

POLITECNICO DI TORINO

Master of Science in Industrial Engineering and Management

Thesis

Lean Process Improvement (LPI) for the department of Indirect Procurement of
a home appliances multinational company



Supervisor

Luigi Benfratello

Author

Daniela Margarita González Castillo

Academic Year 2020/2021

Abstract

A multinational company in the home appliance sector, more specifically in the department of indirect procurement of Europe, the Middle East, and Asia (EMEA) is seeking to improve its processes for the purchase of materials and the contracting of services. Indirect Procurement (IP) which accounts for 29% of the total procurement spend of the company, is divided into different categories such as Marketing, Supply Chain, Travel, IT, MRO, Finance, HR, among others. Each category has a manager and a group of buyers in charge of all the execution of the purchasing process.

The Lean Process Improvement methodology was used during the current project with the deployment of tools such as the SIPOC matrix, impact table, maturity table, flow diagram among others to find a way of adding value to the indirect procurement process. Also, the IP manager requested to evaluate the possibility of creating a “Procurement center” as has been done before in the main region of the company, where there is a team created to provide integration of both the strategic and operational sections of procurement, giving support to process partners and category leads of the end-to-end procurement process, helping solve problems with general directions, supporting strategic commodities including the development of relationships with suppliers and process partners and maintaining an understanding of contract law, negotiations, industry/supplier analysis, supplier quality, and strategy formulation.

At the end of the project, the main goal is to improve the IP team processes by implementing all the tools mentioned before and considering whether or not creating a Procurement center for the IP team would be a good option or if standardizing some processes internally is enough to improve the completely indirect procurement process.

Introduction

In the past three decades, the manufacturing industry has undergone unprecedented changes, which involve drastic changes in management methods, products and process technologies, customer expectations, supplier attitudes, and competitive behavior. In today's highly dynamic and rapidly changing environment, global competition between organizations places higher demands on manufacturing organizations.

The current project is based on the performance of all the processes within the EMEA region of the home appliances company in the study. Since there are different types of home appliances such as air conditioners, freezers, ovens, washing machines, among others, there are also so many different processes for the production of each appliance. Being Europe, the Middle East, and Africa a multi-lingual region, different currencies and laws are applied for each country, so yes, the difference is even bigger than in other regions.

The Indirect Procurement team has been trying to reorganize its structure and the processes required to achieve the team objectives. Day-to-day, buyers have so many files to fill, steps to follow to complete a single activity, meetings to attend, and issues to be fixed. Therefore, even if some tasks are very simple others take longer since it depends on internal and external customers where there is some lack of coordination and communication that causes reprocessing and waste of time. Likewise, there are other main activities buyers do not reach out because of lack of time and organization.

While looking for a way to deeply understand all the processes, tasks, people involve, inputs, and outputs of the IP team, based on previous methodologies implemented for the improvement of procedures in the company, Lean Process Improvement is the methodology elected to evaluate the procedures since it is focused on reducing and eliminating waste by increasing process value through a “mix” between lean theory and six sigma methodologies.

Acknowledgments

Throughout the writing of this dissertation, I have received a great deal of support and assistance.

I would first like to thank my supervisor, Professor Luigi Benfratello, whose expertise was invaluable in formulating the research questions and methodology. Your insightful feedback pushed me to sharpen my thinking and brought my work to a higher level. You provided me with the tools that I needed to choose the right direction and complete my dissertation.

My completion of this project could not have been accomplished without the support of my colleagues from my internship for their wonderful collaboration. I would particularly like to single out my internship supervisor, I want to thank you for your patient support and for all of the opportunities I was given to further my research.

Also, I would like to thank my parents, you encourage me to come to Italy and live this experience which I am about to take to the end. You are always there for me and I know you will always be. To my caring, loving, and supportive family, my deepest gratitude. Your encouragement when the times got rough is much appreciated.

Finally, I could not have completed this dissertation without the support of my best friends, my friends in Italy, and my roommates, who became my family away from home and who I know will be always there for me as I will be for them.

This project has been a challenge for me and all my study journey. It is coming to an end and I am so glad of everything I achieved until today.

TABLE OF CONTENT

1. CHAPTER 1 CONCEPTUAL FRAMEWORK.....	8
1.1. PROCUREMENT IN THE SUPPLY CHAIN OF A COMPANY.....	8
1.1.1. Supply chain integration	8
1.1.2. Procurement in a business.....	10
1.1.3. Direct Procurement and Indirect procurement	11
1.2. SIX SIGMA METHODOLOGY	11
1.2.1. The design for six sigma (DFSS).....	12
1.3. LEAN METHODOLOGY AND INTEGRATION WITH SIX SIGMA.....	13
2. CHAPTER 2 STATE OF ART IN OTHER INDUSTRIES AND CURRENT PROCESS IMPROVEMENTS IN THE COMPANY IN STUDY	17
2.1. STATE OF ART IN VARIOUS INDUSTRIES	17
2.2. THE CURRENT SITUATION FOR THE HOME APPLIANCES COMPANY	19
2.2.1. Existing Procurement Center	20
2.2.2. The previous implementation of Lean Process Improvement in the company	22
3. CHAPTER 3 LPI TOOLS AND APPLICATION IN THE IP DEPARTMENT.....	24
3.1. THE SIPOC DIAGRAM	25
3.2. IMPACT/MATURITY CHART.....	29
3.3. FLOW DIAGRAM	32
4. CHAPTER 4 FINAL IMPROVEMENT PROPOSAL	39
5. CONCLUSIONS.....	42
6. REFERENCES	44

List of tables

Table 1. Indirect procurement purchasing processes for the company.....	26
Table 2. Maturity levels	29

List of figures

Figure 1. Integration of a supply chain (Stevens, 1989).....	9
Figure 2. Procurement general process	10
Figure 3. The organizational structure of the existing procurement center of the company	21
Figure 4. SIPOC diagram.....	28
Figure 5. Maturity table for the IP processes of the company	30
Figure 6. Impact chart	31
Figure 7. Impact maturity chart	31
Figure 8. Flow chart figures definition	33
Figure 9. Ideal process flow chart for Supply Management.....	33
Figure 10. Supply management process with current issues	35
Figure 11. Ideal process flow chart for contract management.....	36
Figure 12. Contract management process with current issues.....	38

1. CHAPTER 1

CONCEPTUAL FRAMEWORK

1.1. Procurement in the supply chain of a company

1.1.1. Supply chain integration

Common to all manufacturing companies is the need to control the flow of material from suppliers, through the value-adding processes and distribution channels, to customers. The supply chain is the connected series of activities, which is concerned with planning, coordinating, and controlling material and services, parts, and finished goods from supplier to customer. (Stevens, 1989) Achieving an integrated supply chain to provide a higher service level, without incurring an undue burden of cost, requires that all activities along the supply chain must be in balance.

As shown in figure 1, the first stage called “baseline” is for a company with almost independent departments, the business is almost reactive, based on the quick fix and short-term thinking, and sometimes it actively demonstrates the incompatible systems and procedures covering all the different areas of the company (procurement, production, planning, etc.). For the second stage called “functional integration”, the focus is on cost reduction rather than performance improvement, which results in inadequate planning and customer satisfaction. The third stage regarding the “internal integration”, incorporates Just-In-Time techniques to support the material planning, there is full system visibility from purchasing to distribution, and synchronized demand management is also included. The last one called “External integration” extends the scope of internal integration to the outside of the business, embracing suppliers and customers, cooperation starts at the early stages of product development and involves all levels, design support, technology exchange, and long-term commitment between all parties of the supply chain.

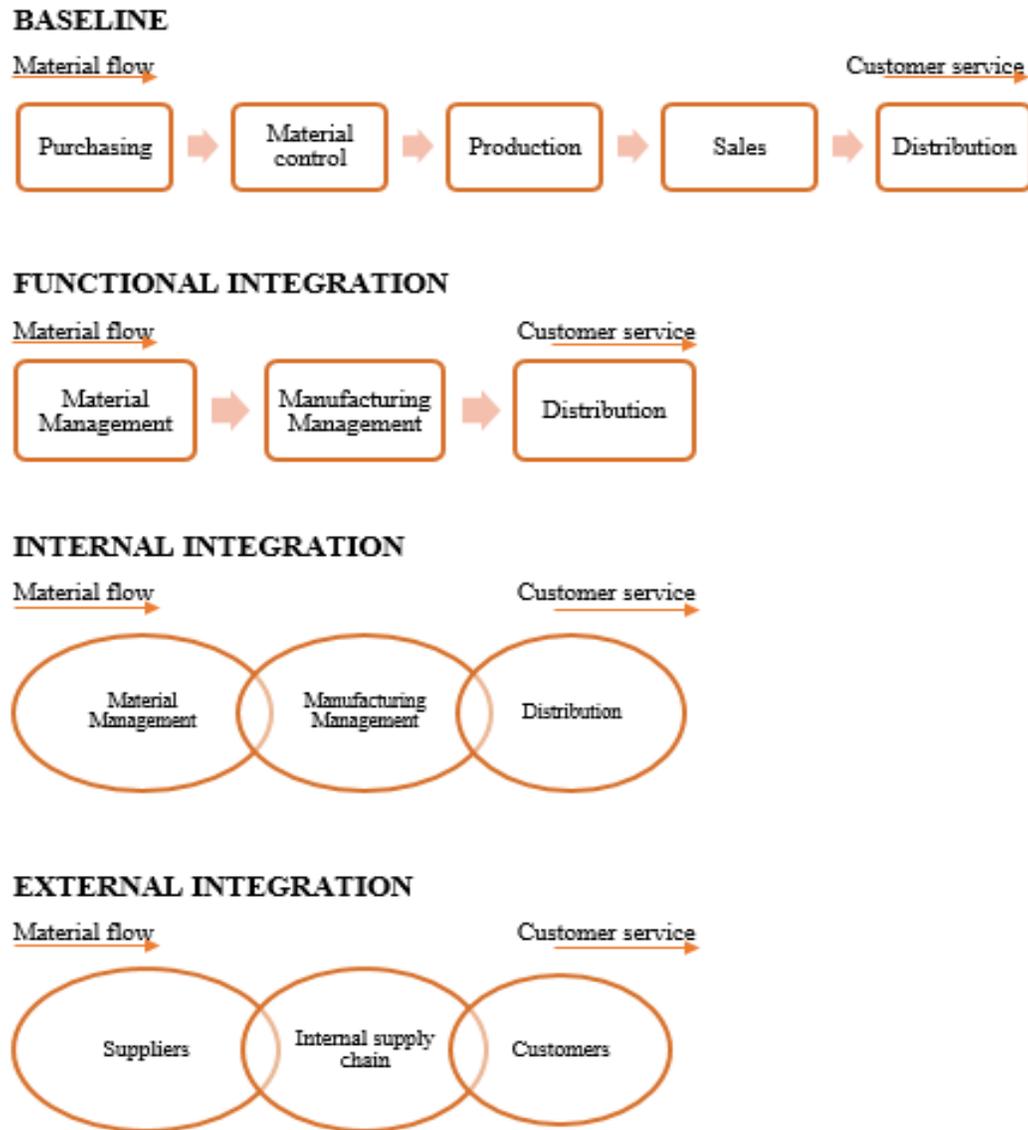


Figure 1. Integration of a supply chain (Stevens, 1989)

The scope of a supply chain begins with the supply, which is the process of searching, negotiating, and purchasing goods and/or services from an external source, also called procurement or purchasing. Supply chain strategies to the company's overall business objectives. A shared understanding of "value creation" builds the foundation for sustainable management of a companies' interconnected supply chains.

1.1.2. Procurement in a business

A basic purchasing process consists of identifying the needs or requirements of the internal customer or stakeholders. Subsequently, the procurement team chooses and prepares tools and processes to communicate with suppliers (external customers). Due to fierce competition, outsourcing has become a popular business strategy. The supplier's influence on the success or failure of the project is very important because the supplier's performance will affect the results of the entire business work. Also, choosing the right qualified supplier can increase the confidence of stakeholders, because it is more likely to lead to the achievement of project goals. Hence, an excellent procurement process is essential to achieve good results in any project. Therefore, selecting a suitable supplier for distribution and evaluating the performance of the supplier when executing the contract plays an important role in ensuring good results. (Borges, Alencar, & Miranda, 2017)

After having all the requirements of the stakeholders the next step is the preparation of RFQ (request for proposal) that must be sent to the suppliers for later on evaluate the proposals and choose the most convenient one in terms of price, quality, specifications, and delivery time. Afterward, the awarding process together with the purchase order generation, tracking and then, the submission of the good receipt and finally the invoice and payment to the supplier. (Arnheiter & Maleyeff, 2005)

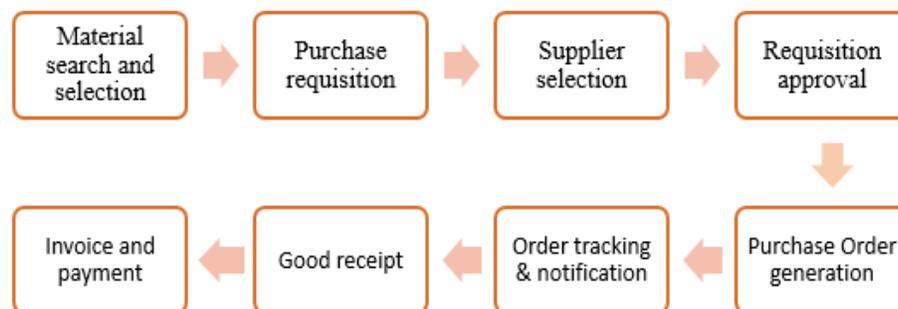


Figure 2. Procurement general process

To ensure the long-term availability of critical items at competitive costs, organizations require a well-developed purchasing strategy. As all business functions, procurement possesses segmentations that must work together, while remaining completely stand-alone: such as Indirect Procurement (IP) and Direct Procurement (DP), both crucial in business growth. Though indirect procurement and direct procurement are different functions that require unique approaches and systems, the good management of both will create a successful supply chain and spend management policies.

1.1.3. Direct Procurement and Indirect procurement

Direct procurement involves the acquisition of goods and/or services to be directly applied to the production of materials, goods, or services of the company. Direct procurement drives external profits, and it is responsible for revenues, costs, quality, and performance.

Instead, indirect procurement holds responsibility for the day-to-day of the organization. It is the sourcing of goods and services necessary for internal use. Even though indirect procurement has no direct impact on customer-driven profits, it is essential for the exact purpose of direct procurement to work. Without the adequate management of facilities, ability to travel for business, software to optimize functions, water, advertising, something would be missing in the company.

1.2. Six Sigma Methodology

Six Sigma is a set of management tools and techniques designed to improve business by reducing the possibility of errors. It is a data-driven method that uses statistical methods to eliminate defects. The etymology is based on the Greek symbol "sigma" or " σ ", which is a statistical term used to measure the deviation of a process from the process average or target. "Six sigma" comes from the bell curve used in statistics, where one sigma represents a single standard

deviation from the mean. If the process has six sigma and the average is 3 higher than the average and 3 lower than the average, the defect rate is classified as extremely low. (Kumar, 2021)

The six-sigma method is a project-driven management approach to improve the organization's products, services, and processes by continually reducing defects in the organization. Six sigma works as a business strategy that focuses on improving customer requirements understanding, business systems, productivity, and financial performance. The challenges and realities in implementing six sigma methods successfully are huge but so are the benefits. It's a structured approach used to achieve low levels of variability. The method has two points of view, the statistical approach, and the business approach. Briefly describing the statistical approach, it is defined as having less than 3.4 defects per million opportunities or a success rate of 99.9997%. However, for the business world where the present document will be targeted, it is a business approach used to improve business profitability, effectiveness, and efficiency of all operations to meet or exceed customer's needs and expectations. The six-sigma approach was first introduced in manufacturing operations and rapidly expanded to different functional areas such as marketing, engineering, procurement, servicing, and administrative support, once organizations realized the benefits. (Kwak & Anbari, 2004)

1.2.1. The design for six sigma (DFSS)

A methodology that utilizes tools and measurements to enable the organization to design processes and products that maximize positive impact and achieve minimum defect rates. DMAIC (Define, Measure, Analyze, Improve, and Control) is the term used to describe the phases of the approach to achieve continuous improvement (CI) with Six Sigma. The DMAIC is used when the process or product already exists but is not meeting the customer requirements at its full potential. (Salah & Rahim, 2019)

The “Define” phase defines the requirements and expectations of the customer, the project boundaries, and the process by mapping the business flow. The “Measure” phase measures the process to satisfy customer’s needs, develops a data collection plan, collects and compares data to determine issues. The “Analyze” phase analyzes the causes of defects and sources of variation prioritizing opportunities for future improvement. The “Improve” phase enhances the process to eliminate variations, develops creative alternatives, and implements an improved plan. The final phase “Control” verifies the process variations to meet customer requirements and develops a strategy to monitor and control the improved process. (Kwak & Anbari, 2004)

Six sigma projects have to be feasible, organizationally, and financially beneficial, planned, and selected to maximize the benefits of the implementations with the customer orientation.

An important element to be defined is the Voice of the Customer (VOC); it describes the customer’s feedback, experiences, and expectations. Under the ongoing project, the customers are internal, and as mentioned in the introduction, mainly buyers, category managers, and stakeholders will be the ones with direct benefits from the LPI implementation. Everyone in the Indirect Procurement team must be involved in the advancement of the LPI; those are the VOC needed to understand processes and to figure out if the guidelines stipulated by the company in its policies are aligned with the day-to-day activities of buyers, managers, and stakeholders.

1.3. Lean methodology and integration with Six Sigma

Lean was born in Toyota in Japan in the 1940s: Toyota Production System is based on the desire for continuous production, and this continuous production does not rely on long-term production to improve efficiency. It is based on the following knowledge: Only a small part of the total time and energy spent on processing adds value to the product for the end customer. It is obvious the opposite to mass production based on material resource planning (MRP) and complex computerized systems that was in development alongside the mass production philosophies

originally developed by Henry Ford. Lean is a methodology that is used to eliminate waste, variation (any activity that deviates from a standard), and work imbalance. Some of the benefits of lean thinking are decreased lead times for customers, reduced inventories for manufacturers and improved knowledge management, and more robust processes (as measured by fewer errors, and therefore less rework). (The Benefits of Lean Manufacturing: What Lean Thinking has to Offer the Process Industries, 2005).

Determining the value and defining the value proposition for a specific customer is the starting point. Without a deep understanding of customer value, manufacturers will not be able to move forward. Outside the process industry, many examples illustrate what everyone calls the "value proposition". An example is when consumers buy a washing machine, what someone may think is valuable is the ability to wash clothes at home. For other customers, its value may be related to cost, specific design features, and even color. The challenge for manufacturers is to develop a product portfolio based on those value propositions. The manufacturing industry develops products based on its specific customer base, product portfolio, and potential capabilities. (The Benefits of Lean Manufacturing: What Lean Thinking has to Offer the Process Industries, 2005)

In general, there are three types of activities in any work environment: value-added activities, business value-added activities, and non-value added activities. For an activity to be classified as a value-added one it must be an action the customer is willing to pay for, must be done right the first time and the activity must somehow change the product or service in some way. In respect to the business value-added activities also called secondary activities are those actions that do not add value but are currently necessary due to the limitations of the process.

The non-value-added activities also called waste, refer to any activity unnecessary to meet the needs of the customer (consuming time, resources, or space), for example, overproduction, defects, unnecessary inventory, inappropriate processing, excessive transportation, waiting, and unnecessary motion. Initially, waste can be easily identified in all processes, and making changes early can save a lot of money. As the process continues to improve, as the company strives to

achieve a waste-free process, the degree of waste reduction will become greater and greater. Continuous improvement is the core of lean thinking. (The Benefits of Lean Manufacturing: What Lean Thinking has to Offer the Process Industries, 2005)

Another element of lean is the reduction of variability at every opportunity, including demand variability, manufacturing variability, and supplier variability. There is also the goal of reducing time variation by establishing standardized work procedures. Lean is based on some principles such as understanding what customers value, mapping the value stream of all the activities, using the just-in-time methodology, and seeking perfection by continuous improvement. (The Council for Six Sigma Certification , 2018)

Since Six Sigma and Lean, are both considered as continuous improvement methodologies with common goals, the effective integration of six sigma and lean methodologies provides a company with a competitive advantage and the term used for the merge of both processes is Lean Six Sigma, where there are Some common tools such as brainstorming, process mapping, standardization, and mistake-proofing.

Lean Six Sigma can help achieve better system-level performance by improving the quality and accuracy of processes; it also encourages the use of a common vision, language, and tools suitable for various problems and departments. To begin with, the implementation of Lean Six Sigma, selecting and implementing the right tool from Lean is the key.

The integration of Lean and Six Sigma can follow the DMAIC road map, and it is not necessary that each of the phases will be a major milestone in the project. Some projects may focus mainly on fixing a measurement system while other projects may merely be solving a problem related to the lack of standard procedures, which means the project does not require a lot of data analysis. In some projects, it is expected that there will be more usage of Lean tools and it is not necessary to pass slowly through each of the DMAIC phases. (CFI, 2021)

Starting with the “Define” phase of the DMAIC to identify waste and analyze it, the SIPOC can be used to understand the voice of the customer including value-added and non-value added activities, key performance indicators, and workloads. Then, determine whether to focus on process flow or variability in order to select the next tools to be implemented.

For the measure part of the DMAIC, there must be a mapping of the current state value-stream and the use of extra activities to approach and identify any quick improvement actions. Therefore, the analysis focuses on studying unnecessary steps and ways to minimize waste within and between steps, and the last part of the DMAIC about improvement and control for Lean Six Sigma, optimizes and standardizes the process eliminating unnecessary steps or at least minimizing waste within it, also developing standard operating procedures and best practices while building an action plan. (CFI, 2021)

The Lean Process Improvement methodology aims to simplify work processes, minimize waste, manage inventory, reduce redundancy, improve quality, and foster value-added work processes that ultimately deliver value to customers. Generally, improvements in lean processes are aimed at making incremental changes to existing agreements. These expansions are carried out at critical moments, using a phased approach to optimize the workflow. Therefore, the goal of every lean process improvement plan is to ensure that all tasks and workflows in the entire supply chain are efficient and effective. Therefore, the improvement of lean processes can enhance customers' awareness of value and overall satisfaction.

2. CHAPTER 2

STATE OF ART IN OTHER INDUSTRIES AND CURRENT PROCESS IMPROVEMENTS IN THE COMPANY IN STUDY

2.1.State of art in various industries

Currently, most manufacturing organizations must respond to rapidly changing customer needs, desires, and tastes. To compete in a constantly changing environment, companies must find new ways to enable them to remain competitive and flexible at the same time, so that their companies can quickly respond to new demands (Black, 1991). As global competition intensifies, attention has shifted from improving efficiency through economies of scale and internal specialization to meeting market conditions in terms of flexibility, delivery performance, and quality (Yamashina, 1995). Changes in the current business environment are characterized by fierce competition on the supply side and fluctuations in customer demand on the demand side. In order to meet the challenges brought by the modern competitive environment, manufacturing organizations must inject quality and performance improvement plans in all aspects of their operations to enhance competitiveness. To start with, there are some reviews that present the overview of various continuous improvement implementation practices demonstrated by manufacturing organizations globally.

A case study conducted at Nichols Foods, which produces food showed a lack of standard operating procedures, strength, and structure. The study describes how company values have improved the working environment of employees and motivated them to achieve excellence. The case describes how the company used lean technology and team training to implement an improvement plan. The results show that the rate of defective products is reduced, changes over time are reduced, and production efficiency is improved. (Lee M.)

Another study described the benefits of including lean methods in industrial technology. The case study describes the steps of implementing lean thinking in a typical Midwestern company developing a dynamic three-resin fiberglass rod, which has a tensile strength 100 times higher than steel. After the implementation of lean thinking, it can be expected to reduce the space used in the building, reduce the cost of material handling, and reduce the scrap rate. (Lee S. D., 2000)

A study made for the continuous improvement and innovation practices of French SMEs (small, medium enterprises) shows the driving forces of change in French SMEs, short- and long-term goals, sources of innovation, and the nature of innovation management. Respondents were asked to consider recent successful innovations in the product, and then pointed out the importance of using many items as a source of a specific innovation. The top nine sources of innovation discovered, including the launch of new products, continuous improvement in work processes, fundamental changes, more attention to marketing/sales work, reduction in the number of indirect employees, improvement in employee capabilities, and improving product and service quality, improve management quality, and strive to improve supplier performance. The study identified two groups of small and medium enterprises. The first group reported satisfaction with its organization's performance in product innovation and reported its organization's innovative strategic approaches. The second group includes small and medium-sized enterprises that are satisfied with the current actions taken to improve short-term performance. Further analysis shows that the second group is more likely to report greater emphasis on performance management methods. (Soderquist, 1996)

After successfully institutionalizing the continuous improvement projects in the organizations, a concerted effort must be made to ensure the continuous deployment of continuous improvement in the manufacturing organization, because only through the continuous deployment of a world-class continuous improvement program can manufacturing improvements be achieved. Changes introduced to the organization through continuous improvement activities must take root and become a fixed part of everyone's daily work. Improvements must be seen as a "change process", not a "project", otherwise, the capabilities acquired by the organization may gradually disappear

after the project is completed. Once key achievements have been achieved through strategic implementation and institutionalized CI plans, the CI team should continue to work hard to find ways to improve their success.

2.2.The current situation for the home appliances company

The company's name in the study is needed to remain anonymous because of confidentiality requirements. Understanding more about the company in study, it is a home appliances company with a total number of employees between 50000 and 80000, more than 40 manufacturing facilities around the world, and more than 50 million products sold in 170 countries.

More specifically, the EMEA region where the current project will be implemented handles a spend of more than 3 billion only for the procurement department of the company. One of the main goals of the procurement area is to standardize processes and tools with the discipline to achieve an optimum balance between short/mid-term actions and robust long-term strategy. The company also looks forward to improving its competitive advantage through the increase in productivity while reducing costs and having a partnership and trust-building with their vendors, to finally improve their supplier relationship management.

One of the most important years for the company was 2020. Some implications on the home appliance industry due to the global pandemic were an increase in the demand almost three times higher than the year before, but there was also price increase for some raw materials, that also affected the logistics of the procurement activities because of the freight cost increase, unavailability of containers and other means of transportation making it difficult to supply the higher demand they were facing.

The indirect procurement department played a very important role in the negotiation strategies required to manage that cost increase and the acquisition of materials and means of transport for delivering its products. All of it was managed thanks to their strategy and organization when

performing the negotiation and procurement activities that will be described later on. For the facts mentioned before, improving processes, eliminating all the time-consuming and non-value added activities in the procurement department is very helpful for the company to focus on the fundamental activities that are necessary to accomplish their goals and strategies.

2.2.1. Existing Procurement Center

In the need for standardizing procedures, manage the flow of so many requests daily from stakeholders, vendors, and buyers, the North American region of the company, a couple of years ago decided to create a procurement center.

The procurement center was first introduced in the company for one specific region, due to the need of merging the strategic and operational part of the procurement area. With the combination of both components, employees would be able to develop a wider view of the processes, not only focusing on specific tasks but being able to perform strategic analysis along with understanding the business decision-making and carrying out the basic tasks for negotiation. It was seen as talent development and improvement opportunity to expand the employee's path in the company but also as a way to standardize processes and to have all the information in one place to enhance the process flow since before the procurement center, the operational part depended on the strategic part to accomplish their activities.

Nowadays, the procurement center consists of five people leaders in charge of project definition involving, spend data analysis, assists category leads by conducting supply market research, spend data analysis, end to end management of request for proposals, they act as people leaders/coaching and give guidance to associates.

On the other hand, there are also fourteen business associates responsible for the day-to-day operations and projects such as quoting and bidding processes, creating the scorecards and pugh

matrix, being the vendors first point of contact, following up procure to pay requisition, assuring policies and procedures, aligning the category strategy, saving projects and analytics, managing issues with replication failure and blocked invoices.

Some facts about the workload of the procurement center annually are: 6094 procure to pay requisition, 7800 emails requesting support with a system issue solution, to get training or to know a requisition current status, 28000 emails that each team member receives related to open topics follow up, 3050 calls for the call center option.

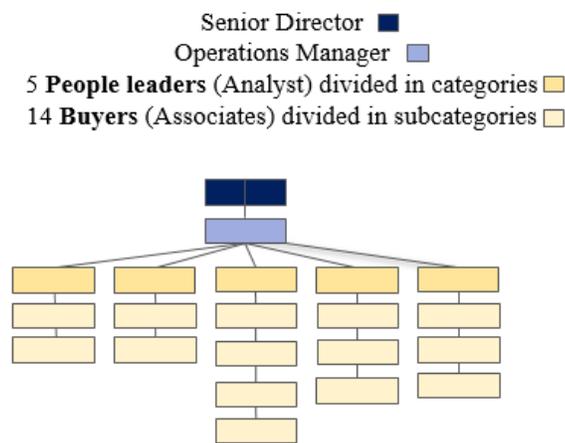


Figure 3. The organizational structure of the existing procurement center of the company

There is a software that runs all the information required for contract management, vendor management, e-sourcing, e-procurement, and another software that runs all the “customer” service services.

For the contract part, the software works as a means of consultation about dates, details, conditions, and overview of the contracts so that way every party interested has access to all the information in one place. Referring to the vendor management, the procurement center team handles the inputs and updates of the vendor information such as business name, bank accounts, new contact mail, and phone number. The e-sourcing relates to the launching of tenders, the

requisition of documentation to the vendors invited, and management of requests for proposal templates. Lastly, the e-procurement section manages the requisition, approval, and final check of purchasing orders.

Furthermore, the software used for the customer service of suppliers and stakeholders is the most used tool to resolve questions, doubts, or issues with policies, requisitions, or purchase orders. Being available 100% of the time managing and solving issues related to all the activities mentioned before has been crucial for the soft flow of the procurement process and the coordination between all the stakeholders linked to the procurement activities.

2.2.2. The previous implementation of Lean Process Improvement in the company

Approximately five years ago, the company in question implemented a lean process improvement procedure as a need to improve processes and to avoid waste. More precisely to have better visibility on what the company does, their customers, targets, and why they do what they do. The project was carried out for many departments of the company such as direct procurement area, product development, quality, and finance. In other words, for all the goods and services purchases that go directly to the manufacturing of the final product.

The basic flow of the process was to insert inputs such as global process, people feedback, key performance indicators monitoring, and individuals' best practices. Then, mapping and prioritization of the processes along with improvement and creation to finally have standard processes and key performance indicators in place.

The whole Lean Process Improvement mapped 71 processes in the company with 14 people in the project team. After the mapping was done with a SIPOC by area, a maturity/impact table helped define how mature processes were and which ones were more suitable for improvement depending on customer feedback. Two processes were selected, and then a flow diagram for each process

implementing lean methodology was done trying to understand deeply how the process works and where the bottlenecks were to find ways to improve.

After many analyses for the processes, the main issues were detected and so an action plan started. Process improvement helped standardize two departments of the company, facilitating employees with their daily activities, avoiding small issues that used to cause lots of reprocessing and waste of time.

3. CHAPTER 3

LPI TOOLS AND APPLICATION IN THE IP DEPARTMENT

Focusing only on the Indirect Procurement department of the EMEA region, with 28 people in the team, many tasks, steps, or activities are performed as a means to provide to the factories the inputs needed for producing the appliances. Spare parts, commodities, and final goods come from over the world to the company's factories to start production and then the distribution of the final products to retailers or direct clients. A process is the sum of some number of steps, each step requires resources and at the same time, processes are made up of components that include inputs, outputs, events, tasks, and decisions.

Inputs as the first element of a process referred to anything that enters a process or is required to enter a process to drive the creation of outputs. Understanding all inputs in a process is a matter of importance since inputs can cause errors or defects in the process, as well as the resources required for a process to run, also, identifying extraneous inputs that are not required, the costs and how those inputs are related to the next steps of the process. Then the output of a process is the results achieved when adding value to the inputs, the outputs are the services or products used by the customer of the process. Those customers could be internal or external, meaning the employees or the final client that purchases a product. The employees of the Indirect Procurement field of the Company are the customers for the ongoing project for example and for completing a whole process, the tasks or activities are the core of the process. Since outputs can be inputs of future processes and input can be output from previous processes there is a notable relationship between the components of a process, then a process can be very complex plus there are also decisions to make to improve or change the steps of a process related to the tasks and how those should be done.

When working with teams to improve processes, the owner of each process must be defined, it does not have to be necessary people with decision-making power, there could be also people

without decision-making power but she or he is held responsible for the performance of the process. (CFI, 2021)

3.1.The SIPOC diagram

The SIPOC diagram is a mapping tool used in TQM (Total Quality Management) and Six Sigma projects. SIPOC stands for “suppliers” which are the people, processes, and organizations that supply inputs to the process, next the “inputs” explained before, “process”, “output”, and “customers”, the ones that make use of the outputs of the process. The SIPOC helps to understand how a process in a business environment is linked to another process. A SIPOC diagram can be created either for individual exercise or a team environment; it can also be used at any level of a business. (CFI, 2021)

During the “Define” step of the DMAIC, the SIPOC diagram is used to understand the voice of the customer and prepare for the Value Stream Mapping (VSM), which in the LPI project to be developed; that voice is given by the buyers and category managers of the Indirect Procurement team.

When building the SIPOC diagram shown in figure 4, a template from a previous LPI project of the company was used. The processes, sub-processes, owner of each subprocess, inputs, outputs, suppliers, and customers were defined by the three team members in charge of the development of the current LPI, two of them are category managers and one of them is the Director or the IP team.

After designing the first draft of the SIPOC diagram, four buyers of the IP team were contacted to revise the first draft SIPOC and give the team feedback from their perspective, that because buyers are the foundation of the team, they are the ones in contact with the stakeholders and at the same time with vendors. Those buyers commented and completed what was missing in the first draft of the SIPOC, such as processes or data related to the inputs and outputs. Due to the experience and knowledge of the Indirect Procurement process that every person that contributed

to the making of the SIPOC diagram has an accurate SIPOC loomed. Hereunder a description of the main procurement process defined by the LPI team considerations and buyers feedback:

Commodity Strategy	Definition of the strategy that will be implemented during the year for the optimization and betterment of the key performance indicators for each commodity.
Procure to Pay / Supply Management	Includes the core activities such as receiving the requests for quotation, doing all the negotiation, awarding to suppliers, approvals, and follow up of policy compliance and system issues
Price Management	Process more oriented to the category of supply chain indirect purchases.
PO management	Process more oriented to the category of supply chain indirect purchases.
Pre-Invoice management	Process more oriented to the category of supply chain indirect purchases.
Vendor Master Management	All the procedures related to the vendor search, documentation, creation, and updates
Contract Management	Encompass all activities associated with the documentation, approval, and management when a contract needed,
Results planning and forecasting	Tracking and analysis of the key performance indicators of the IP department
Risk Management	Full financial supplier analysis
Profit Plan preparation	Process-driven by the strategy of each category
Supplier relationship management	Meeting with suppliers to follow up on contracts, issues, updates
Waste selling management	Management of offers and payments
Stakeholders relationship management	Regular meetings since stakeholders and the IP team must be aligned to work smoothly and coordinated.

Table 1. Indirect procurement purchasing processes for the company

Other than the definition of processes, the sub-processes for each process were also defined; inputs and outputs were added to the matrix including the key performance indicators of the team such as productivity, free cash flows, and the number of new suppliers, coverage of purchase orders, and contract coverage.

After filling all the cells of the SIPOC, four extra columns were added, the first one called “workload”, the second one called “tools”, another one called “process type” and the last one for brainstorming. The information contained in those extra columns cannot be shown as they include confidential information about the company so only descriptive information will be provided below.

The “workload” column contains a drop-down list that includes workload frequencies such as “never, once per year, once per month, twice per month, once per week, twice per week, daily, by request” per each subprocess.

The workload column will later help to analyze how often each sub-process is needed to be done. The “tools” column will help contribute to checking if all the buyers and category managers are aligned or not with the tools stated in the indirect procurement policy such as specific files, software, or documents, hence decide which processes require more standardization or even extensive training related to the tools needed for each activity.

The “process type” column has also a drop-down list with the three process types mentioned before (value-added activities, business value-added activities, and non-value-added activities); it will help understand which are the more critical processes from buyers and category managers’ perspective, even if it will not be the final statement since many other tools are demanded.

The last column “brainstorming” is kind of a “free” column for the buyers and category managers who later filled the SIPOC diagram to give feedback including improvement ideas, claims, and general comments that will be taken into account for improvements.

The specified columns were included in the SIPOC which was sent to the 28 people of the team afterward. Once each person filled the final SIPOC, answers were collected and analyzed, generating a final SIPOC with a plain perspective of what the day-to-day buyers and category managers look like.

SIPOC FOR LEAN PROCESS IMPROVEMENT INDIRECT PROCUREMENT						
PROCESS NAME	PROCESS OWNER	SUB PROCESS	SUPPLIER	CUSTOMER	INPUT	OUTPUT
COMMODITY STRATEGY	CM/BUYER	Spend analysis by category	Category Manager, stakeholder	IP Director Stakeholders	New Policies requirements, Budget, Service Level Agreement, Market data, DPO file, IP spend file.	Defined process strategy
		GSS Category strategy				
P2P/SUPPLY MANAGEMENT	BUYER	Vendor scouting	Buyer, Stakeholder, Payable Team, Help Desk	CM, stakeholder	Stakeholder's budget, Service Level Agreements, volumes, compliance, deadlines	PO, supplier awarding, business continuity, catalog
		REQ checks, policy compliance and issues				
		REQ follow up in case of system issues				
		RFQ preparation				
		RFQ analysis				
		PUGH Matrix creation				
		Negotiation				
		Price catalog updates				
		RFQ awarding				
		REQ approval, PO				
		Invoice, Payment issues				
PRICE MANAGEMENT	BUYER	Ocean table preparation - upload in SAP	Buyer	IP Team, Stakeholders	Buyer negotiation	Price list, vendor awarding
		Ocean SAP maintenance				
		Road table preparation - upload				
PO MANAGEMENT	BUYER	Road assignment table preparation	Buyer	IP Team, Stakeholders	Stakeholder Information	PO
		PO creation for Road/Ocean for each legal entity				
PRE-INVOICE MANAGEMENT	BUYER AND CONTROLLER	Guarantee all data for pre-invoice creation	Buyer, Stakeholder	Finance controller	Stakeholder Information	Pre-invoice, Authorization differences list
		Certificate the differences between invoice and pre-invoice				
VENDOR MASTER MANAGEMENT	BUYER	Preliminary DD checks	Vendor	Stakeholder	Clear supplier data, Supplier Financial scorecard, New vendor proposal template	Potential new supplier list and vendor codification
		Collection of Vendor Documentation				
		Vendor creation				
		Vendor update (bank details)				
		Vendor update (other than bank details)				
CONTRACT MANAGEMENT	BUYER	Vendor blocking/unblocking	Legal, sourcing excellence	Vendor stakeholder, IP director, legal	Contract data, plan timing	Contract signed and stored
		Contract finalization				
		Contract approvals / signature				
		Contract archiving				
RESULTS PLANNING & FORECASTING	BUYER	Intake form	Buyer	IP Team	Purchases data, savings, DPO data, SBO data	KPI Results
		Drawing up contracts and Sew				
		Management of tracker recurrent/non recurrent file				
		Management of FCF				
RISK MANAGEMENT	CM	Management of SBO	Finance, CM	Procurement leadership	Financial Distress Supplier Management, dependancy	Supplier risk score
		Management of PO coverage				
PROFIT PLAN PREPARATION	CM/BUYER	Financial Distress Supplier Management	CM, stakeholder, finance	IP Team	Gross productivity, market impact	PP
SUPPLIER RELATIONSHIP MANAGEMENT	CM/BUYER	Dependency	Vendor	IP Team, Vendor	Vendor/buyer information	Harmonization
WASTE/SCRAPS SELLING MANAGEMENT	CM/BUYER	PP preparation	Stakeholders, buyer	EHS, stakeholders, IP team	Scrap, production	Cash inflow
		Meeting with current suppliers				
STAKEHOLDER RELATIONSHIP MANAGEMENT	CM/BUYER	Getting offer for spot sales	Stakeholders, IP, Legal	IP Team, Stakeholders, Legal	Stakeholder/buyer information	Harmonization
		Checking for the sales payment with accounting				
		Meeting with stakeholders operative				
		Meeting with stakeholders for project prioritization and spending analysis				
		Support to Stakeholders				
One off activity for Decommissioning						
Quality checks for NEW tools						
GDPR Compliance						

Figure 4. SIPOC diagram

3.2. Impact/Maturity chart

The next step after developing the SIPOC is building a maturity/impact chart. A maturity chart is kind of a “checklist” that evaluates how well-developed processes are. Maturity alignment indicates that an organization must implement the appropriate managerial and operational processes and systems according to the desired maturity level. The maturity matrix is also a powerful tool to understand where barriers may exist in a process. The maturity chart implemented in the current project consists of six maturity levels as seen below in table 2.

Maturity level	Description
Level 1	Ad-hoc/semi-chaotic so performance is unpredictable
Level 2	Repeatable basic control. The ability to deliver repeatable tasks may be disconnected from customers' expectation
Level 3	Defined process. Starting to identify customers' requirements and measure satisfaction
Level 4	Managed process. Measurements and results are collected for process and product quality
Level 5	Optimized process. Measurements and results are collected for process and product quality
Level 6	Robust process

Table 2. Maturity levels

The matrix comprises the maturity levels in the rows and all the processes to be examined in the columns. The 13 processes in the study during the SIPOC matrix are the same taken for the maturity chart. The first step is filling the cells according to the information each process fulfills. Until the first “no”, there is where the level of maturity is defined for each process, and a formula shows an indicator of maturity as shown in figure 5.

After filling the matrix all the processes in the indirect procurement department reached at least the second level of maturity. That actively demonstrates that all processes have almost repeatable basic control but are still unpredictable.

		Process						
		COMMODITY STRATEGY	P2PI SUPPLY MANAGEMENT	SAP PRICE MANAGEMENT (SC)	PO MANAGEMENT (SC)	PRE-INVOICE MANAGEMENT (SC)	VENDOR MASTER MANAGEMENT	CONTRACT MANAGEMENT
MATURITY LEVEL	MATURITY DESCRIPTION	Process A	Process B	Process C	Process D	Process E	Process F	Process G
Level 1: Initial Ad-hoc / Semi-chaotic	Performance is unpredictable	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Process is included on the Impact Maturity Chart?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Level 2 Repeatable Basic Control	Process Owner is Identified?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	SIPOC or equivalent is documented?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Standard work in place identified?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	QCPC approach defined?	No	No	No	No	No	No	No
Level 3: Defined Process	Ability to deliver repeatable, may be disconnected from customers' expectations							
	Process metrics (minimum: escapes and delivery) are defined?							
	Significant progress in development of standard work per plan?							
	Starting to identify customers' requirements & measure satisfaction							
	Current state process mapped?							
	QCPC data are collected and analyzed?							
	Customer-agreed Quality & Delivery Metrics/Targets being tracked?							
		1/4	1/6	1/6	1/6	1/4	1/6	1/4
		1.4	1.6	1.6	1.6	1.4	1.6	1.4

Figure 5. Maturity table for the IP processes of the company

In the meantime, the impact matrix is implemented. It helps understanding how each process is being influenced by some criteria. The main criteria for the current project are the impact of the key performance indicators also used in the SIPOC (productivity, free cash flows, number of new suppliers, coverage of purchase orders, and contract coverage) for every process. The impact matrix consists of linking the criteria with the processes by giving each process a score between 0 and 5 being 0 not applicable, 1 low impact, 2 for low to medium impact, 3 for medium impact, 4 medium to high impact, and 5 high for impact as shown below in figure 6.

Processes	COMMODITY STRATEGY	P2P/ SUPPLY MANAGEMENT	SAP PRICE MANAGEMENT (SC)	PO MANAGEMENT (SC)	PRE-INVOICE MANAGEMENT (SC)	VENDOR MASTER MANAGEMENT	CONTRACT MANAGEMENT	RESULTS PLANNING & FORECASTING	RISK MANAGEMENT	PROFIT PLAN PREPARATION	SUPPLIER RELATIONSHIP MANAGEMENT	WASTE/SCRAPS SELLING MANAGEMENT	STAKEHOLDER RELATIONSHIP MANAGEMENT
Deliverables	Process A	Process B	Process C	Process D	Process E	Process F	Process G	Process H	Process I	Process J	Process K	Process L	Process M
IMPACT ON PRODUCTIVITY/SAVINGS	4	5	5	1	3	1	3	5	0	5	3	5	3
IMPACT ON FCF	4	1	1	1	3	3	3	5	0	3	3	0	3
IMPACT ON SBR	4	1	1	1	1	5	3	5	4	3	4	0	3
IMPACT PO COVERAGE	3	5	1	5	1	1	1	3	0	3	3	0	3
COST AVOIDANCE	3	5	1	1	1	1	5	4	0	3	4	3	3
PO AFTER THE FACT	1	5	1	1	1	1	1	1	0	3	3	0	3
NEW CONTRACT COVERAGE	1	0	1	1	1	1	5	1	0	3	0	0	3
Total	2.9	3.1	1.6	1.6	1.6	1.9	3.0	3.4	0.6	3.3	2.9	1.1	3.0

Figure 6. Impact chart

Following the completion of the maturity and the impact chart, the template used generates the scatter plot graph showed in figure 7 to see the relationship between the process maturity found in figure 5 and the impact on objectives in figure 6.

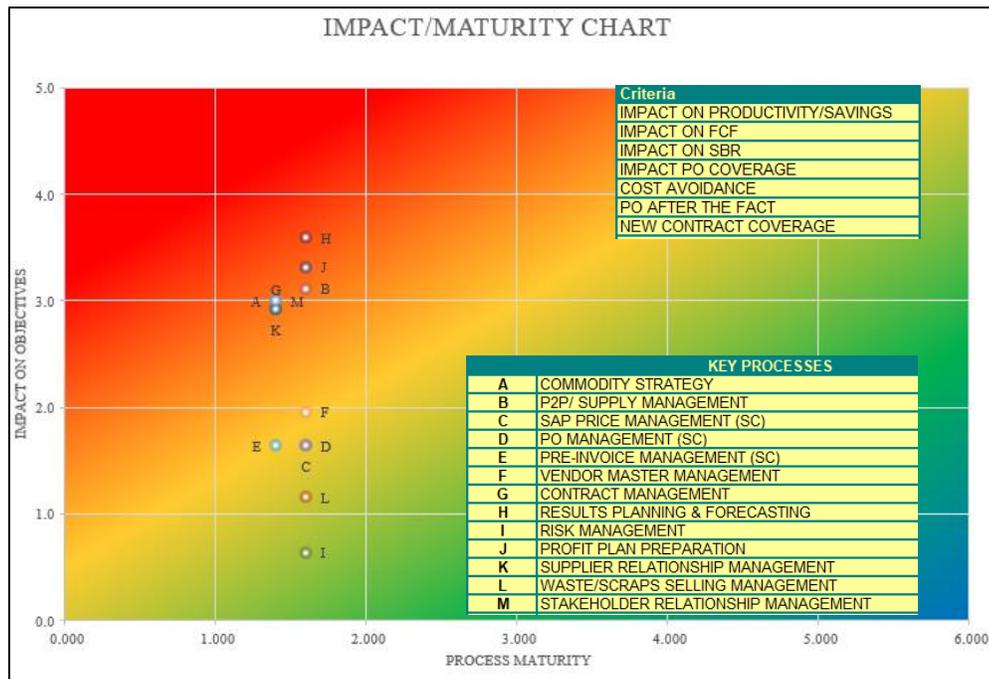


Figure 7. Impact maturity chart

As seen in figure 7, processes A, E, G, K, M are the most immature processes, being G the one with a higher impact on objectives and E the one with lower impact on objectives. For the rest of

the processes, B, C, D, F, H, I, J, N, achieving a maturity level closer to 2, and being B, J, H the ones with the higher impact on objectives.

Knowing that all processes need improvement since all of them are under the second maturity level, but because of many factors such as time and extra resources needed, only two processes have been selected by the lean process improvement team to be improved.

The first process due to its low maturity and high impact on objectives is process G which refers to contract management. When developing the SIPOC and having the buyers' feedback about each process and subprocess, there were many complaints about the way contracts are managed from the beginning until the repository part. The second process chosen for improvement is process B called P2P/ supply management. Process B is the core process of the indirect procurement team since it consists of all the requests, negotiation, and awarding of purchase orders to the supplier, so for that reason even if it is not the process with higher impact, there is a determinative factor such as the importance of the everyday activities of the process for the indirect procurement department, and the supply management process is a daily process with essential subprocesses for the indirect procurement performance. The next step after having the results of the impact/maturity chart and having decided which processes are suitable and feasible for improvement a deeply detailed flow chart for each process must be done.

3.3.Flow Diagram

Lean focuses on process flow with minimum waste, and the idea is to improve speed and increase productivity by eliminating all sorts of non-valued added activities and waste.

Flow charts provide a step-by-step picture of the processes and focusing on the business process, it is a collection of tasks performed by stakeholders to deliver results (products or services) to customers. Any business process can be made into a flowchart or an intuitive representation of

the process. The main figures used in the present flow chart to be developed are explained in figure 8.

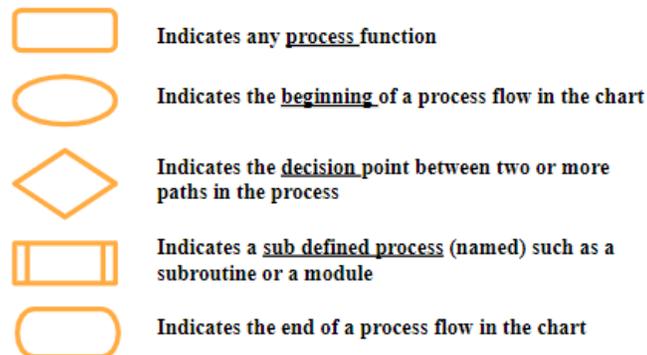


Figure 8. Flow chart figures definition

First, to create the company’s flowcharts for both contract management and supply management processes, a very detailed description of the process was requested to some buyers to understand how things actually work and how things should ideally work. The feedback obtained to build the flow chart is the one shown in figure 9 and figure 11.

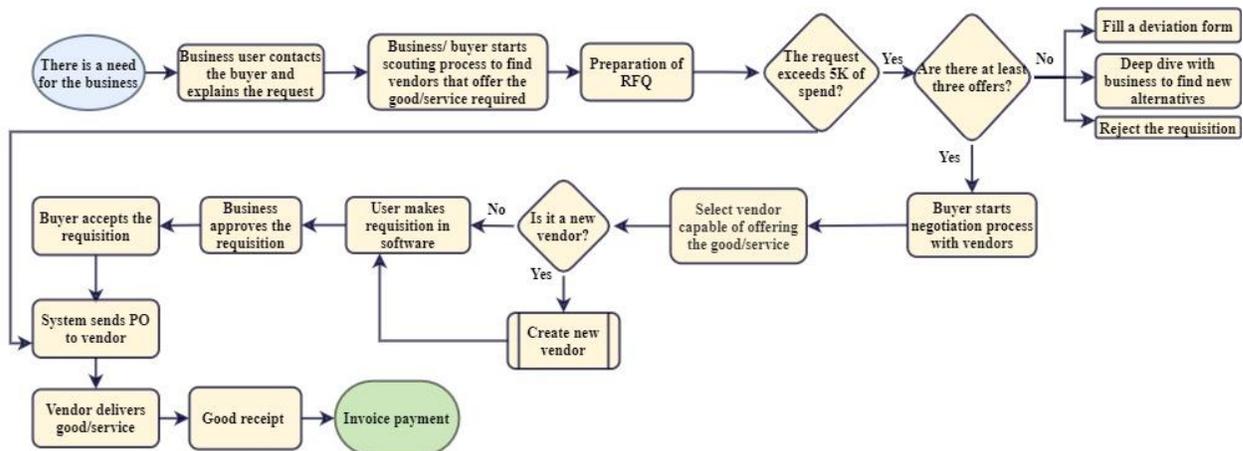


Figure 9. Ideal process flow chart for Supply Management

As a result, a full description of the supply management process starts with the moment where there is a need from any of the indirect procurement stakeholders; then, there is the prior contact

between the stakeholder or business user with the indirect procurement buyer. The next step is the creation of the request for proposal (RFP) which must be according to the indirect procurement policy, where there is a check needed to understand if the request is above 5000 EUR or not. If it is lower than the threshold, the request is sent directly to the vendor selected by the stakeholders. On the other hand, if it is higher than 5000 EUR then at least three offers from vendors are required, if there are not at least three offers, the stakeholders must contact the buyer to explain the reason why some offers are missing, or the stakeholder must fill a deviation form or the buyer will reject the requisition.

Therefore, when the buyer confirms all previous steps, the negotiation with vendors starts until there is a vendor that complies with the company policy, and with the terms and conditions of the request. Once the vendor is selected, if it is a new vendor, then the vendor management process must be performed, if it is not, the stakeholder makes the requisition officially in the system, the business and the buyer also approves, the system sends the purchase order to the vendor, the vendor delivers the goods/services requested and the process finalizes with the invoice payment in charge of the financial department.

The process described before in figure 9 is the one according to the companies policy but, in the real day-to-day activities of the buyers, there are many issues and inconsistencies with the ideal process. First, as seen in figure 10, usually stakeholders upload the request in the system, without giving the buyer a prior background of the requisition needed, neither the opportunity of negotiating with vendors, so once the buyer sees the requisition in the system, he has to go back in the process, checking if the request that arrived directly in the system is compliant with the procurement policy. Sometimes there are cases where the invoice arrives and the purchase order had not even been created in the system, which actively demonstrates that the supplier delivered the service without a purchase order, implying the buyer wasn't taken into account for the purchasing process.

Secondly, when the requisition uploaded in the system does not comply with the policy there are lots of reprocessing and time-consuming activities. The buyer has to go back through all the steps of the process, making sure the vendor is created, also that the RFQs are correct, and checking if it is above the threshold if the number of RFQ requested by the policy is compliant, so those are activities that delay significantly the supply management process.

The last issue found in the supply management process is at the end of the flow chart, when it comes to invoices, it is not a buyer activity but it is a daily time-consuming activity for them since every time there is a blocked invoice because of prices differences or terms of payment, vendors contact the buyer to try to fix the issue, then the buyer has to contact the stakeholder to manage it and so going back and forth until the issues are fixed and invoice is paid to the buyer. Those are activities the buyer does to keep an optimal stakeholder and vendor relationship management.

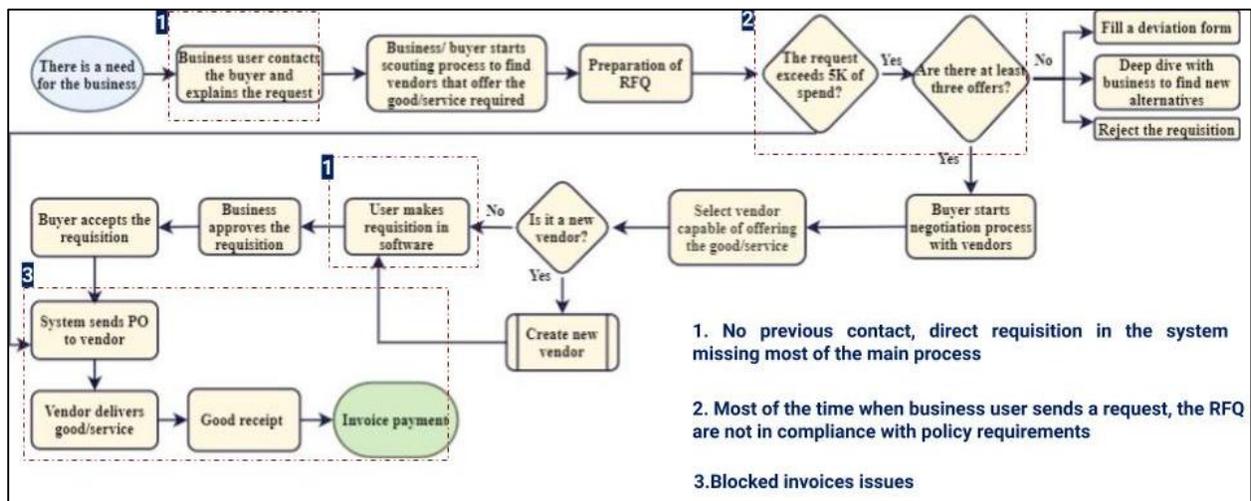


Figure 10. Supply management process with current issues

On the other hand, as shown in figure 11, the contract management process starts with a request from a stakeholder/business user, if the requisition falls in one of the policy requirement for contracts which are expenses higher than 100.000 Euro for existing business requisition, 500.000 for new requisition or requirements that affect confidentiality issues, then a new contract

management process must be implemented, if not then the requisitioner must follow the company policy for non-contract requisitions.

Once the buyer gets the requisition, he/she must contact the legal department through an email explaining the background and needs for the new contract. After that, the buyer fills in an “intake” form which includes specific questions and details about the contract in the study, and once legal approves the intake form, the buyer, the stakeholder, and the legal department arrange a couple of meeting to create a template with all the specifications, policies and requirements for the contract to share it with the vendor afterward. Immediately the exchange between the vendor and the buyer starts until they both agree on the terms and conditions of the contract and then, the contract is sent for signing to the vendor and the power of authority. Finally, when the contract is signed, it must be archived in a repository file (google sheet) that is shared with all the indirect procurement team.

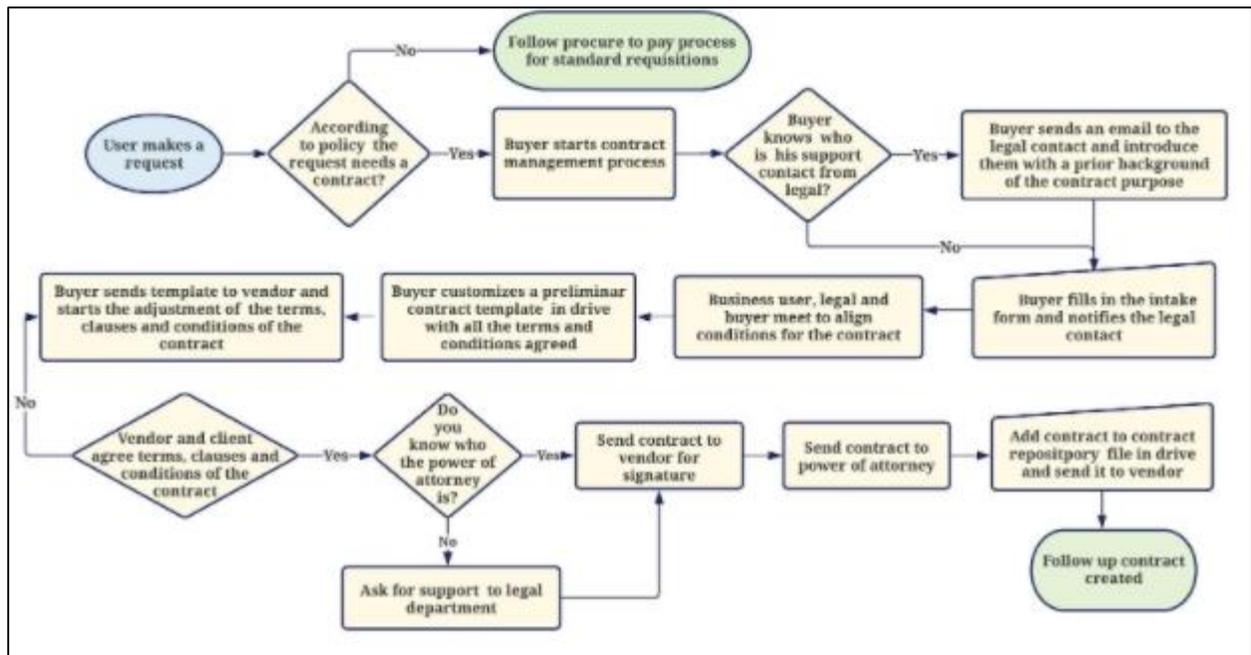


Figure 11. Ideal process flow chart for contract management

The process described before is the ideal one. Now, focusing on the real step-by-step process for the contract management, as seen in figure 12, the first inconsistency starts with the knowledge of the person the buyer should contact from the legal department. When the buyer doesn't know who to contact because of the type of contract, or the country where the contract is going to be implemented, or other facts, there is a waste of time while sending emails to the legal department to ask who is the person in charge, then waiting for the answer that usually takes very long, then being able to contact the right person and fill in the intake form. After so, the second issue is about the lack of support from the legal department when creating the template of the contract. Buyers are not experts in legal problems, so deep guidance from a legal figure is needed. Sometimes legal stakeholders take too long to answer or don't even answer to the buyers' needs. It creates a bottleneck during the process causing a delay in the next steps.

The third situation is the lack of coordination about the power of attorney, it is not always the same person the one in charge of the signing of contracts so that activity of asking back and forth who is the person in charge is also time-consuming. The last point is about the contract repository, it is a very manual activity where there is a big sheet where most of the main information of the contract has to be filled.

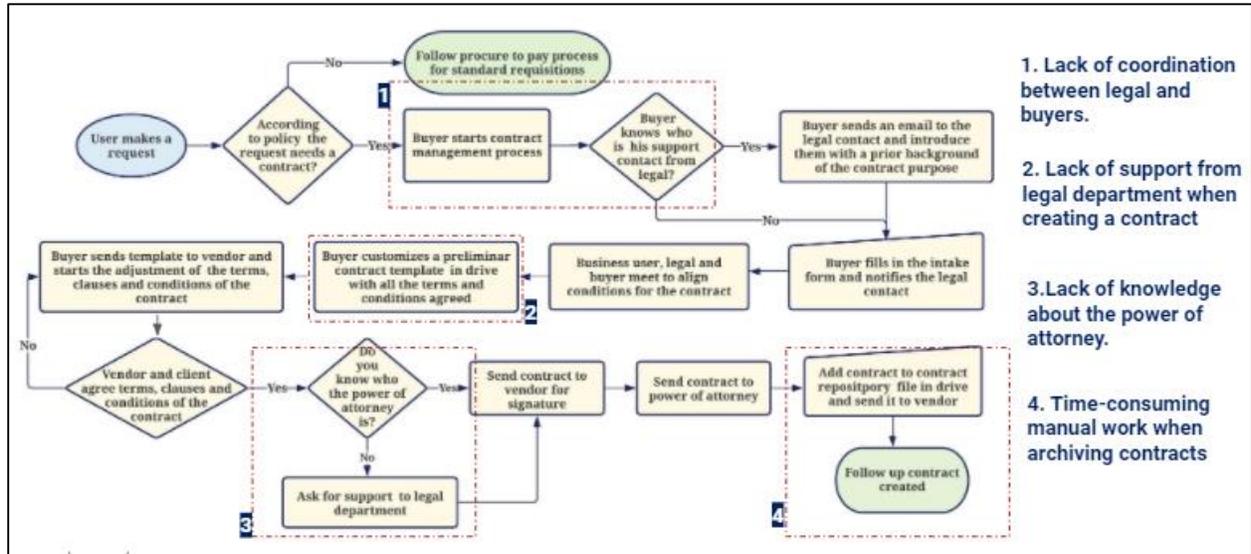


Figure 12. Contract management process with current issues

4. CHAPTER 4

FINAL IMPROVEMENT PROPOSAL

In order to build a feasible and accurate improvement plan according to what was found during the mapping process, interviews with buyers, maturity/impact matrix, and flow diagrams, all the comments, and considerations have been shared with the category managers and the indirect procurement leader.

After a discussion with the team, about the improvements that could be done on a short-term basis, taking into account the budget constraints for the current period trying to spend the less possible but having significant changes as well, the improvement plan is the following:

First, for the contract management activities, the activation of the repository of the contract module is a feasible and quick improvement. It will require the migration of all the contracts information from google sheet to the software, then the training for all the buyers and category managers who will have access to the repository, a couple of pilot activities to understand the repository module of the software and to identify the issues that could be presented while using the repository. It is an improvement that does not generate an extra cost for the department since the software already has the repository but it has never been used in EMEA. The implementation will demand support from the IT department, and as explained before, the main region of the company already uses the repository, and after talking to them, they offered their support for training and adoption of the repository module. The repository of contracts will help the department to have an only place to archive and to manage all the contracts, thus achieving a centralized information system for the contract management process since it allows interaction between vendors and buyers, to have a track of the budget remained by contracts and deadlines of the contracts.

Also, for the contract management process but related to the lack of coordination and support from the legal department, category managers agreed to have a few meetings with legal with the objective of standardizing the procedures between legal and indirect procurement. That way, everyone in the IP team has a clear knowledge of who to contact from legal in case of issues or support need saving time and reprocessing.

Second, about the supply management process, the lack of compliance with the policy requirements is the main issue where a solution is crucial. Before any main implementation, the idea of creating webinars where all the parties involved have access to the policy requirements instructions and how to fix issues that normally the buyer has to manage is a basic improvement.

One of the options proposed by one of the category managers is to create an alert in the software that “blocks” the requisition when it does not comply with the policy requirements. That way, the requestor will not be able to proceed with the requisition unless it complies with the policy requirements. Even though the proposed solution could be a very good one, because it will avoid many of the reprocessing and non-value added activities the buyers usually have to spend a lot of time on, it will take a long time to be implemented since there should be considered a modification to the software and can incur an extra cost.

Another idea that can go along with the webinars is additional training for the stakeholders and the indirect procurement department for all the parties to respect the policy, so create a strong culture within all the parties. For continuous improvement projects, organizations must rely on various training programs and experience-sharing meetings to support the strategy of learning between projects. The content of the training plan must be carefully designed while taking into account the evolving needs of the project in a dynamic business environment. (Jiju Antony, 2019). To conduct the training and the improvements made, a monthly meeting between the stakeholders and buyers of each category must be carried out to fix issues and inconsistencies of the improvement. Meetings are effective at increasing communication and coordination between the stakeholders and indirect procurement department, it helps identify in time issues on which

management needs to take action. That way the continuous improvement becomes part of the daily activities of each party and so the process will be in constant improvement always achieving better results.

As a medium-term solution, some of the structure of the current existing procurement center can be implemented in the EMEA region. It means, it will probably not be a procurement center with around 20, but hiring extra people (around 5) for the team in charge of supporting those non-value-added activities mentioned before will help buyers and stakeholders have more availability for the value-added activities and in case extra support from training is needed, they can contact the new support people to solve issues or to ask for assistance on daily activities. This idea was already considered by the category managers and the indirect procurement manager which will consider the hiring of those people, but a cost study and availability of human resources are needed to be studied.

5. CONCLUSIONS

Manufacturing organizations must prepare, implement and maintain improvement measures. The implementation covers a wide range of processes such as innovative thinking (structured problem solving, creative problem solving, vision meetings, concurrent design, rapid product/service design); development of teams and individuals (development of change agents, cultural assessment and adjustment, change management, flexible work, performance guidance, emotional intelligence, multi-functional teams, project-based team building); effective leadership (strategic planning, operational planning, policy deployment, strategic negotiation, strategic procurement); acquire knowledge and expertise (lean service, lean manufacturing, risk management, process redesign, six sigma, project and plan management, concurrent design, supply chain management, strategic procurement, outsourcing, knowledge management).

As expected, the indirect procurement department of the large multinational got to map and review their processes while finding the most critical issues in it. Everyone in the team was very open to giving information and feedback at every stage of the process. Also, the category managers and buyers were always willing to help and collaborate with ideas for improvement that at the end were taken into account for the final proposal.

Most of the final improvement proposal is on track to be implemented. The contract management module in the software is already being adapted to the indirect procurement department, running pilots and checking what to keep or not from the module. Meetings with the legal department in order to standardize procedures are also planned to be carried out. For the hiring of support people, it will take longer to be implemented but for now, some interns are in charge of few activities to help and support buyers from the indirect procurement department.

Results of the final improvement proposal will be seen during the day-by-day activities if everyone in the team is aligned and focus on maintaining improvement measures. The processes

chosen for improvement must follow the policy of the company, all the stakeholders must be aware of the procedures for problem solutions and training may always be constant. The lean process improvement implementation can be effectively used to successfully achieve a fundamental improvement in the organization's performance in a highly competitive environment.

6. REFERENCES

- Allen C. Ward, D. K. (2014). *Lean Product and Process Development*. Lean Enterprise Institute.
- Antony, J. (2011). Six Sigma vs Lean: Some perspectives from leading academics and practitioners. *International Journal of Productivity and Performance Management*, pp. 185-190.
- Arnheiter, E. D., & Maleyeff, J. (2005). The integration of lean management and Six Sigma. *The TQM Magazine*.
- Black, J. (1991). *The Design of the Factory with a Future*. McGraw-Hill.
- Borges, M., Alencar, L., & Miranda, C. (2017, April). Project procurement management: A structured literature review. *International Journal of Project Management*, pp. 353-377.
- CFI. (2021). Retrieved from <https://corporatefinanceinstitute.com/resources/knowledge/other/procurement/>
- Jagdeep Singh, H. S. (2012, 06 01). Continuous improvement approach: state-of-art review and future implications. *International Journal of Lean Six Sigma*, pp. 88-111.
- Jiju Antony, S. G. (2019, March 4). Top ten reasons for process improvement project failures. *International Journal of Lean Six Sigma*, pp. 367-374.
- Kumar, P. (2021, 03 31). *Simplilearn*. Retrieved from <https://www.simplilearn.com/what-is-six-sigma-a-complete-overview-article>
- Kwak, Y. H., & Anbari, F. T. (2004). Benefits, obstacles, and future of six sigma approach. *Technovation*, 708-715.
- Lee, M. (n.d.). Customer service excellence through people motivation and Kaizen. *IEE Seminar on Kaizen: From Understanding to Action*, 5, 1-21.
- Lee, S. D. (2000). Kaizen: an essential tool for inclusion in industrial. *Journal of Industrial Technology*, 16(1), 1-7.
- Melton, T. (2005). The Benefits of Lean Manufacturing: What Lean Thinking has to Offer the Process Industries. *Chemical Engineering Research and Design*, 83(6), 662-673.
- Nandeesh, S., Mylvaganan, R., & Siddappa, S. (2015). A multi-step recommendation engine for efficient indirect procurement. *IEEE*.

- Salah, S., & Rahim, A. (2019). *An Integrated Company-Wide Management System*. Springer, Cham.
- Soderquist, K. (1996). Managing innovation in SMES: a comparison of companies in UK, France. *International Journal of Technology Management*, 12(3), 291-305.
- Stevens, G. C. (1989, 09 1). Integrating the Supply Chain. *International Journal of Physical Distribution & Materials Management*, pp. 0269-8218.
- The Benefits of Lean Manufacturing: What Lean Thinking has to Offer the Process Industries. (2005). *Chemical Engineering Research and Design*, 83(6), 662-673.
- The Council for Six Sigma Certification . (2018). *Six Sigma: A Complete Step-by-Step Guide: A Complete Training & Reference Guide for White Belts, Yellow Belts, Green Belts, and Black Belts* .
- Ward, S. (2021, 01 10). *Balance small business*. Retrieved from <https://www.thebalancesmb.com/procurement-2948316>
- Yamashina, H. (1995). Japanese manufacturing strategy and the role of total productive. *Journal of Quality in Maintenance Engineering*, 1(27-38).