 2017, pp. 16-22.
- Monden Y., "Toyota Production System: A Practical Approach to Production Management", in Industrial Engineering and Management Press, Norcross, Ga, 1983, pp. 141.
- Mossman A., "Creating value: a sufficient way to eliminate waste in Lean design and Lean Production", in Lean Construction Journal, 2009, pp. 13-23. (www.Leanconstructionjournal.com).
- Negro G., Ozzello S., Le soluzioni snelle per la PA, Franco Angeli, Maggioli Editore, Milano, 2010.
- Ng D., Vail G., Thomas S., & Leppa C., Applyng the Lean principles of the Toyota Producttion System to reduce wait times in the emergency departement. CJEM, 2010, pp. 50-57.
- Nuti S., Panero C., La sfida dei servizi in sanità tra personalizzazione e standardizzazione dei processi, in Cinquini L., Di Minin A., Varaldo R. Nuovi modelli di business e creazione di valore: la Scienza dei Servizi, pp. 193-210, Edizioni Springer, 2011.
- Perrella G., Delli Cocili G., Nomos, Riduzione degli sprechi e miglioramento dei servizi nella pubblica amministrazione, FrancoAngeli, 2009.

- Pil F, Fujimoto T., Lean and reflective production: the dynamic nature of production models. Int J Prod Res., 2007.
- Porteus E. L., "The Impact of Inspection Delay on Process and Inspection Lot Sizing", in Management Science, Vol. 36, No. 8, Aug 1990, pp. 999-1007.
- Radnor Z. & Walley P., *Learning to Walk Before We Try to Run: Adapting Lean for the Public Sector, Public Money & Management*, 2008.
- Radnor Z., Walley P., Stephens A., & Bucci G., Evaluation of the approach to bussiness management and its Use in the Public sector. Fesearch findings, 2006.
- Romaniuk P., Application of Lean Management in modern management public administration, Journal of Modern Science TOM 2/37/2018, S. 203–218.
- Rosa A., Lean organization in sanità esperienze e modelli di applicazione da nord a sud, Guerini Next, 2017.
- Rother M., Shook J., Learning to See, value stream mapping to add value and eliminate muda, Lean Enterprise Institute, 1998.
- Samuel K. M. Ho, "5-S practice: The first step towards total quality management", in Total Quality Management, 10:3, 1999, pp. 345-356.
- Sarkar, D., The challenges of service lean implementation, 2009.
- Schmidtke D., Heiser U., Hinrichsen O., "A simulation-enhanced value stream mapping approach for optimization of complex Production environments", in International Journal of Production Research, 2014, Vol. 52, N. 20, pp. 6146-6160.
- Simboli A., Taddeo R., Morgante A., "Value and Wastes in Manufacturing. An Overview and a New Perspective Based on Eco-Efficiency", in Administrative Sciences (2076-3387), Sett 2014, Vol. 4, Issue 3, pp. 173-191.
- Slack N., Brandon-Jones A., Johnston R., Betts A., VinelliA., Romano P., Danese P., Gestione delle operations e dei processi, Pearson, 2013.
- Soriano-Meier, H., Forrester, P. L., Markose, S., Garza-Reyes, J., The role of the physical layout in the implementation of lean management initiatives, International Journal of Lean Six Sigma, 2011. Vol. 2 Issue: three, pp. 254 – 269.
- Southworth T., "Muda, mura, muri", in Label & Narrow Web, Nov/Dec 2010, Vol. 15, Issue 8.
- Sugimori Y., Kusunoki K., Cho F. & Uchikawa S., "Toyota production system and Kanban system Materialization of just-in-time and respect-for-human system", in The International Journal of Production Research, 1977, 15:6, pp. 553-564.
- Taylor F.,The principles of Scientific Management, 1911.
- Tourani S., *The Idea of Lean Hospital,* Hospital Practices and Research, 2017.
- Villa S., Bensa G., Giusepi I., La gestione delle operations in ospedale, in Lega F., Mauri M., Prenestini A., L'ospedale tra presente e futuro, pp. 243- 286, Egea, Milano, 2010.

- Waller D.L., Operations management. A supply Chain approach. 2° ed. Londra: International Thomson Business Press, 2003.
- Wang J. X., "Jidoka: Implement Lean Manufacturing with Automation", in J. X. Wang, Lean Manufacturing: Business Bottom-Line Based, Taylor & Francis Group, 2011.
- Womack J., Jones D., Lean Thinking: Banish Waste and Create Wealth in Your Corporation, Productivity Press, 1996.
- Womack James P., Jones Daniel T., Lean Thinking. Come creare valore e bandire gli sprechi, Milano, Guerini e associati, 2006.
- Womack, James P., Jones, Daniel T., and Roos, Daniel (1991), The Machine That Changed the World: The Story of Lean Production, HarperBusiness, 2003.

Sitography

- https://www.considi.it/lean-thinking/
- https://istitutolean.it
- https://healthmanagement.org/
- https://planet-lean.com/
- https://www.hus.fi
- https://husinvuosi.fi/en/