



Facultad de Ciencias Económicas y Empresariales

TRABAJO FIN DE GRADO

**PROGRAMA INTERNACIONAL DEL DOBLE GRADO EN
ADMINISTRACIÓN Y DIRECCIÓN DE EMPRESAS Y ECONOMÍA**

**The reorganization of the Purchase Quality Material Department of Volkswagen
Navarra S.A. for the simultaneous production of two car models**

Leire Arrubla Gamboa

**DIRECTOR
Ignacio Contin Pilart**

Pamplona-Iruña

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ABSTRACT

The objective of this project is to explain the reorganization process of the Purchase Quality Material section of Volkswagen Navarra's Quality department. The necessity for change comes from the future introduction of two models' simultaneous series production, a complete innovation for this factory.

In order to understand completely the redesign, this project firstly analyses the functioning of the PQM department, its main tasks and the different types of workers that form it.

Afterwards, the project focuses on the core part: the redesign process. It is divided into three main phases so that the change it is successfully planned and implemented. The reorganization of the PQM department is a key issue for the Volkswagen Navarra factory because it is in charge of ensuring the quality for which the company is well known.

In conclusion, the implementation of a new operational design of the PQM department is crucial for achieving the quality requirements in face of two models' series production.

KEYWORDS

- Quality assurance
- PQM department's redesign
- Two models' simultaneous production
- Volkswagen Navarra

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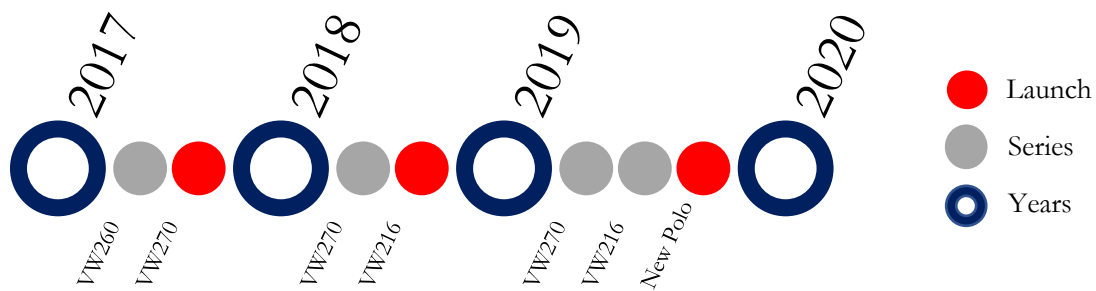
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1. INTRODUCTION

This project is about my collaboration during my internship to the reorganization of the Purchase Quality Material (PQM) section of the Quality Department in Volkswagen Navarra. The need of this reorganization has its origin on the strategic shift of the company: The introduction of the simultaneous production of two different Polo models in 2019.

Figure 1: Series and New Models' Launch timeline of Volkswagen Navarra



Source: Own elaboration from data provided by PQM worker

Volkswagen Navarra as part of the Volkswagen AG company is committed with the group's mission: the production of high quality and reliable cars, affordable for medium income families. The PQM section of the Quality department, is one of the major contributors to the achievement of this goal, considering it is responsible for ensuring the car parts' quality requirements and solving, hand to hand with the supplier, the various defects of vehicle components and customers' claims.

With regard to this fact, the reorganization of PQM becomes a crucial issue for guaranteeing the required quality objective for 2019 when the production of two different polo models will be adopted.

The organization of this project is structured in three main parts, to clearly understand the redesign process. First of all, there is an introductory part that consists of Volkswagen group's current data and an introduction to Volkswagen Navarra factory, containing a brief description of its production process and organization of the factory.

Then, an explanation of the major functions of the department follows in addition to the distinct types of workers that integrate it. The duty of the department is divided into two main

blocks that correspond to daily series production and the new models' launching process, each of them consisting on different tasks.

Finally, the project focuses on its core section: the reorganization of PQM department. This process has been conducted into three main distinctive phases so that the new proposed design is successfully planned and implemented. Firstly, a description of the current organization of PQM area and the participants involved in the redesign process is provided along with the specification of pursuit goals.

Afterwards, the operational redesign planning, the key section of the redesign process and the most time consuming one, is exposed. According to (Nadler & Tushman, 1997) the operational design focuses at the bottom levels where the work takes places and it involves the redesign of structures, processes and systems to translate the strategic objectives into reality. For applying this concept to this research paper, various reunions with the PQM staff have been arranged for analysing closely the subtasks performed by the workers and classifying them into distinct categories; efficient, optimizations, transferable and wastes. In this way, the subtasks that do not add any value to our department will be either eliminated or transferred so that the workers can centre their efforts in the important ones. Besides, apart from the meetings with the workers there have also been arranged meetings with the top manager and bosses of the department.

Finally, for ending up with the project, there are exposed conclusions about the total time and costs savings figures that the department would get in case the reorganization is successfully implemented. Besides, there are some final suggestions for making sure that the implementation is efficiently made, as this phase is the most critical and the one that puts in risk the whole reorganization process. Companies usually find anxiety, rejection and they may even loose the organizational control during the execution of the redesign. In order to solve this, the general managers should give the workers a clear picture about the future situation and search for constant feedback making sure that the change is efficiently carried out.

2.VOLKSWAGEN GROUP

2.1 Introduction to Volkswagen Group

The Volkswagen group was born in Berlin in 1937. Nowadays it is the biggest carmaker in Europe and one of the leading car manufacturers in the world, it sold 10.927 million vehicles in 2016.

The Group has its headquarters in Wolfsburg and it is composed by twelve brands from seven European countries: Volkswagen Passenger Cars, Audi, SEAT, ŠKODA, Bentley, Bugatti, Lamborghini, Porsche, Ducati, Volkswagen Commercial Vehicles, Scania and MAN. Each brand works independently on the market and they offer a wide range of products from motorcycle and small cars to luxurious cars or heavy trucks.

Figure 2: Brands of Volkswagen Group



Source: Volkswagen Group Website

It has 120 factories located in all the continents: 71 in 20 European countries and 49 more production sites located in 11 different regions. It is composed by 626,715 employees and produces more or less 43,000 vehicles a day, which are then sold in 153 countries.¹

¹ *Volkswagen AG: Portrait and Production Plants.* (n.d.). Retrieved from <http://www.volkswagenag.com/en/group/portrait-and-production-plants.html>

Figure 3: Map of Volkswagen Group's Factories



Source: Volkswagen Group Website

The mission of the Volkswagen Group is to offer high quality and reliable cars affordable for a big spectrum of the society. The company focuses its efforts in the achievement of such statement paying special attention at the quality requirements.

3.VOLKSWAGEN NAVARRA

The Volkswagen Navarra factory was born in 1984. Since this moment, the plant has been source of continuous improvement, indeed it was awarded as the best factory of Europe in 2014 with the Industrial Excellence Award². In the following section, there will be an explanation about the type of production process and the organization of Volkswagen Navarra factory, so that the reader can learn a little bit more about it.

3.1 Production Process of Volkswagen Navarra

According to Krajewski, Ritzman and Malhotra³, the process choice is the way of organizing the available resources around the process or product. There are four several types of structuring the production process options:

² Volkswagen Navarra. (n.d.). *La fábrica en datos*. Retrieved from Volkswagen Navarra: <http://vw-navarra.es/nuestra-fabrica/la-fabrica-en-datos/>

³ Krajewski, L. J., Ritzman, L. P., & Malhotra, M. K. (2013). *Operations Management: Processes and Supply Chains*. Pearson.

- **Job Processes:** It is a system of high flexibility that allows the production of a wide variety of products. The manufacturing volume of each of the products is low and the tasks performed for their production diverge.
- **Batch Processes:** There is also a wide variety of products but the similar ones are grouped into batches. The main difference with job process is the higher volume, variety and quantity.
- **Lines Processes:** There is little or no variety on the produced products and the volume is very high. The process is performed with high technology machines.
- **Continuous flow processes:** involves the highest volume and standardization of the four types of processes. The raw materials enter the production process and flow from one step to the next one until finished. The main difference with respect to the line process is that in the flow process the product never stops even during the work shifts.

In the case of Volkswagen Navarra, the resources are organized following the line process guidelines as it is a company with just one product, the Polo and it is produced in a considerably high amount, 1 Polo every 55 seconds. However, this is not the only factor defining the production process of the company, Volkswagen Navarra adopted in 1990 the Lean Production system, the key element shaping its production.

The Lean systems are based on maximizing the value added by each of the company's activities by removing wastes and delays from them (Krajewski, Ritzman, & Malhotra, 2013). There are seven types of wastes: overproduction, unnecessary motion, waste of inventory, defects, waiting time, underemployed workers and shipping time.

One of the key elements of the lean systems solving some of the wastes and which is present in the Volkswagen Navarra factory is the Just-in-Time (JIT) process. The idea underlying this concept is eliminating the waste of inventory and shipping in time by an advance prescheduled shipment that allows suppliers to prepare the parts and meet the quality and without having to be stored.

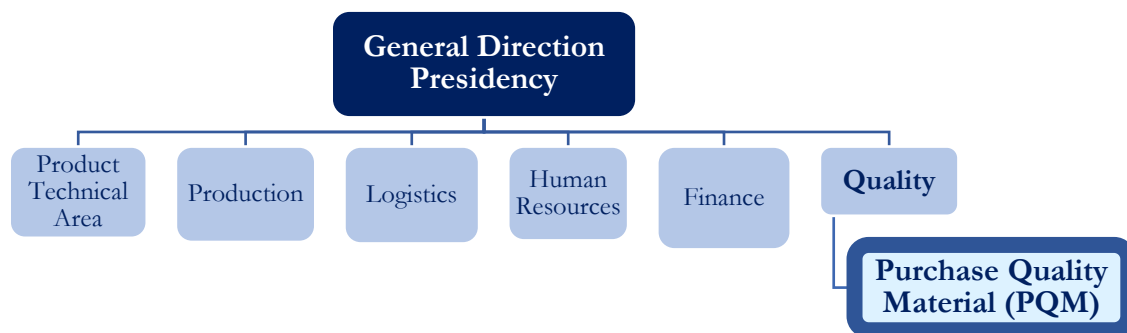
The JIT concept is closely linked to another key factor that guides the manufacturing process of the site: the vehicles are only produced when customers order them. This idea in which production is based on demand is another crucial issue of Lean System known as 'pull'. This

make-to-order approach allows the company savings in work-in-process and finished inventories⁴.

3.2 Organization of Volkswagen Navarra

Volkswagen Navarre it is organized in six main areas and all of them are under the rule of the president and director Emilio Sáenz: Technical Area, Manufacturing, Logistics, Quality, Human Resources and Finance.

Figure 4: Volkswagen Navarra Factory Organization



Source: Own elaboration with data obtained from Volkswagen Navarra Intranet

General Direction and Presidency

The aim of this area is to take the necessary decisions (organizational, accounting, finance...decisions) for ensuring the success of Volkswagen Navarra Factory. Apart from the general direction this area includes the **production planning and production system** departments.

- Production System: Its goal is to optimize the production system (processes, working times...) for continuous improvement. It contains workshops, new work organization (training center) and industrial engineering.
- Production Planning: The duty of this area is to introduce the production optimization tools into the production chain.

⁴ Krajewski, L. J., Ritzman, L. P., & Malhotra, M. K. (2013). *Operations Management: Processes and Supply Chains*. Pearson.

Product technical area

This area is specialized in the Volkswagen Polo and is composed by three departments:

- **Technical Office:** Is the responsible of documenting all the modifications introduced in the car. Besides, it is the recipient of the suggestions of the rest of the areas of VW Navarra factory and the I+D department of the Wolfsburg headquarters.
- **Concept Analysis:** It analyzes the problems of the series production due to faulty project design and proposes changes for solving them.
- **Pilothalle:** Is the department in charge of backing up the other areas of the factory for ensuring that the quality, cost and due dates requirements are followed.

Production

The objective of this department is to achieve the planned number of cars under the quality, cost and dates requirements.

It is formed by seven workshops: metal presses, sheet metal processing, painting, assembling, engines, car assembling and final review.

Logistics

This department is in charge of supplying on time the required materials to the line and respecting the quality requirements.

- **Logistics Planning and shopping:** It has to plan the supply of goods and packaging. It is the one comparing the costs of the different providers and deciding which will be the one supplying the production line.
- **Transport and provisioning:** It has too keep track of the stock in VW Navarra factory for ensuring that there is no supply shortage or surplus.
- **Materials Management:** It is the responsible of managing the materials that VW Navarra factory receives by storing it until the production chain requires it.

Human Resources

This department is formed by many different and diverse areas: foreign relations and communication, human resources development and strategy, personal service, environment, security, preventive and medical system. The task of the human resources department is in charge of directing and coordinating the activity of all these areas.

Finance

It is formed by three other departments:

- Administration: It manages the accounting, payrolls, tax settlements...
- Controlling and finance planning: Its duty is to keep track of the factory's investment costs and ensure that they don't exceed the available budget.
- Information Technologies (IT): It is the responsible of the maintenance of computer systems.

Quality

This department oversees the quality assurance of the products and processes. It is composed by four principal areas:

- Finished Car Audits: It proceeds audits to series production cars.
- Quality planning and analysis: It is the area receiving the claims from final customers and managing them.
- Series Quality: It checks the quality during the production process of the VW Polo by conducting final product and process audits.
- Car Analysis: This area makes tests to the car parts. It is composed by laboratory (material check), processing center (functioning, driving...test, technical measuring center (measuring test) and Meisterbock/Cubing (measuring test).
- Purchase Quality Material (PQM): The responsible of ensuring the quality requirements of the car parts.

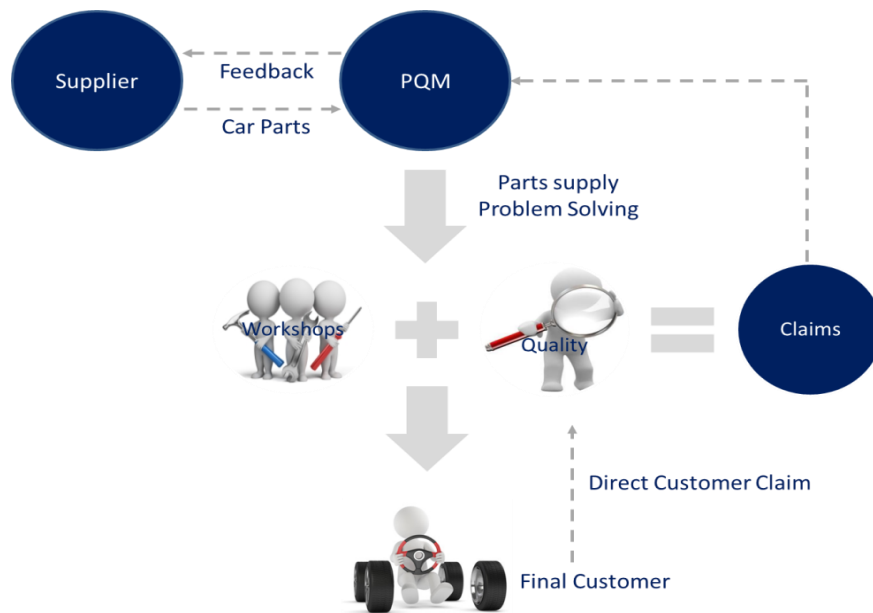
4. PURCHASE QUALITY MATERIAL

4.1 Introduction

This department is the center of study of this report as it the one that is going to be re-organized.

Roughly speaking, the task of this area is to guarantee that the parts are supplied on time and under the quality requirements. PQM receives claims from the other units of the factory (audits, workshops, Meisterbock, Cubing...) and from final customer (Direct Customer Claim) and tries to solve the problem as soon as possible

Figure 5: PQM Department's Functioning



Source: Own elaboration from data provided by PQM worker.

The department is formed by 40 employees of Volkswagen and 33 subcontracted 'Autovisión' workers hired due to the workload increase. The department is divided into four sub-areas according to the car parts managed by each of them and another fifth one that coordinates all of them. Each of the subunits is directed by the so-called 'service boss':

1. Electrics (QK 1)
2. Interior (QK 2)
3. Metallic (QK3)
4. Exterior (QK 4)
5. Management and new projects (QK 5)

Among all these workers there are several types of jobs: Parts' Quality Responsible (PQR) and task force. These are part of the first four subunits. On the other hand, the coordination subunit is composed by eight workers that centralize all the information coming from the other subunits to transmit it distinct third parties. Besides, they are in charge of communicating the new work and standard procedures to the rest of the department.

4.2 PQM Department's Functions

In the following section, we are going to deeply analyze the labor of the purchase quality material department in their way for the quality assurance. We are going to divide the tasks into two main blocks (series production and project launch labor) and we will study the workers involved in each of them and their duties.

4.2.1 Series Production

The labor related to series production can be divided into two different main blocks:

- Continuous Improvement
- Claim Management

In the following section, we will study the duty that the PQM department performs in each of them.

- *Continuous Improvements*

One of the main goals of the purchase quality department in series production is to achieve continuous improvements on the final product either for achieving better quality, reduce costs or more efficient production methods. In case it is for quality improvement PQM will try to introduce it as soon as possible. We can find different types of modifications:

- 'ÄKO'⁵: These are introduced on a daily basis. They are modifications made on daily series production cars' parts.
- 'Änderungsantrag'⁶: These are parts modifications that have to pass duration tests: crash test, mileage...These changes are introduced twice during the series production: Calendar week (cw) 22 and 45.

⁵ Änderungskontrolle: Control of changes

⁶ Änderungsantrag: Improvements

Whenever one of these changes in the car parts is introduced, the PQR workers have to analyze it and decide if they accept the changes or not. It may happen that one modification is introduced for saving costs but it may affect the quality. On the other hand, we may have the case of a change that improves the quality of the part, so the PQRs will push the introduction of the modification.

- *Claim Management*

On the other hand, the PQM department has the duty of responding to different claims, analyzing the causes of the problem (if it was suppliers fault or not for example) and taking corrective actions to avoid the same problem in the future.

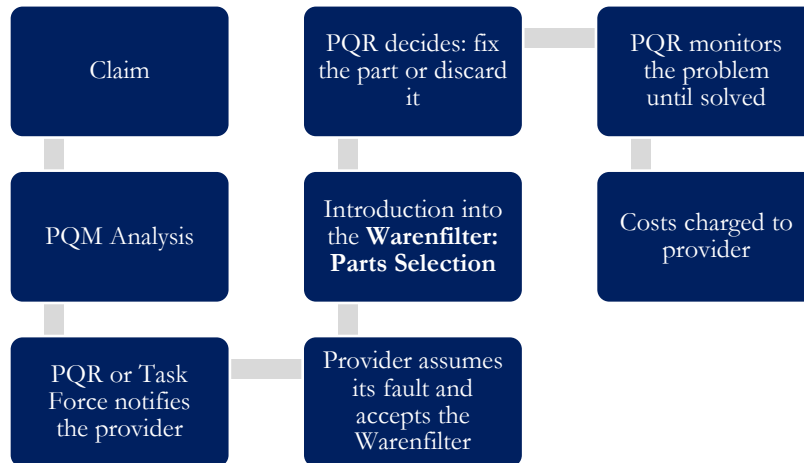
Once having analyzed the claims the workers may come up with three possible causes of the mistakes:

1. **Correct Parts:** The parts fulfill the specified requirements but due to the allowed small intolerances (0.01mm thickness deviation is accepted, for example) it can't be assembled. In this case, the PQR should ask the provider to manufacture the part in another way but he can't impose it as an obligation because the part is under the established requirements.
2. **VW Navarra Factory's fault:** It may happen that the supplier sent correct parts but in the assembling line they have been damaged. The PQM department workers analyze the part and conclude that it is not suppliers fault and notify the VW Navarra area responsible of the error.
3. **Incorrect Parts due to suppliers' fault:** If the part is faulty then the PQM workers have to notify the provider and he will have to admit its fault. Afterwards and with supplier's permission, the part is introduced into the so-called **Warenfilter**, where it is conducted a selection to separate the correct and incorrect parts by testing them with the appropriate tools. It may happen that the provider sends us new corrected parts so the old ones are not introduced into the Warenfilter.

Once this selection is made, the PQR has to decide whether to fix the parts or discard them. In case the part has to be mend, VW Navarra will ask the subcontract enterprises JJAR, Formel D and SGE for doing it. The PQR worker will follow the

corrective actions taken by the provider until the problem is solved and the parts are totally correct (see figure 6).

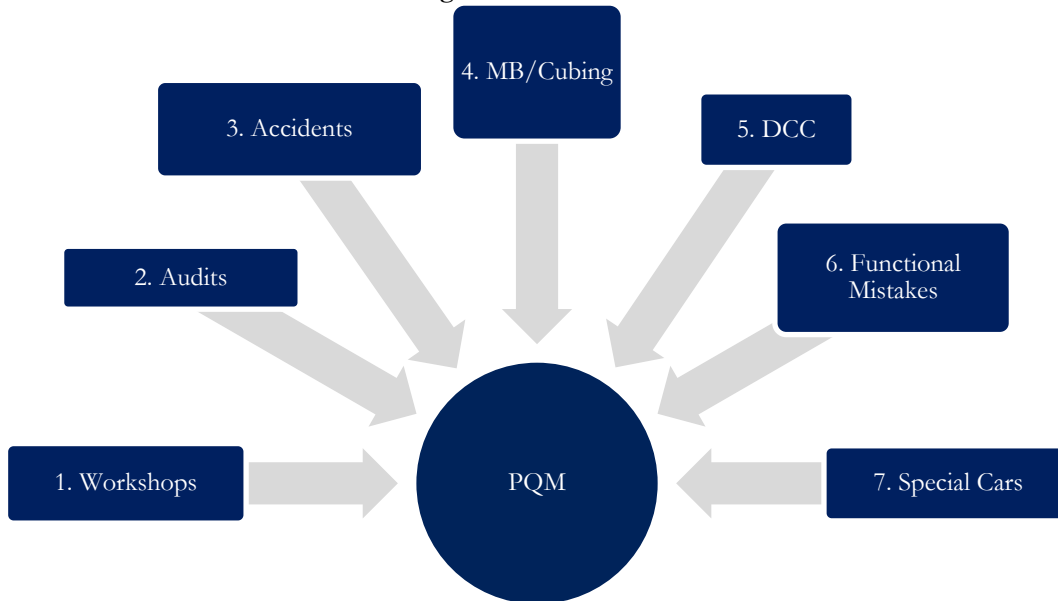
Figure 6: Claim Management Process



Source: Own elaboration with data obtained with data obtained from BTV training ppt.

We are now going to analyze the different claims that come to PQM department in series production. Every claim except for the accidents are **caused by suppliers' fault** and the corrective actions follow the procedure just described (figure 6).

Figure 7: Claim Source



Source: Own elaboration with data obtained with data obtained from PQR training ppt.



1. Workshops

It may happen that during the production of the Polo any of the workshops that conform the factory find problems in some of the parts. The complaint may come from the following areas of: Engines, final review, assembling, metal sheet or painting.

The faulty parts arrive to the rejection box and the task force examines them for determining whether it is suppliers' fault or not, it may happen that it is an assembling fault for example. If the task force can clearly determine the origin of the mistake, he will proceed the claim himself. In case of doubt, he will contact the PQR in charge of that part.

All in all, regardless of being the task force or the PQR the one managing the claim the way of proceeding is the same: stop the assembling of the defective parts for avoiding the production of cars containing them and cooperate with the provider for solving the source of the mistake.

Table 1: Workshop's Claims

Claim Source	PQM Tasks	Characteristics	Responsible
Workshops	<ul style="list-style-type: none"> Avoid the assembly of faulty parts in the production of cars Analyze the cause of part's fault Work with the provider for solving the mistakes Ensure that the mistake won't be repeated 	<ul style="list-style-type: none"> Clear error source  Doubtful error source  	<ul style="list-style-type: none"> Task force PQR

Source: Own elaboration with data obtained from BTV training ppt.

2. Finished Car Audits (FCA)

In this part of the factory different Polos are randomly selected considering that they must have distinct characteristics among each other. In other words, they try to take one GTI polo with blue painting and a basic Polo painted in black. The auditors analyse the cars exhaustively from a very demanding customer point of view. In fact, the audit of a single car involves a close examination that lasts four hours and one-hour driving test.

Afterwards, all the mistakes are classified into three different categories (A, B and C) and collected into a report that will be distributed to the VW Navarra factory areas responsible of solving the mistakes.

In case of our department, one of the workers attends the audits every day at eleven o'clock where is informed about the errors corresponding to PQM and communicates it to the PQR in charge of the part. The aim of this procedure is to be aware of the mistake as soon as possible to take corrective actions for solving it. In this way, the problem could be fixed before the official daily audit meeting at 13 o'clock. Apart from that, the way of proceeding with the claim is the same as we have described before.

Table 2: Audits' Claims

Claim Source	Procedure	Characteristics	Responsible
Audits	<ul style="list-style-type: none"> • Avoid the assembly of faulty parts in the production of cars • Analyze the cause of part's fault • Work with the provider for solving the mistakes • Ensure that the mistake won't be repeated 	<ul style="list-style-type: none"> • Cars analysed from a demanding customer point of view • Assistance to the pre-audit for knowing the error as soon as possible 	<ul style="list-style-type: none"> • PQR • Coordination Worker

Source: Own elaboration with data obtained from BTV training ppt.

3. Accidents

The claims from accidents arrive to PQM when something unusual has happened, for example: A box full of car parts has fallen and they are damaged. In this type of claim, is important to highlight that the duty of PQM is not to analyze whether the supplier is the responsible of the error because these mistakes are caused by the rest of areas of VW Navarra.

Table 3: Accidents' Claims

Claim Source	Procedure	Characteristics	Responsible
Accident	<ul style="list-style-type: none"> • Select the correct and faulty parts • Decision: <ul style="list-style-type: none"> - Mend the faulty parts for re-using them - Discard the faulty parts 	<ul style="list-style-type: none"> • It is not suppliers fault 	<ul style="list-style-type: none"> • Task Force

Source: Own elaboration with data obtained from BTV training ppt.

As we see in the table 3, these claims are managed by the task force workers that have to select the correct parts and decide whether to mend the faulty ones or discard them. In case it is decided to fix the parts, there are three enterprises (Formel D, JJAR and SGE) subcontracted by Volkswagen Navarra, in charge of doing so.

4. Meisterbock/ Cubing

The Meisterbock and Cubing are metal cars, not completely built and more similar to a metal frame, with the precise size for the perfect assembling of the parts. It is used for testing the parts before the production of a new car model.



Figure 8: Cubing

Source: BTV training from Volkswagen Navarra Intranet

The parts examination in Meisterbock and Cubing is more rigorous than the audits, as if the most demanding customer would be analyzing it. In fact, the type of mistakes found in this test are measurement errors that usually can't be perceived by final customer.

The way of proceeding in our department is the following: The PQR attends the pre-cubing meeting to know which parts has to take to the test, afterwards the parts are audited and the measurement errors are reported. In case any of the mistakes is suppliers' fault, the PQM department processes the claim as explained before.

Table 4: MB/Cubing's Claims

Claim Source	Procedure	Characteristics	Responsible
MB/Cubing	<ul style="list-style-type: none"> • Avoid the assembly of faulty parts in the production of cars • Analyze the cause of part's fault • Work with the provider for solving the mistakes • Ensure that the mistake won't be repeated 	<ul style="list-style-type: none"> • Highly demanding customer point of view 	<ul style="list-style-type: none"> • PQR

Source: Own elaboration with data obtained from BTV training ppt.

5. DCC (Direct Customer Claim)

These are the complaints that the client directly makes to Volkswagen Navarra. Each of the PQR is the responsible for solving the complaints of its assigned parts. The way of proceeding is the standard one.

6. Functional Mistakes

These ones are detected by the series quality area. They require an in-depth analysis because they can't be observed easily but in case they are not detected they will reach the customer as they are found in car series production.

The way of proceeding with this claim is the same one with the other ones.

Table 5: Functional Mistakes' Claims

Claim Source	Procedure	Characteristics	Responsible
Functional Mistakes	<ul style="list-style-type: none"> • Avoid the assembly of faulty parts in the production of cars • Analyze the cause of part's fault • Work with the provider for solving the mistakes • Ensure that the mistake won't be repeated 	<ul style="list-style-type: none"> • Reach final customer if not detected 	<ul style="list-style-type: none"> • PQR

Source: Own elaboration with data obtained from BTV training ppt.

7. Special Cars

In this category, we have four different cars that can be organized into:

- KAF⁷: These are special cars that are analyzed and driven in the headquarters of the Volkswagen Group in Wolfsburg. They undergo the most demanding tests.
- MAF⁸: They are another type of special cars but this time they are analyzed by the direction of Volkswagen brand.
- WAF⁹: The special car is analyzed by the Volkswagen Navarra factory.

Some of the coordination workers of QK 5 receive the claims and they transmit them to the corresponding PQR for managing it in the standard way that we have already seen. However, this time it is crucial to keep track in problem sheets of all the corrective actions that the PQR take due to the demanding nature of the special cars.

⁷ KAF (Konzernabnahmefahrt): Consortium-level driving test cars

⁸ MAF (Markenabnahmefahrt): Brand-level driving test cars

⁹ WAF (Werksabnahmefahrt): Factory-level driving test cars

Table 6: Special Cars' Claims

Claim Source	Procedure	Characteristics	Responsible
MAF KAF WAF	<ul style="list-style-type: none"> Avoid the assembly of faulty parts in the production of cars Analyze the cause of part's fault Work with the provider for solving the mistakes Ensure that the mistake won't be repeated 	<ul style="list-style-type: none"> Document the corrective actions in problem sheets High requirement degree (VW Group/Brand/Navarra Managers) 	<ul style="list-style-type: none"> PQR Coordination workers

Source: Own elaboration with data obtained from BTV training ppt.

- SOFA¹⁰/WIFA¹¹ : These cars are taken to hostile environments like the desert and the north pole for testing them under extreme climatological conditions.
The PQR conduct the standard way of processing claims but this time they cooperate with the laboratory area because usually the problems are linked to parts materials, such as undulations caused by the heat.

Table 7: Climate Cars' Claims

Claim Source	Procedure	Characteristics	Responsible
SOFA WIFA	<ul style="list-style-type: none"> Avoid the assembly of faulty parts in the production of cars Analyze the cause of part's fault Work with the provider for solving the mistakes Ensure that the mistake won't be repeated 	<ul style="list-style-type: none"> Preventive tests Collaboration with laboratory 	<ul style="list-style-type: none"> PQR

Source: Own elaboration with data obtained from BTV training ppt.

¹⁰ Sommerfahrt: Summer season driving test cars

¹¹ Winterfahrt: Winter season driving test cars

It may happen that the supplier does not admit his fault even though the parts have been analysed and PQM has no doubts. Besides, it may happen as well that the supplier is not able to solve the mistakes and these appear repeatedly. In this case, the employee responsible of the quality of the part can conduct the ‘**scalation of suppliers procedure**’.

The aim of this process is to bring the problem to whichever authority level required so that it can be solved. The PQR will firstly try to solve the problem themselves but if they are not able they will require higher job positions’ help. The suppliers will be marked with 1,2 or 3 scalation level (see table 8).

Table 8: Supplier's Scalation Levels

LEVEL	PROBLEM DESCRIPTION	RESPONSIBLE
0	The provider has problems	PQR
1	The provider can't solve the problems successfully	Service Manager or PQM Manager
2	The provider needs third party assistants	Quality Direction
3	The provider does not fulfill the signed agreement	Quality& Factory Directors + Quality Director of VW Group

Source: Own elaboration with data obtained from BTV training ppt.

The **escalation of supplier** plays a key role for discarding worst performing providers, because once they have reached level 3 they the supplier can't offer himself for future new projects of VW Navarra.

4.2.2 Project-Related Tasks

When the company decides to launch a new model the tasks performed by the Purchase Quality Material Department change with respect to the ones related to series production. It is based mainly in a narrow relationship with the supplier.

The entire process, from planning the supply requirements and ending up with the correct series production of parts, it is guided by the ‘Formel Q of new parts’ procedure that we will analyzed in this section.

- *Integral QPN (Qualification program for new parts)*

It is a standardized way of proceeding of the VW group for following up the evolution of purchase of new parts from the planning stage to the series production. The objective of tracking the performance of the supplier through this process, is to ensure that the supplied parts fulfill the quality requirements and that the shipment is made on time.

The Formel Q procedure it is based on different tools that are: QTR, AML, Sampling (homologate) and 2DP. The QTR¹², AML¹³ and 2DP¹⁴ are optional but the **sampling is compulsory**. In the following section I will explain each of these processes so that once we analyze the tasks of the PQM staff we can correctly understand them.

Figure 9: QPN Components



Source: Own elaboration with data obtained from Formel Q New Parts Integral

1. QTR (Quality Technical Requirement)

It is a process that starts 33 months before the SOP (Start of Production). The objective of it is to seek among the different suppliers the most appropriate one.

The process starts with the candidature of different suppliers which have to send certain information to be one of the possible candidates (see table 9). Once the due date is reached no more offers are accepted.

Afterwards, the PQR agrees with the procurement department of Volkswagen which ones among the candidates can be discarded. Once the first selection is made the PQR decides if they are going to apply the QTR process or not. This decision is based mainly on experience and the type of parts; If they are innovative car parts the QTR is made because the part is considered ‘critical’ or if they already worked before with the supplier and they obtained bad results it will be discarded.

¹² Quality Technical Requirement

¹³ Assurance of Maturity Level

¹⁴ Two Days Production

Table 9: QTR Requirements

Requirements
• Company's organization for the project and contact person
• Manufacturing process plan and plan site's layout
• Planning and due dates for allowing the production of the definitive car-parts
• Management of subcontracted suppliers
• Required actions for achieving quality requirements
• Commitment towards achieving the agreed costs, due dates and quality
• Risk evaluation of the possibilities of not meeting the requirements
• Logistics and packaging

Source: Own elaboration with data obtained from Formel Q New Parts Integral

The suppliers that must follow the QTR have to respond a standardized questionnaire and after that the PQR has to organize a meeting (*QTR gespräch*) with the provider for analyzing some unclear points of the questionnaire.

Once the meeting is done the suppliers are classified into three categories: green, yellow and red. If it is red then the provided is discarded, if it is yellow the suppliers is imposed some conditions for working with Volkswagen and if it is green then, there is no problem. I would like to point out that sometimes the results of the QTR are not totally followed by the procurement department. It may happen that a red-labelled provider is finally chosen because sometimes is hard take such a major decision just based in a questionnaire and the PQR's meeting evaluation.

2. AML (Assurance of Maturity Levels)

The AML ('assurance of maturity levels') starts once the QTR is finished. The aim of this procedure is to ensure that the supplier is following up the right path and that it will be able to supply the quantity needed for series production with the quality requirements established by Volkswagen.

2.1 Supplier selection criteria- Risk Classification

The amount of car parts and suppliers for VW Polo is considerably big so, VW Navarra cannot apply the QPN procedure to each of them. The company considers two criteria for identifying providers that have to follow this:

- Complex Car parts: JIT (Just In Time) parts which involve many components.
- Critical suppliers: They don't provide the parts on time, they are not able to correct the defects...

According to these characteristics the supplier is classified into three categories that are high, medium or low risk for the assurance of the maturity stages (see table 10). The more complex the car parts and the more critical the supplier is, the risk is higher and there are more parties involved in the AML assurance process.

Table 10: Suppliers' Risk Classification

Categories	Actions
A= High Risk	The maturity stages assurance will be made by PQM and other areas of Volkswagen group (For example: Logistics)
B= Medium Risk	The maturity stages assurance is made between the supplier and the PQR
C= Low Risk	The supplier has the responsibility of assuring itself the maturity stages

Source: Own elaboration with data obtained from Formel Q New Parts Integral

2.2 AML (Assurance of Maturity Level) Stages

The AML consists of 8 distinct stages. The first two are decided in Wolfsburg and the following six stages are made with the cooperation of the PQRs and the suppliers and they consist of standardized questionnaires that the provider must fill in and which change from one stage to the following one.




- Degree 0: The VW Navarra Factory cooperating with the VW group direction decides the amount of critical parts (high technology or innovative ones) to decide the riskiness degree.

- Degree 1: The VW group defines the number of parts to be supplied through the cooperation of quality area and production workshops (engines, assembling...).
- Degree 2: The supplier presents the information related to the organization, planning and control of the project. It should explain clearly the delivery process including subcontract suppliers.
- Degree 3: The provider exposes the production plan under the technical specifications asked by the Volkswagen factory.
- Degree 4: The Volkswagen group has given the supplier the necessary means for the production so that it starts with the manufacturing of the first parts. The PQR and provider must agree the dates for the product and process approval (due date of the PQR's approval of suppliers' production and product).
- Degree 5: At this point the first parts are produced with official manufacturing tools. They are analysed and it is decided if the products or process can be optimized.
- Degree 6: The products have been approved. The parts have been homologated and it is time for the process approval. For doing so, the PQR has to conduct the 2 days' production (2 DP) for testing if the supplier is able to provide enough parts, on time and under quality requirements.
- Degree 7: The project has finished and from now on the supplies will be evaluated in terms of normal production. In other words, they will be from now on part of the PQR's series production tasks.

Roughly speaking, we could say that the main task of the PQRs is to evaluate the suppliers' responses and meet them in the so-called **round tables** for clarifying the possible critical points

Once the questionnaires are completed the PQRs have to analyze the responses and mark them with green, yellow and red categories. If it is red then, the problem is exposed at the 'pilothalle' meeting and the PQRs ask for help to higher position authorities in the group for solving the problem. If it is yellow, then the process can continue but it is taken into account that there are some aspects that have to be improved. In case the provider is marked with green then the procedure continues with no problem at all (see table 11).

Table 11: QPN AML Results

Evaluation	Meaning	Corrective Actions
	At least one of the objectives won't be achieved	The objective is adapted for being accomplished
	Some of the objectives are at risk of achievement	Corrective actions taken → Objectives achieved
	The objectives are achieved	No Actions

Source: Own elaboration with data obtained from Formel Q New Parts Integral

3. *Samplings*

Once the MLA process is between RG5-RG6 the sampling starts. This is a key part of the QPN process because it is the only one that must be done compulsorily, the other stages are just optional.

The **objective** of this stage is to check whether the part fulfills the planned size requirements, current legal regulations and above all, that it can be **assembled in car** for sell to final customers.

According to the Formel Q standard, the sampling process involves two sample shipments of 5 parts each, the first one is tested on PVS ¹⁵ cars and the second one on Zero Series production. The PVSs are special cars that are assembled for trying the different car parts in car tests like crash or mileage test. It is important to highlight that these vehicles do not reach the final customer. The zero series simulate normal production and they **may** reach the final client, so the quality department must be very careful. Usually they are for internal customers, that is, group factories that use them for moving around the plant sites.




In order to check the quality of the part, the labor of the PQR in each of the samplings is to make the necessary tests: **assembling, laboratory and measuring**. The PQR has to ask the different areas to conduct the test and supply them with the necessary amount of parts.

¹⁵ Produktions-Versuchs-Serie (de): Pilot Series

It may be the case that the supplier has send a good information related to material and measuring tests that it has conduct, so, the PQR can decide not to repeat those tests again. However, the **assembling** test is a must-do one.

When the analysis is finished the PQR obtains the results. If the tests were ordered, the corresponding areas (laboratory, assembling and metrology) send the PQR a grade (1,3 or 6). If the PQR didn't order the laboratory and/or measuring tests he will set the mark himself according to the information provided by the supplier. The worst grade of the three test will be the global one:

Table 12: Sampling Results

Grade	Meaning
 1	The part fulfills all the requirements
 3	The part can be assembled with a deviation permission. It has to be improved
 6	The part can't be used.

Source: Own elaboration with data obtained from Formel Q New Parts Integral

Once the PQR has obtained the overall mark it has to analyze the causes of it and decide whether agrees or not, for example: It may happen that the assembling test has set a mark of 3 because they think that it is probable that it will rub other parts, however, the PQR has spoken with the project area and due to the design of the car, they are 100% sure the friction will not happen.

Besides, the PQR has to keep in mind the importance of the causes; a car part may get a mark of 6 because some of the required documents are missing. The workers must be careful and analyze if it is a critical mistake or a default that can be easily fixed.

The goal of the sampling process is to obtain an overall mark equal to three in the first sampling and mark 1 in the second one, so that the product can be approved.

4. *Two Days Production (2DP)*

The 2DP test consists of three stages. In each of them the PQR follows the same procedure:

1. The PQR gives the supplier a questionnaire that has to fill in about the production site and production process. Once the provider responds them the PQR analyzes the responses before going to the production site.
2. The PQR visits the production facility and analyzes it for observing the production process, devices (tools, machines...), plant's organization (departments, number of workers, organization of the work shifts...). According to the observed information, the PQR fills in another questionnaire.
3. The plant starts the production for two hours in the case for the first two stages but an entire shift production in the third one. In the case of the first two test the quantity obtained in two hours is extrapolated to a normal production shift. The PQR observes the process and takes one of the parts in the concrete place where the 'limiting action' is. That is, the most critical point in the production line, for example: If at some point of the process a machine transforms five parts per minute and at next step other machine transforms 2 parts per minute, that would be the 'limiting action'. Afterwards, they analyze the selected part and fulfill.
4. In the end, according to the production and plant site information, the 2DP may get green, yellow or red result. If it is green then the process is okay. If it is yellow the process should be improved. In case it is red, it should be repeated and the costs related to the repetition will be charged to the supplier.

The three stages of the 2DP are the following ones:

- Precheck: It is made at the end of ML5 and its goal is the quality assurance of the parts for PVS cars and the quantity assurance under zero series production conditions which is the quantity agreed when the supplier presented its offer to VW, plus a 15% more. The result of this test can't be green because it is not made with series production conditions, that is, the quality and quantity required are not the same as the series production ones. If the result is yellow, improvements have to be introduced but there aren't critical problems. In case the result is red, the test must be repeated and the costs will be charged to the provider.
- Process Acceptance: For conducting this stage the pre-check has to be successfully done. The goal is the production process and quantity approval under zero series conditions (agreed quantity plus 15% and quality). Besides, it also must be

conducted the start of the series production process but not at full capacity. This time, the results of the test can be green, yellow or red.

- Performance Test: This time the supplier has to show that it is able to produce the agreed quantity plus 15% under series condition and with the required standards, the production corresponds to one shift, can't be extrapolated as in the other two stages. Sometimes this stage is made as a repetition of the process acceptance because we may have got red in that stage and there is not enough time for repeating it, so the performance test is considered as the second process acceptance.

In case the tests are repeated and the results keep being red, the PQR will make use of the escalation of supplier's program.

5. PQM Re-Organization

This section is the key of the project because is where we conduct the reorganization of PQM department. The reorganization will consist of the analysis of the workers' subtasks to check if they should be optimized, transferred to another department or eliminated. In order to achieve a successful change, the reorganization process has to follow three steps:

1. Definition of the current situation: Organization (internal and external), reasons for change and goals.
2. Change implementation: Participants, re-organization and management of transition stage.
3. Evaluation: comparison between current and future state. (Is not analyzed in the project due to my internship's length)

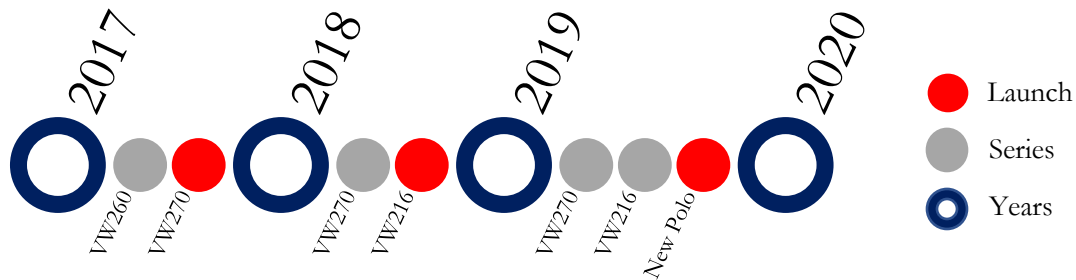
5.1 Current Situation

5.1.2 Reason for Change

The reason behind the reorganization of PQM department is a **strategic** shift, that is, a change that occurs as a result of new technologies, output or organizational performance (Nadler & Tushman, 1997). In our case, as we can see below (figure 10), the VW Navarra factory will

introduce for the first time the simultaneous production of two car models which supposes a major innovation.

Figure 10: Series and New Models' Launch timeline of Volkswagen Navarra



Source: Own elaboration from data provided by PQM worker

This kind of shifts usually requires the workers to redirect their efforts and apply resources differently, which is exactly what should be achieved once the reorganization is implemented. The PQM department, with this new situation will have to face a higher workload because it will receive a bigger number of claims coming from two models' (VW270 and VW216) series production and the launch of another new polo, so our goal is to optimize the tasks of our workers so that they are able to perform the essential ones at zero cost for the factory.

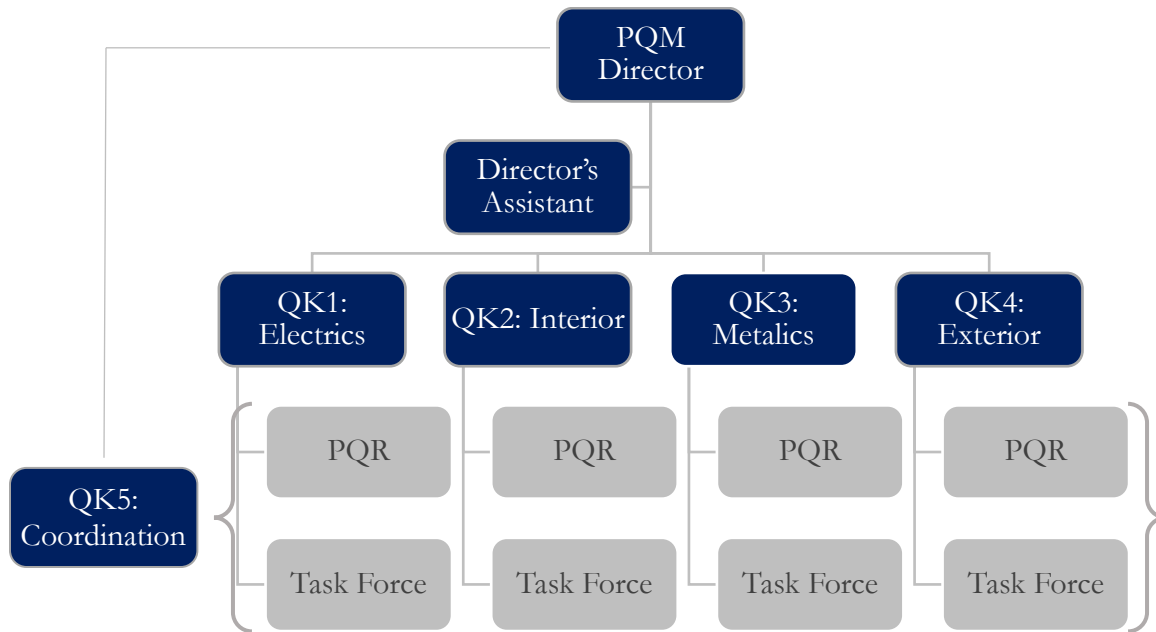
In order to adapt to this new situation, the type of redesign that is going to be implemented is an operational one. The **operational design**¹⁶ focuses at the bottom levels where the work takes place and it involves the redesign of structures, processes and systems to translate the strategic objectives into reality. This is exactly what it is going to be done with the redesign of the PQM department: a close analysis of the working procedure and subtasks of the worker for organizing them in a new optimized way and ensure that VW Navarra is able to face the simultaneous production of two models and the launch of another one.

¹⁶ Nadler, D., & Tushman, M. (1997). *Competing by design: The Power of Organizational Architecture*. Oxford University Press.

5.1.3 Internal Organization

As said before the PQM department is divided into five different sections QK1, QK2, QK3, QK4 and QK5 which are directed by the PQM general manager. Among these units, we find distinct types of relationship:

Figure 11: PQM Department's Internal Organization



Source: Own elaboration with data provided by PQM Worker

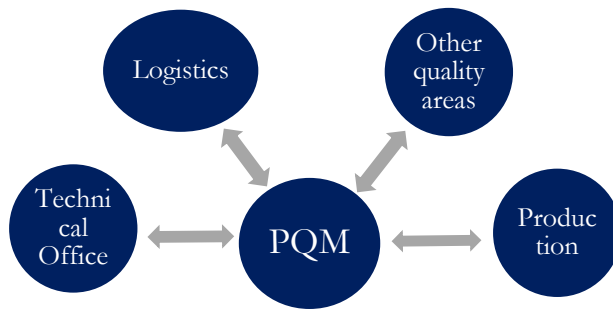
- **Vertical relation:** The first four subunits work independently between them as each of them have been assigned a different car section. These units have a hierarchical relation with the PQM manager to which they report the necessary information about the car parts.
- **Horizontal relation:** relations among units at the same hierarchical level. The fifth section, QK5, performs an **integrator** role: it has the responsibility of achieving coordination across the other four subunits. It shows the other QKs new procedures when they are introduced (such as new problem sheets) and they also gather the necessary information to report it to the general manager (for example, how many

parts have 6 mark in sampling). So, all in all, this subunit has hierarchical relation with general manager and horizontal with the rest of subunits.

5.1.4 External Organization

As we have seen before, Volkswagen's mission is to provide high quality reliable cars affordable for medium income families. Due to the crucial importance that the quality plays in the company, the PQM department in VW Navarra works closely with many other areas of the factory to ensure that the parts fulfil the quality requirements.

Figure 12: PQM Department's External Organization



Source: Own elaboration with data obtained from Formel Q New Parts Integral

Technical Office: They communicate the parts' modifications to PQM, so that it validates the modified parts. The communication can also be the other way around: PQM tells technical office whether change is required to avoid parts' problems.

Logistics: The PQM department ask logistics for new parts and it also communicates whether the parts arrived in good conditions or not.

Other quality areas: They send the claims (audits, DCC) to PQM and this one tries to solve it. Besides, it gives feedback about the state of the claims.

Production: Assembling, engines... send the claims to our department and PQM once having solved the claim communicates it to the production areas.

The relationships between the PQM department and the other areas is defined as **reciprocal interdependence**¹⁷, that is, each of the department has to work closely with the others in order to ensure the quality of the cars.

It is important to understand the link between the PQM department and other areas because it has to be taken into account when the redesign is planned, for example, in case of tasks transmission.

5.1.4 Re-organization's goals

The objectives that we want to achieve with this modification are four:

- 1. More efficient use of resources:** If we prioritize our tasks focusing just on the ones that add value to the department's performance and eliminate the wastes we will save money either by decreasing the extra hours or shedding of part of the staff.
- 2. Increase in clients' satisfaction:** If the workers can focus themselves in the key tasks the quality of the parts will be better, so there will be less client claims. Besides, in case there is any of them the PQRs will be able to attend them more efficiently. These facts, less claims and better management of them, will increase final customers' satisfaction.
- 3. Homogeneous workload distribution:** We would like to achieve an equal distribution of the work among the workers so that there aren't some workers doing extra hours and others too calmed.
- 4. Increased cooperating with other factory areas:** We would like a close cooperation with other areas so that each one has its corresponding tasks defined and clearly assigned and the job can be done more efficiently.

5.1.5 Design decisions and participants

In order to analyze closely the subtasks that the workers perform it is required the participation of the staff. However, before talking to the workers the reorganization plan was presented to

¹⁷ Nadler, D., & Tushman, M. (1997). *Competing by design: The Power of Organizational Architecture*. Oxford University Press.

the service bosses and the general manager of PQM. In this way, we have a mixture of two different approaches for making design decisions:

1. Top down: The organization's top levels are involved in the redesign process, the decisions are taken at the top levels and then transmitted to the lower ones. In this case, this approach is beneficial for two reasons:
 - On the one hand, once the service bosses and general manager have understood and agreed with the change they are the most efficient tool for transmitting the necessity of it to their workers. Usually people are comfortable with habit and they fear the innovations, thus, the top levels should communicate the staff the benefits of the future situation and how unsustainable would be to continue with the same organization in the future. They should be committed with the change so that their employees are committed too and more opened and collaborative.
 - On the other hand, the top management levels are necessary for transferring some of the tasks to other factory areas. It must be a coordination between the different departments and an agreement of the task transmission.
2. Bottom-up: The workers performing the job at the most basic level are involved in the redesign process. Their participation by studying with them their subtasks and taking into account their suggestions and point of view about the change makes them feel part of the change and more committed with it. Besides, it ensures the reorganization a more realistic approach.

5.2 Reorganization and Implementation

5.2.1 Sub Task Analysis

The procedure for reorganizing the PQM department is to analyze the sub-tasks of the main activities of the workers and classify them into the following categories:

1. **Efficients:** These tasks are inherent to our department. They create added value to PQM, they are the key tasks of our work so they can't be neither removed nor transferred. We should try to use the time obtained from the elimination of the wastes for focusing more on these tasks.

2. **Optimizations:** These tasks are the ones that can't be deleted because they generate added value to our department but they have to be modified for making them more efficiently.
3. **Transferable:** These tasks may add value to our department or to other ones in the factory so they must be maintained. However, they should be performed by their corresponding responsible which may be other factory areas or the supplier.
4. **Wastes:** These tasks are totally useless; they don't add any value to PQM, so they have to be eliminated. The time saved from their removal is transferred to the essential and necessary activities.

The analysis of the subtasks and the classification into the categories has been made by meeting the workers asking them about their opinion and following them up in their daily work. As Nadler and Tushman¹⁸ say, design efforts benefit not only widespread participation but from insights shared by people who understand both the day-to-day workings of the organization and the network of relationships in the informal organization

If we successfully apply the sub-tasks classification into the department we would have achieved to transmit the saved time of transferred and waste tasks to the efficient and optimized ones. In this way, the department will be able to face the bigger workload of two models' series production and the launch of a new one.

In order to explain the procedure of the subtask analysis, their classification and the computations of time and cost savings, I am going to show you one of the tables. For further information about the complete subtasks analysis see annexes 1,2 and 3 located in the pages 43-55.

The calculus for obtaining the total time and cost have been made in the following way:

$$\text{Total Time (Hours per year)} = \text{Time (hours)} \times \text{Units (per year)}$$

$$\text{Total Cost (Euros per year)} = \text{Time (hours)} \times \text{Units (per year)} \times \text{Wage (euros per hour)}$$

¹⁸ Nadler, D., & Tushman, M. (1997). *Competing by design: The Power of Organizational Architecture*. Oxford University Press.

Table 13: Task Force's Rejection Management Analysis

1. Rejection Management							
Sub-Tasks	Category	Reason	Time (hours)	Units	Total Time (h/year)	Price/h	Total Cost
Daily assistance of assembling, engines, JIT parts and rejection meetings	Efficient	PQM Labour	0,67	288	192	36,34	6977
Preanalysis of problem's fault: look for the code, name...	Efficient	The cause must be known	0,17	288	48	36,34	1744
Create the delivery or discarding documentation	Efficient	PQM Labour	0,17	288	48	36,34	1744
Parts and their delivery's request	Transferable	Logistics	0,17	288	48	36,34	1744
Prepare the packaging and delivery	Transferable	Logistics	0,25	288	72	36,34	2617
Store data in excel	Efficient	PQM Labour	0,08	288	24	36,34	872

Source: Own elaboration with data obtained from meetings with Task Force workers

After doing the same procedure with all the subtasks that PQR and task force workers perform I have summed the time and cost corresponding to the transferred tasks and wastes obtaining the following total savings (See annexes 1,2,3 for further information):

Table 14: Total Savings from task force's and PQR's transferred or waste functions

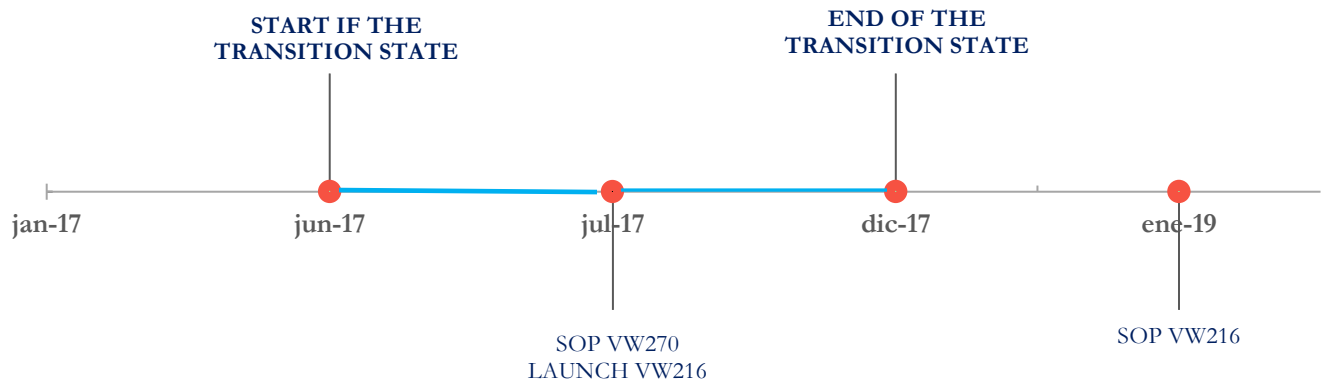
Total Savings	
Total Time Saved (Hours)	7.616
Total Cost Saved (Euros)	276.745

Source: Own elaboration with data obtained from meetings with PQM workers and own computations

This extra amount of time that the department will have once the redesign is implemented will be used for the task that truly correspond to PQM and add value to our work.

5.2.2 Planning of the Transition State

Figure 13: Timeline of Key Milestones



Source: Own elaboration with data provided by PQM worker

According to Bechard and Reuben the objective of change is to successfully move from the current state (existing configuration of strategy, work, people and structures) toward a future state (vision of how the organization should function)¹⁹. Once having created a clear vision of the current organization of the PQM department and the future desirable situation is time to plan the transition state that goes from June to December 2017 (see figure 13).

This step in between the current and future state it has to be managed delicately because it is the stage where many designs fail. When a new redesign is going to be implemented many organizations find three usual problems:

- Resistance: If workers believe that their relative position and power in the organization is at risk they may create resistance to change.
- Anxiety: People fear the unknown and feel comfortable with habit. In face of a new situation they are assaulted with anxiety and concerns that usually end up with the same question: What will the change mean for me? The bosses and manager should be the ones answering that question as soon as possible so that the staff doesn't get stressed and reluctant to change.

¹⁹ Nadler, D., & Tushman, M. (1997). *Competing by design: The Power of Organizational Architecture*. Oxford University Press.

- **Organizational Control:** When the redesign affects normal activity, managers may feel that they are losing control as it is usually harder to control the performance of the workers.

In order to avoid these problems, the PQM department's top levels should consider the following three key transition guidelines:

1. **Communicate a clear future state:** In face of a new situation workers may have doubts about which tasks are under their responsibility. In case they are not responded the staff may create a job paralysis. The managers should communicate clearly the future situation related to job specifications to avoid that problem. The new organization has to be clear and concrete for the workers.
2. **Monitor the task transmission among organization's components:** Once the redesign is implemented there may be some critical changes like the transmission of tasks from the PQM department to logistics area, that affect the fit among these two areas. If the work transmission is poorly defined and the area adopting it is not provided with the required resources or know-how information the task may not be performed correctly.
3. **Actively seek feedback and conditions of the transition state:** During the beginning of the implementation, workers may face problems in performing their work and fear to communicate them to their bosses. In that case, the top hierarchical levels should try to adopt feedback mechanisms to get as much information as possible. It can be done either by using formal methods (interviews, surveys...) or informal ones (face to face encounters). In this case, as the five QKs make daily or weekly meetings with their employees the managers have decided that they will ask their workers and gather the required information in these reunions.

5.2.3 Transfer of Functions

In order to successfully transfer some functions to other areas of the factory the PQM department should consider the following points:

1. **Agreement among the general managers:** The transfer must be agreed between the top hierarchical levels of PQM and corresponding area because otherwise the workers who receive the additional task may be reluctant to accept it.

2. Know-how Transfer: The PQM department, for making sure that the recipients of the function will perform it efficiently, has the responsibility of transferring the knowledge of how to perform it. This process will be made by the arrangement of workshops between PWM and the new departments in charge.
3. Adaptation Period: PQM should take under consideration that the tasks transfer requires an adjustment phases so that the functions are optimally performed by the other area. During this time PQM will work closely with the other department in order to help with the possible problems and enabling a step-by-step transfer.

In case PQM follows these guidelines, the functions will be correctly transferred to the other factory departments and without wrecking daily work performance.

6. CONCLUSIONS

During my Internship in the Purchase Quality Material section of Volkswagen Navarra's Quality Department, I could foresee the need of its reorganization due major shift that the company will conduct from 2019 on: the simultaneous production of two different Polo models rather than only one as it has been making.

The PQM department, by ensuring the parts fulfil the quality requirements, is one of the main contributors to the pursuit of quality for which the company is well known. Due to this fact, the department must be reorganized for being able to perform efficiently its labour and at zero cost when the simultaneous production is adopted and the workload increases.

Before starting with the redesign process, first I had to understand clearly how the labour of the department is performed. Once having a clear picture of it, the first of the three phases of the redesign started: the analysis of the current situation. This involved the department's current organization definition, the statement of the goals that wanted to be achieved and the choice of the type of redesign.

Regarding the goals, there were mainly four of them: more efficient use of resources, increase clients' satisfaction, higher cooperation degree between PQM and other departments and homogeneous workload distribution. Related to the redesign type, the choice was an operational one, that is, the one involving the reorganization of bottom hierarchical levels of PQM where the daily work actually takes places. However, the general manager and bosses were also involved in the redesign for obtaining their approval and so that they could motivate their employees with regard to the change.

During the second phase the redesign was planned. Due to the operational profile of the chosen reorganization model, it was necessary the arrangement of meetings with the PQM workers for a close analysis of their subtasks. Afterwards these were classified into four categories: efficient, optimizations, transferable and wastes. In this way, the wastes will be eliminated, some of the subtasks would be transferred to other departments and others improved. The saved time from the transfers and wastes will be used for focusing in the tasks adding more value to our department.

The implementation, the third and last phase, if successfully conducted the predicted results are time and cost saving of 7.616 hours and 276.745 euros respectively per year. This outcome implies a more efficient use of resources, as the time wasted is reduced, as well as a more homogeneous workload distribution because the workers will be centered in performing the tasks within their truly competence. Besides, with the new organization of PQM, the workload will be more homogeneously distributed and the department's cooperation with other factory areas will increase due to the tasks' transfer. Finally, an increase impact on client's satisfaction will be attained because the workers will be more focused in the key tasks such as solving the claims. The achievement of this last goal is the most important one as it contributes to Volkswagen brand's reliable image and its relentless pursuit of quality.

Due to my internship's length, I will not be able to presence the redesign's implementation. This last phase is the most critical one as it is common the failure of the companies in transmitting the planned reorganization into reality. The anxiety, rejection to change and the loss of organizational control are common among the workers when facing a new situation. In order to avoid these types of problems and achieve a successful redesign I have suggested the company some guidelines retrieved from organizational design theories (Nadler & Tushman, 1997). On the one hand, the managers should provide their employees with a clear picture about the future state to alleviate their anxiety. On the other hand, they should seek actively for feedback from their employees to check the correct task execution and avoid the loss of organizational control. Finally, regarding the transfer of tasks, PQM should be involved in workshops with other areas to transmit the required knowledge for the task performance and back up the new recipient areas during the first phase of the transmission.

In conclusion, I believe that the planned operational redesign in which I have collaborated can produce dramatic results as long as the company follows the made suggestions for a successful implementation.

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8. ANNEXES

Annex 1: Task Force Functions' Analysis

This first annex is composed by four tables that contain the task force workers' subtask analysis. Each of the tables corresponds to one main task which then is divided into the various subtasks that compose it. These ones have been classified into four different categories (efficient, optimization, transferable and wastes) so that we can save time from the transferable and waste ones.

On the other hand, there is a fifth table which compiles the transferable and waste subtask so that it is possible to make a quantification of the total time (hours per year) and cost (euros per year) saved.

Table 15: Rejection Management's Analysis

1. Rejection Management						
Sub-Tasks	Category	Reason	Time (hours)	x Units	x Price/h	= Total Cost
Daily assistance of assembling, engines, JIT parts and rejection meetings	Efficient	Parts' preanalysis for avoiding future wastes. Communication with corresponding responsible	0,67	288	36,34	6977
Preanalysis of problem's fault: look for the code, name...	Efficient	The cause must be known	0,17	288	36,34	1744
Create the delivery or discarding documentation	Efficient	PQM Labour	0,17	288	36,34	1744
Parts and their delivery's request	Transferable	Transferred to logistics	0,17	288	36,34	1744
Prepare the packaging and delivery	Transferable	Transferred to logistics	0,25	288	36,34	2616
Store data in excel	Efficient	Must be followed up	0,08	288	36,34	872

Source: Own elaboration with data obtained from meetings with Task Force Workers.

Table 16: Claim Management’s Analysis

2. Claim Management						
Sub-Tasks	Category	Reason	Time (hours)	Units	Price/h	Total Cost
Consult the claims	Efficient	Required: satisfy clients' needs	0,17	834	36,34	5.051
Attend oral claims from assembling workshop	Efficient	Required: satisfy clients' needs	0,17	834	36,34	5.051
Attend the assembling workshop and analyze the problem	Efficient	Required: satisfy clients' needs	1,00	834	36,34	30.308
Make the claim to the provider	Efficient	Required: satisfy clients' needs	0,50	834	36,34	15.154
Request the selection of parts if required	Efficient	Required: satisfy clients' needs	1,00	834	36,34	30.308
Parts delivery to supplier for their analysis: look for packaging and transport service	Transferable	Required: satisfy clients' needs	0,42	834	36,34	12.628
Rejection of faulty parts	Efficient	Required: satisfy clients' needs	0,17	834	36,34	5.051
Follow up in the warefilter of selected parts	Efficient	Required: satisfy clients' needs	0,25	834	36,34	7.577
Follow up of the faulty parts in the assembled cars	Transferable	Transferred to series quality area	1,00	834	36,34	30.308
Production check if required: stored cars, production line	Transferable	Transferred to series quality area	8,00	259	36,34	75.296
KPM opening and follow-up until stage 5	Efficient	Required: satisfy clients' needs	0,33	834	36,34	10.103
Charge creation in SAP	Efficient	Required: satisfy clients' needs	0,25	834	36,34	7.577

Source: Own elaboration with data obtained from meetings with Task Force Workers.

Table 17: Accidents Management's Analysis

3. Accidents' Management						
Sub-Tasks	Category	Reason	Time (hours)	Units	Price/h	Total Cost
Go to the workshop, analyze the parts and ask the PQR	Efficient	Part of PQM labour	0,25	40	36,34	363
Documentation and management of faulty parts: discard them on SAP	Efficient	Part of PQM labour	0,17	40	36,34	242

Source: Own elaboration with data obtained from meetings with Task Force Workers.

Table 18: Warehouse Management's Analysis

4. Warehouse Management							
Sub-Tasks	Category	Reason	Time (hours)	N° People	N° Working Days	Price/h	Total Cost
Parts sampling warehouse	Efficient	Need good parts to compare them with the faulty ones	0,12	4	212	36,34	3.595
PQM Warehouse	Waste	No need of a warehouse	0,12	4	212	36,34	3.595

Source: Own elaboration with data obtained from meetings with Task Force Workers.

Table 19: Task Forces' transferable and waste sub-tasks

Task Force's transferred or eliminated functions							
Sub-Tasks	Category	Reason	Time (hours)	x Units/ Days	= Total time	Price/h	Total Cost
Parts and their delivery's request	Transferable	Transferred to logistics	0,17	288	48	36,34	1.744
Prepare the packaging and delivery	Transferable	Transferred to logistics	0,25	288	72	36,34	2.616
Parts delivery to supplier for their analysis: look for packaging and transport service	Transferable	Transferred to logistics	0,42	834	348	36,34	12.628
Follow up of the faulty parts in the assembled cars	Transferable	Transferred to corresponding workshops	1,00	834	834	36,34	30.308
Production check if required: stored cars, production line	Transferable	Transferred to corresponding workshops	8,00	259	2.072	36,34	75.296
PQM Warehouse	Waste	No need of a warehouse	0,12	212*4 (n° workers)	99	36,34	3.595

Source: Own elaboration with data obtained from meetings with Task Force Workers.

Above there is a compilation of the transferable and waste subtask of the task force workers (table 19). With the sum of the cost and time spent in each of these it has been obtained the total time and cost saving (Table 20).

Table 20: Total time and cost savings from transferable and wastes sub tasks (task force)

Task Force Total Savings	
Total Time Saved (hours)	3.473
Total Cost Saved (euros)	126.188

Source: Own elaboration with data obtained from meetings with Task Force Workers

Annex 2: PQR Functions' Analysis

This second annex includes the analysis of the PQR workers' functions, conducted in the same way as the task forces' one.

Table 21: Claim Management's analysis

5.Claim Management						
Sub-Tasks	Category	Reason	Time (hours)	Units	Price/h	Total Cost
Claim Reception	Efficient	PQM labour	0,08	835	36,34	2.529
Obtaining the part or information (videos, photos...)	Optimization	Must be included in the claim	0,67	835	36,34	20.229
Workshop, audits and test centre						
Pre-analysis: identifying faults' responsible	Efficient	PQM labour	0,50	835	36,34	15.172
Introduction of required corrective actions	Efficient	PQM labour	0,25	835	36,34	7.586
Assurance of correct line production free of errors	Efficient	PQM labour	0,67	835	36,34	20.229
Check of stored cars	Transferable	PQM Labour	3,00	260	36,34	28.345
Stock check and selection of the faulty parts	Efficient	PQM labour	0,17	835	36,34	5.057
Make the official claim to the provider and KPM opening	Efficient	PQM labour	0,33	835	36,34	10.115
Claim's follow up and written report	Efficient	PQM labour	0,17	835	36,34	5.057
Claim closing	Efficient	PQM labour	0,25	835	36,34	7.586
CAT Realization	Efficient	PQM labour	0,08	835	36,34	2.529
Historical problem follow up	Efficient	PQM labour	0,08	835	36,34	2.529
Functional Mistake: Problem sheet and long-term follow up	Optimization	Standardization of problem sheets	1,33	103	36,34	4.991
Special cars: Problem Sheet and long-term follow up	Optimization	Standardization of problem sheets	1,33	29	36,34	1.405

Source: Own elaboration with data obtained from meetings with PQR Workers

Table 21: Claim Management's analysis

5.Claim Management						
Sub-Tasks	Category	Reason	Time (hours)	Units	Price/h	Total Cost
Cubing: Ask for parts and bring them to cubing	Efficient	PQM labour	0,50	2232	36,34	40.555
Preparatory meeting: PQM-Cubing	Efficient	PQM labour	0,50	2232	36,34	40.555
Collection of corrective actions into an excel file	Efficient	PQM labour	0,50	2232	36,34	40.555
Official Cubing meeting: supplier	Efficient	PQM labour	3,00	2232	36,34	243.333
Claims' follow up	Efficient	PQM labour	2,00	2232	36,34	162.222
Direct Customer Claim (DCC)						
Historical problem follow up	Transferable	Transferred to Quality Planning&Analysis	0,25	134	36,34	1.217
Problem's cause analysis	Transferable	Transferred to Quality Planning&Analysis	0,25	134	36,34	1.217
Already known cause: inform about the corrective actions taken in the corresponding date	Transferable	Transferred to Quality Planning&Analysis	0,25	134	36,34	1.217
Unknown cause: Check if the problem persists in the line production	Efficient	Transferred to Quality Planning&Analysis	0,50	134	36,34	2.435
If persists: the same claim procedure as with the workshops.	Efficient	Transferred to Quality Planning&Analysis	0,00	134	36,34	0

Source: Own elaboration with data obtained from meetings with PQR Workers

Table 22: Sampling's analysis

6. Sampling						
Sub-Tasks	Category	Reason	Time (hours)	Units	Price/h	Total Cost
ÄKO's valuation	Efficient	PQM labour	0,17	6525	36,34	39.520
Communication with the provider: reasons for the sampling process	Efficient	PQM labour	0,25	6525	36,34	59.280
Check parts' characteristics: measuring, status	Efficient	PQM labour	0,17	6525	36,34	39.520
Check the documents: measuring, brackets...	Efficient	PQM labour	0,50	6525	36,34	118.559
Check the information of the materials (tests, certificates) according to requirements	Efficient	PQM labour	0,33	6525	36,34	79.040
Assembling and/or laboratory tests request	Efficient	PQM labour	0,08	6525	36,34	19.760
Laboratory: request parts' components for the tests	Transferable	Transferred to laboratory	0,50	6525	36,34	118.559
Assembling	Efficient	PQM labour	0,17	6525	36,34	39.520
Measuring: Reports' check	Efficient	PQM labour	0,33	6525	36,34	79.040
Obtain the results: marks 1,3,6	Efficient	PQM labour	0,08	6525	36,34	19.760
Mark 3: assembling permission request	Efficient	PQM labour	0,08	6525	36,34	19.760
Mark 6: Prepare the problem-sheet and assembling permission	Efficient	PQM labour	1,00	6525	36,34	237.119
Obtain from the supplier corrective actions and timing for next sampling	Efficient	PQM labour	0,50	6525	36,34	118.559

Source: Own elaboration with data obtained from meetings with PQR Workers

Table 23: 2DP's analysis

9. 2 DP						
Sub-Tasks	Category	Reason	Time (hours)	Units/Year	Price/h	Total Cost
Organization: dates agreement and documents delivery	Efficient	PQM labour	0,17	190	36,34	1.151
Prepare and verify the documentation before the 2DP	Efficient	PQM labour	1,00	190	36,34	6.905
Realization of the 2DP test, including the trip	Efficient	PQM labour	20,00	190	36,34	138.092
Realization of the 2DP procedure	Efficient	PQM labour	1,00	190	36,34	6.905
Follow up of the troublesome points of the 2DP	Efficient	PQM labour	0,33	190	36,34	2.302

Source: Own elaboration with data obtained from meetings with PQR Workers

Table 24: MLA's analysis

10. Maturity Level Assurance (MLA)						
Sub-Tasks	Category	Reason	Time (hours)	Units	Price/h	Total Cost
Organization: dates agreement and documents delivery	efficient	PQM labour	0,50	126	36,34	2.289
Prepare the meeting	efficient	PQM labour	1,00	126	36,34	4.579
Meeting	Optimization	Meeting via Skype with reliable providers	4,00	126	36,34	18.315
Prepare the meeting procedure	efficient	PQM labour	1,50	126	36,34	6.868
Procedure's follow up until achieved correctly	efficient	PQM labour	0,33	126	36,34	1.526
Communicate the QPN MLA status to the corresponding parties (bosses, manager...)	Optimization	Communication via one unique way	0,17	126	36,34	763

Source: Own elaboration with data obtained from meetings with PQR Workers

Table 25: PQRs’ transferable and waste sub-tasks

PQR’s Transferred or eliminated functions						
Sub-Tasks	Category	Time (hours)	Units	Total Time	Price/h	Total Cost
Laboratory: request parts' components for the tests	Transferable	0,5	6525	3263	36,34	118.559
Workshop, audits....: Check of stored cars	Transferable	3,00	260	780	36,34	28.345
DCC:						
Historical problem follow up	Transferable	0,25	134	34	36,34	1.217
Problem's cause analysis	Transferable	0,25	134	34	36,34	1.217
Already known cause: inform about the corrective actions taken in the corresponding date	Transferable	0,25	134	34	36,34	1.217

Source: Own elaboration with data obtained from meetings with PQR Workers

Above there is a compilation of the transferable and waste subtask of the PQR workers (table 25). With the sum of the cost and time spent in each of these it has been obtained the total time and cost saving (Table 26).

Table 26: Total time and cost savings from transferable and wastes sub tasks (PQR)

PQR Total Savings	
Total Time saved (Hours)	4.143
Total Cost saved (Euros)	150.557

Source: Own elaboration with data obtained from meetings with PQR Workers

Annex 3: Total Time and Cost Savings of the PQM department

This annex compiles the time and cost saving (per year) obtained from PQR and task force workers that compose the PQM department. By summing the totals from the two types of workers we obtain the total figures (see table 27).

Table 26: Total time and cost savings from transferable and wastes sub tasks (PQR)

PQR Total Savings	
Total Time Saved (Hours per year)	4.143
Total Cost Saved (Euros per year)	150.557

Source: Own elaboration with data obtained from meetings with PQR Workers

Table 20: Total time and cost savings from transferable and wastes sub tasks (task force)

Task Force Total Savings	
Total Time Saved (hours per year)	3.473
Total Cost Saved (euros per year)	126.188

Source: Own elaboration with data obtained from meetings with Task Force Workers

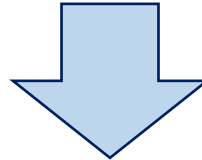


Table 27: Total time and cost savings from transferable and wastes of the department

Total Savings	
Total Time Saved (Hours per year)	7.616
Total Cost Saved (Euros per year)	276.745

Source: Own elaboration with data obtained from meetings with PQR and Task Force Workers